

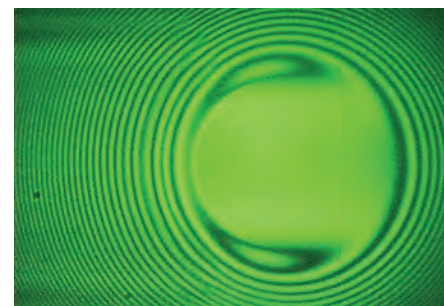


# WTC 2013

5<sup>th</sup> world TRIBOLOGY congress

September, 8-13, 2013  
Palaolimpico

**TORINO**  
Italy



[www.wtc2013.it](http://www.wtc2013.it)

Under the High Patronage of the President of the Italian Republic

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WTC2013 is the fifth World Tribology Congress that takes place in Torino after the sessions in London (1997), Vienna (2001), Washington DC (2005) and Kyoto (2009). The main objective of these meetings is to provide a unique opportunity of discussion concerning recent progress in different aspects of tribology and strength the linkage between academy and industry.

The Italian Tribology Association (AIT) in cooperation with Polytechnics of Torino and University di Pisa has organized the World Tribology Congress 2013. The unforeseeable critical political and economical situation made the organization of this Congress extremely difficult. The hard work of the members of the Committees in a real strong international cooperation made possible what a couple of years ago or even a few months before the Congress seemed to be impossible. The Chairmen are grateful to the members of all Committees and Boards, to the Cooperating Societies that publicized the Congress around the World, to the Track Organizers and Co-Organizers for their great work, as well as to all participants.

A congress of this size is also made possible if companies and industries that believe the innovation arises support it by research and scientific exchange. The Chairmen are therefore also very grateful to the industries that have sponsored the World Tribology Congress 2013.

The Congress explores every aspect of fundamental and applied Tribology research. The range of topics to be discussed embraces all aspects of concern including advanced materials, corrosion, energy applications, and lubricants with particular attention to the environmental impact. A sustainable development is today recognized as an inevitable priority for industries operating in the current world. Scientists and engineers that operate in the field of tribology must be familiar with a wide range of issues, including material characterization, surface mechanics, compatible lubricants, chemical and biological processes, computer simulation and many others. WTC V will highlight how Tribology fundamentals and applied studies can supply an essential support to obtain significant savings in materials and energy consumption and minimize the environmental impact.

About 900 oral presentations and 200 poster presentations have been accepted inside 14 Tracks and organized into 150 oral sessions and 3 poster sessions. A Plenary Lecture and 5 Plenary Talks are planned the first day of the Congress and some Keynote Speeches are included in the sessions. A technical Exhibition and some technical tours complete the Congress program.

Some joint Events are held as a part of WTC2013: ECOTRIB 2013 Tribology of Machine Elements, VIENNANO '13 Nanotechnology, STLE/ASME Lubrication Fundamentals, and AddNano Workshop, as well as some special sessions of LUBMAT. Another joint Event has been organized the week before the WTC: Tribo-Lyon 2013, combining the 40th Leeds-Lyon Symposium on Tribology and Tribochemistry Forum 2013.

**A warm welcome to all participants!**



Enrico Ciulli  
Chairman of the Program Committee



Terenziano Raparelli  
Chairman of the Organizing Committee



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# CONFERENCE AT A GLANCE

|       | Sunday 8 <sup>th</sup> | Monday 9 <sup>th</sup>                                                              | Tuesday 10 <sup>th</sup> |  |
|-------|------------------------|-------------------------------------------------------------------------------------|--------------------------|--|
| 08:30 |                        |                                                                                     |                          |  |
| 09:00 |                        | Opening Ceremony                                                                    | Technical Sessions TU 1  |  |
| 10:00 |                        | Plenary Lecture<br><i>Dr. P. Giubellino</i><br><i>ALICE Experiment Spokesperson</i> |                          |  |
| 11:00 |                        | Coffee break                                                                        | Coffee break             |  |
| 12:00 |                        | Plenary Talk 1<br><i>Prof. E. Ioannides</i>                                         | Technical Sessions TU 2  |  |
| 13:00 |                        | Plenary Talk 2<br><i>Prof. J. Luo</i>                                               |                          |  |
| 14:00 |                        | Lunch Time                                                                          | Lunch Time               |  |
| 15:00 |                        | Plenary Talk 3<br><i>Prof. B. Bhushan</i>                                           |                          |  |
| 16:00 |                        | Plenary Talk 4<br><i>Prof. K. Friedrich</i>                                         | Technical Sessions TU 3  |  |
| 17:00 | Registration           | Plenary Talk 5<br><i>Prof. W.G. Sawyer</i>                                          |                          |  |
| 18:00 | Welcome Cocktail       | Coffee break                                                                        | Coffee break             |  |
| 19:00 |                        | Technical Sessions MO 1                                                             | Technical Sessions TU 4  |  |
| 20:00 | ITC Meeting            |                                                                                     |                          |  |

Poster Session 1

AddNano Workshop

## CONFERENCE AT A GLANCE

|       | Wednesday 11 <sup>th</sup> | Thursday 12 <sup>th</sup>  | Friday 13 <sup>th</sup>    |
|-------|----------------------------|----------------------------|----------------------------|
| 08:30 |                            |                            |                            |
| 09:00 | Technical Sessions<br>WE 1 | Technical Sessions<br>TH 1 | Technical Sessions<br>FR 1 |
| 10:00 |                            |                            |                            |
| 11:00 | Coffee break               | Coffee break               | Coffee break               |
| 12:00 | Technical Sessions<br>WE 2 | Technical Sessions<br>TH 2 | Technical Sessions<br>FR 2 |
| 13:00 | Lunch Time                 | Lunch Time                 | Closure                    |
| 14:00 |                            |                            |                            |
| 15:00 | Technical Sessions<br>WE 3 | Technical Sessions<br>TH 3 |                            |
| 16:00 | Coffee break               | Coffee break               |                            |
| 17:00 | Technical Sessions<br>WE 4 | Technical Sessions<br>TH 4 |                            |
| 18:00 |                            |                            |                            |
| 19:00 |                            |                            |                            |
| 20:00 | Conference Dinner          |                            |                            |

### Organizing Committee

Terenziano Raparelli – Chair (*Politecnico di Torino*)  
Muzio Gola – Vice Chair (*Politecnico di Torino*)  
Luigi Mazza – Secretary (*Politecnico di Torino*)  
Enrica Cane (*SKF Industrie S.p.A.*)  
Federico Colombo (*Politecnico di Torino*)  
Flavia Gili (*Centro Ricerche Fiat S.C.p.A.*)  
Andrea Trivella (*Politecnico di Torino*)

### Program Committee

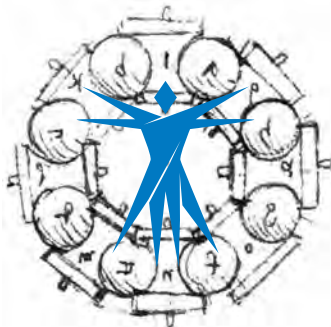
Enrico Ciulli – Chair (*Università di Pisa, Italy*)  
Roberto Bassani – Honorary Chair (*Università di Pisa, Italy*)  
Bruno Piccigallo – Vice Chair (*Accademia Navale Livorno, Italy*)  
Benyebka Bou-Said (*INSA-Lyon, France*)  
Luis Ferreira (*University of Porto, Portugal*)  
Mitjan Kalin (*University of Ljubljana, Slovenia*)  
Nikolai Myshkin (*National Academy of Sciences, Belarus*)  
Andreas Pauschitz (*AC<sup>2</sup>T Research GmbH, Austria*)  
Nicholas D. Spencer (*ETH Zürich, Switzerland*)

### International Advisory Board

H. Peter Jost – ITC President – Honorary Chair (*United Kingdom*)  
Wilfried J. Bartz (*Germany*)  
José D. Biasoli de Mello (*Brasil*)  
Michael T. Dugger (*United States*)  
Friedrich Franek (*Austria*)  
Jean Frêne (*France*)  
Sergei Glavatskikh (*Sweden*)  
Irina G. Goryacheva (*Russia*)  
Kenneth Holmberg (*Finland*)  
Satish V. Kailas (*India*)  
Dae-Eun Kim (*Korea*)  
Yoshitsugu Kimura (*Japan*)  
Jianbin Luo (*China*)  
Hugh A. Spikes (*United Kingdom*)  
Gwidon Stachowiak (*Australia*)  
Patrick G. Swan (*South Africa*)  
Jože Vižintin (*Slovenia*)

### National Advisory Board

Guido Belforte (*Politecnico di Torino*)  
Massimiliano Bestetti (*Centro Rivestimenti AIM*)  
Federico Cheli (*Politecnico di Milano*)  
Carlo Cinquini (*AIMETA*)  
Ignazio Crivelli Visconti (*AMME-ASMECCANICA*)  
Alberto Demenego (*AVIO S.p.A.*)  
Fabrizio Micari (*AITEM*)  
Edzeario Prati (*Università di Parma*)  
Guido Saracco (*Politecnico di Torino*)  
Massimo Sorli (*Politecnico di Torino*)  
Laura Vergani (*AIAS*)





### Track Organizers

#### Ecotribology

##### Organizers

Ille C. Gebeshuber (Vienna University of Technology, Austria;  
Universiti Kebangsaan, Malaysia)

Jianbin Luo (Tsinghua University Beijing, China)

##### Co-organizers

Koshi Adachi (Tohoku University, Japan)

Braham Prakash (Luleå University of Technology, Sweden)

Zygmunt Rymuza (Warsaw University of Technology, Poland)

#### Biotribology

##### Organizers

Girma Biresaw (NCAUR-MWA-ARS-USDA, United States)

Rowena Crockett (Empa, Switzerland)

#### Biomimetics

##### Organizers

Bharat Bhushan (Ohio State University, United States)

Giuseppe Carbone (Politecnico di Bari, Italy)

#### Surface Tribology

##### Organizers

Javier Barriga (Tekniker, Spain)

Daniele Dini (Imperial College London, United Kingdom)

##### Co-organizers

José Daniel Biasoli de Mello (Universidade Federal de  
Uberlândia, Brazil)

Izhak Etsion (Technion, Israel)

Daniel Nélías (INSA-Lyon, France)

Roman Nevshupa (CISDEM-CSIC, Spain)

Junyan Zhang (Chinese Academy of Sciences, China)

#### Dry Friction and Wear

##### Organizers

Lorella Ceschini (University of Bologna, Italy)

Marian Szczerek (National Research Institute, Poland)

##### Co-organizers

Carla Martini (University of Bologna, Italy)

Thomas G. Mathia (École Centrale de Lyon, France)

Giuseppe Palombarini (University of Bologna, Italy)

Giovanni Straffelini (University of Trento, Italy)

Jan Suchánek (Czech Technical University in Prague, Czech  
Republic)

Waldemar Tuszyński (Institute for Sustainable Technologies,  
Radom, Poland)

#### Lubricants and Additives

##### Organizers

Jean-Michel Martin (École Centrale Lyon, France)

Antonella Rossi (Università di Cagliari, Italy; ETH Zürich,  
Switzerland)

##### Co-organizers

Ana Aranzabe (Tekniker, Spain)

Julien Fontaine (École Centrale Lyon, France)

Amaya Igartua (Tekniker, Spain)

Stefano Mischler (École Polytechnique Federale de Lausanne,  
Switzerland)

Adolfo Senatore (University of Salerno, Italy)

Ian Sherrington (University of Central Lancashire, United  
Kingdom)

#### STLE/ASME – Lubrication Fundamentals

##### Organizers

Philippa Cann (Imperial College London, United Kingdom)

Jeffrey Streator (Georgia Institute of Technology, United States)

#### VIENNANO'13 – NanoTechnology

##### Organizers

Wilfried J. Bartz (Tribology and Lubrication Engineering,  
Germany)

Friedrich Franek (Vienna University of Technology, Austria)

##### Co-organizers

Maria Allegrini (Università di Pisa, Italy)

Bharat Bhushan (Ohio State University, United States)

Ali Erdermir (Argonne National Laboratory, United States)

Ille C. Gebeshuber (Vienna University of Technology, Austria;  
Universiti Kebangsaan, Malaysia)

Rudy Ghisleny (EMPA-Thun Switzerland)

Stephen Hsu (George Washington University, United States)

Alberto Rota (University of Modena and Reggio Emilia, Italy)

Zygmunt Rymuza (Warsaw University of Technology, Poland)

#### Bearings

##### Organizers

Guillermo Morales Espejel (SKF Engineering & Research  
Centre, The Netherlands)

Vladimir Viktorov (Politecnico di Torino, Italy)

##### Co-organizers

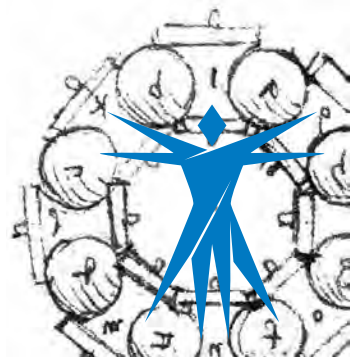
Teresa M. Berruti (Politecnico di Torino, Italy)

Antonio Gabelli (SKF Engineering & Research Centre, The  
Netherlands)

Luigi Garibaldi (Politecnico di Torino, Italy)

Gerhard Poll (University of Hannover, Germany)

Jorge Seabra (University of Porto, Portugal)



### ECOTRIB 2013 – Tribology of Machine Elements

#### Organizers

Mitjan Kalin (University of Ljubljana, Slovenia)

Paolo Pennacchi (Politecnico di Milano, Italy)

#### Co-organizers

Federico Cheli (Politecnico di Milano, Italy)

Matthias Kröger (University of Freiberg, Germany)

Andrea Manuella (University of Cagliari, Italy)

Giovanni Mimmi (University of Pavia, Italy)

Thomas Papatheodorou (Parker Hannifin, United States)

Martin Priest (University of Leeds, United Kingdom)

Maddalena Rostagno (DIAD, Italy)

### Tribology in Manufacturing

#### Organizers

Luca Iuliano (Politecnico di Torino, Italy)

Nikolaos Michailidis (Aristotle University of Thessaloniki, Greece)

#### Co-organizers

Luca Settineri (Politecnico di Torino, Italy)

Gennaro Dionoro (University of Cagliari, Italy)

Domenico Umbrello (University of Calabria, Italy)

### Tribology of Materials

#### Organizers

Sergei Glavatskikh (KTH Royal Institute of Technology, Sweden)

Giulio Malucelli (Politecnico di Torino, Italy)

#### Co-organizers

Marco Actis (Politecnico di Torino, Italy)

Michele Ciavarella (Politecnico di Bari, Italy)

Marcello Conte (Tekniker, Spain)

Giuseppe Demelio (Politecnico di Bari, Italy)

Umberto Galiatti (Politecnico di Bari, Italy)

Daniele Ugues (Politecnico di Torino, Italy)

Laura Vergani (Politecnico di Milano, Italy)

### Joint Mechanics

#### Organizers

Muzio Gola (Politecnico di Torino, Italy)

Lars Panning von Scheidt (University of Hannover, Germany)

#### Co-organizers

Matthew Brake (Sandia National Laboratories, United States)

Lothar Gaul (University of Hannover, Germany)

Michael Starr (Sandia National Laboratories, United States)

### Novel Aspects in Tribology

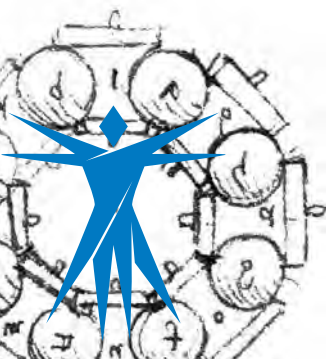
#### Organizers

Jian Wen Choo (Petronas, Malaysia)

Joichi Sugimura (Kyushu University, Japan)

### Cooperating Societies

- Armenia Tribology Committee, Armenia
- Austrian Tribology Society, Austria
- BTA - Balkan Tribological Association, Balkans
- Society of Tribologists of Belarus, Belarus
- Tribology Division of the Brazilian Association for Metals, Materials and Mining, Brazil
- Society of Bulgarian Tribologists, Bulgaria
- Chinese Tribology Institute, China
- Czech Tribology Society, Czech Republic
- Egyptian Society for Tribology, Egypt
- Finnish Society for Tribology, Finland
- Groupe Scientifique et Technique Tribologie of the Association Française de Mécanique, France
- Tribology Society of Georgia, Georgia
- Gesellschaft für Tribologie e.V., Germany
- Tribology Group, Scientific Society of Mechanical Engineers, Hungary
- Tribology Society of India, India
- The Israel Society for Tribology, Israel
- AIAS - Associazione Italiana di Analisi delle Sollecitazioni, Italy
- AIM - Associazione Italiana di Metallurgia, Italy
- AIMETA - Associazione Italiana di Meccanica Teorica e Applicata, Italy
- AITEM - Associazione Italiana di Tecnologia Meccanica, Italy
- Japanese Society of Tribologists, Japan
- Korean Society of Tribologists and Lubrication Engineers, Korea
- Lithuanian Scientific Society Department Tribologija, Lithuania
- The Norwegian Tribology Society, Norway
- Polish Tribology Society, Poland
- Sociedade Portuguesa de Materiais, Portugal
- The Romanian Association of Tribology, Romania
- Association of Tribology Engineers (ATE), Russia
- The Tribology Council of the Russian Academy of Sciences, Russia
- Serbian Tribology Association, Serbia
- Slovak Society of Tribology, Slovak Republic
- Slovenian Society of Tribologists, Slovenia
- South African Institute of Tribology, South Africa
- Svenska Tribologi Guppen, Sweden
- Swiss Tribology, Switzerland
- Dutch Tribological Society, The Netherlands
- Tribology Group of the Institution of Mechanical Engineers, United Kingdom
- Society of Tribologists and Lubrication Engineers, United States
- Tribology Division of the American Society of Mechanical Engineers, United States



## GENERAL INFORMATION

### CONGRESS VENUE

The Palaolimpico Isozaki Torino

C.so Sebastopoli, 123 - Torino, Italy - Tel. +39 011 6164963

The Palasport Olimpico or Olympic Arena or Palaisozaki (from the name of the architect) is a multipurpose indoor sports/concert arena located at the Santa Rita district in Turin. It is a few meters east of the Olympic Stadium. With its 12,300 seats and an overall cost of 87 million Euros it is the largest indoor stadium in Italy. Built for the 2006 Winter Olympics, it hosted the ice hockey events. The design of the building was subject of an international competition, won by a team led by architect Arata Isozaki of Tokyo. Composed the study Archa spa Turin, Italy Arup s.r.l. Milan, Ing. Joseph Amaro, Arch. Mark Brizio. The venue was designed by the Japanese architect Arata Isozaki and the Italian architect Pier Paolo Maggiora and is part of the larger compound known as the central Olympic compartment composed of the Olympic stadium, the Swimming Hall and Park parade ground. The futuristic design reminds of a strict rectangular Cartesian building coated with stainless steel and glass, with a base of 183 to 100 meters. Rising over four levels, two underground (up to 7.5 meters below ground) and two outdoor (up to 12 meters high). The overall length of the plant is about 200 meters. The structure, designed to be a true "events factory", as defined by its architect, is completely flexible and adaptable in its internal structure: the arrangement of furniture stands (thanks to a modern system of movable and retractable bleachers and the possibility of temporary movement of a deck), and plant in acoustics.

A kind of magic box, actually designed for an almost infinite potential use after having been one of the Olympic venues: ice sports, various indoor sports, athletics, concerts, shows, conventions, exhibitions, events, parades, fairs, religious gatherings, etc. Its maximum capacity is 18.500 seats in concert mode. It served as one of the venues hosting ice hockey events at the 2006 Winter Olympics, including the finals. It opened in 2005 and has seats for 12.350 spectators. The venue includes also has a practice rink.

### HOW TO REACH TURIN FROM CASELLE AIRPORT

By car: you can reach the city center by taxi (cost about Euro 30,00).

By bus: **SADEM Bus Service** to and from city center and Turin Airport. It includes several en route stops: Porta Nuova railway station, Porta Susa railway station, via Stradella 242/245, Borgaro and Caselle town.

A "direct" bus service between Turin and the airport is also available, which does not include stops at Borgaro and Caselle town but that only stops at Porta Nuova and Porta Susa railway stations.

- One-way fare: Euro 6,50 (+0,50 Euro aboard). Euro 5,00 with Torino+Piemonte Card
- Journey time: 45/50 minutes
- Passengers are kindly requested to buy their tickets before getting on the bus

For further information and timetable confirmation visit Sadem Bus Shuttle or call tel. +39 011.3000611

### BOOK OF ABSTRACTS

The congress bag contains a USB pen drive with all congress papers.

### REGISTRATION DESK

#### Congress Secretariat Operating Hours

|                         |               |
|-------------------------|---------------|
| Sunday September 8:     | 15:00 – 19:00 |
| Monday September 9:     | 07:30 – 19:00 |
| Tuesday September 10:   | 07:30 – 19:00 |
| Wednesday September 11: | 07:30 – 18:00 |
| Thursday September 12:  | 08:00 – 19:00 |
| Friday September 13:    | 08:00 – 13:00 |



- Ⓐ Porta Nuova Railway Station - take the bus no. 4 and get off at Corso Unione Sovietica / Corso Sebastopoli
- Ⓑ Palaolimpico
- Ⓒ Porta Susa Railway Station - take the bus no. 10 and get off at Corso IV Novembre / Corso Sebastopoli

## GENERAL INFORMATION

### TRAVEL & ACCOMMODATION

#### Travel

Lufthansa Airlines offers a comprehensive global route network linking major cities around the world. As airline partner, Lufthansa offers special prices and conditions to participants, visitors, exhibitors and invited guests as well as employees of the Contracting Partner and their travel companions.

To make a reservation, please click on [www.lufthansa.com/event-booking\\_en](http://www.lufthansa.com/event-booking_en) and enter the access code ITZSDTQ in the "Access to Event Booking" area. An online booking platform will automatically calculate the discount offered or provide you with an even better offer if another promotional fare is available.

NOTE: Pop-ups must be enabled otherwise the booking platform window will not open.

#### Accommodation

To reserve a room you could ask our Staff during the Congress at the registration desk.

### BADGES

Participants should collect name badges from the congress registration desk. Since only registered participants will be permitted to attend the scientific sessions and the exhibition areas, you are kindly asked to wear your badge when entering to the congress venue. In case you lose your badge, please proceed directly to the Congress Secretariat in order to get a new one.

### CERTIFICATE OF ATTENDANCE

Certificates of Attendance can be requested at the Registration Desk during Congress.

### CLOAKROOM

There will be 2 Cloakrooms beside the Main Entrance to the Palaolimpico. Please note that we cannot take any responsibility for valuable belongings such as passports, cash, etc. Please remove these from your coats/luggage.

### COFFEE BREAKS

Coffee will be offered during the coffee breaks, according to the time schedule mentioned in the program.

### CONGRESS REGISTRATION FEES (VAT INCLUDED)

|                                                                                |             |
|--------------------------------------------------------------------------------|-------------|
| Regular registration                                                           | Euro 720,00 |
| Regular registration for AIT Members and for Members of Cooperating Societies* | Euro 670,00 |
| Students and retired                                                           | Euro 350,00 |
| One day                                                                        | Euro 450,00 |
| Gala dinner                                                                    | Euro 90,00  |

(\*) Cooperating Societies are listed on page 8.

The Registration fee includes: free access to the welcome cocktail (Sunday September 8, starting from 18:30), scientific sessions, congress material, exhibition area, coffee breaks and technical visits to the Companies on Thursday (starting at 14:00) - on request.

#### Payment method

Registration fees should be paid either by Credit Card (VISA or MASTERCARD) or by cash.

### CURRENCY, EXCHANGE, CREDIT CARDS

The official currency in Italy is the Euro (€). You can change foreign currency in several banks and Currency Exchange Businesses. Bank cheques are not so popular and they are seldom accepted. Credit cards are very common in the urban areas. Shops and restaurants that normally accept credit cards display a list of these cards on their shop windows. It is advisable to carry some cash, since for small purchases shops do prefer to be paid cash.

Bank are open: Mon-Fri, from 08:30 to 13:30 and from 14:30 to 16:30.

They are closed on Saturday and Sunday.

### ELECTRICITY SUPPLY

In Italy electricity is generally supplied at 220 volts and a frequency of 50 Hz. Plugs are normally with two or three pins. Plug adaptors or converters might be necessary for guests from United States, United Kingdom and Japan and others.

### EMERGENCIES, MEDICAL ADVICE

Emergencies Numbers are free of charge: Ambulance 118 – Police 113 or 112 – Fire Department 115

For detailed information, please contact the Registration Desk.

### GALA DINNER

The 5<sup>th</sup> Tribology Congress Social Evening will be held on September 11 starting from 20:00 at the Palaolimpico (Foyer). To participate you can buy the Gala Dinner coupon at the Registration Desk, by Monday September 9. The cost is Euro 90,00 (vat included) per person.



## GENERAL INFORMATION

### INSTRUCTIONS FOR POSTER PRESENTATION

Poster will be displayed divided in 3 sessions:

**Tuesday September 10 from 09:00 to 16:30**

**Wednesday September 11 from 09:00 to 16:30**

**Thursday September 12 from 09:00 to 16:30**

Authors are invited to hang their posters the day of their presentation preferably by 08:00.

Authors must guarantee their presence nearby the poster during lunch break in the day of their presentation. Poster size is 100 cm (high) and 70 cm (wide). Modality to stick the poster: double sided adhesive - Pins are not usable.

Double sided adhesive and scissors will be available at the Registration Desk.

Note that in case you will not follow the above date/time schedule, the Organizing Committee and Congress Secretariat, are not responsible in case of loss or damage of your poster.

### INSTRUCTIONS FOR LECTURES AND ORAL PRESENTATION

Speakers are requested to upload their files to the Slide Centre the day before, if their presentation is in a morning session, or at least 2 hours before the beginning of the session, in case of an afternoon session.

Optimal conditions of presentation files: Microsoft PowerPoint Windows-Office 2010.

If you have a Macintosh computer, please bring an appropriate converter with you.

### LIABILITY

The organizers cannot accept liability for any personal accidents, loss of belongings or damage to private property of participants and accompanying persons that may occur during the Congress.

### LUNCHES

No official lunches are provided. You can have lunch at the Self-Service Areas Restaurant in the corridors of the Palaolimpico.

### INTERNET POINT

Free WiFi on site.

### OFFICIAL LANGUAGE

The official language of the Congress is English.

### PUBLIC TRANSPORT IN TORINO

Public transport in the city is well organized. You could purchase special price bus and underground tickets directly at Registration Desk. Here below details of prices:

| Valid for | Rate reserved for conferences per person | Regular Rate |
|-----------|------------------------------------------|--------------|
| 2 days    | Euro 5,50                                | Euro 7,50    |
| 3 days    | Euro 7,00                                | Euro 10,00   |
| 4 days    | Euro 8,00                                | Euro 15,00   |
| 5 days    | Euro 9,00                                | Euro 17,50   |
| 6 days    | Euro 10,00                               | Euro 20,00   |

### SHOPPING

The usual shopping hours in Torino are from 09:00 to 19:30; large shopping centers are open up to 21:00.

### SMOKING

Smoking is not allowed inside the Congress buildings, venues of social events and in all public places in the city. Smokers are kindly requested to smoke outdoors.

### TAXI

You can take a taxicab anywhere in the city.

Ask the reception of your hotel or dial numbers +39 0115730 or +39 0115737.

### TELEPHONES

International calls can be made using any public telephone in the city center. Please remember to dial the international code of the country you want to call to. The dialing code for Italy is +39 followed by the telephone number you call. Pre-paid telephone cards are very easy to use and can be bought in any tobacco shop or newspaper kiosk.

### STAFF

Should you have any questions, congress staff will be pleased to help you. Please contact the Registration Desk.

### TECHNICAL TOURS

Technical tours will be held on September 12.

#### **PETRONAS LUBRICANTS INTERNATIONAL SDN. BHD (PLI)**

Petronas Lubricants International SDN. BHD (PLI) is a global oil lubricant business with operations in more than 20 countries worldwide, which includes development, manufacturing, marketing and distribution of high-end lubricants, functional fluids and anti-freeze for automobiles, racing cars including F1, motorcycles, trucks, agricultural tractors and earth moving machinery as well as for other industrial equipment.

Petronas, short for Petroliaam Nasional Berhad, is Malaysia's national petroleum corporation. Established on 17 August 1974, Petronas has grown into one of the world's largest integrated oil and gas companies with strategic business interests in more than 30 countries. The Group is engaged in a wide spectrum of value-adding petroleum and related activities and is a leading global LNG player.

The visit of the site of Villastellone (Torino) will include a tour of the main PLI R&D Centre (Laboratories & Mechanical Testing Department) where a team of researchers and engineers carries out the development of products on the cutting edge of technology thanks to the close relationship with global players in the automotive industry.

The visit will also include a tour of the plant where products are manufactured bearing the most famous PLI's brands such as Syntium, Selenia, Paraflu.

#### **AVIO**

Avio is an international leading group in the aerospace industry, with its headquarters in Turin (Italy). Founded in 1908, it is active in 4 continents with commercial offices and 12 manufacturing sites. It has over 5,300 employees, of which approximately 4,500 are in Italy. In 2012, its revenues exceeded 2.3 billion Euro. It is active in the following business areas: Aeronautics; Space; MRO and service; aircraft-derivative turbines for marine and industrial use; control, automation and electrical systems. It carries out research and technological development through a network of laboratories in Italian university campuses and through collaborations with 24 Italian and international universities and research centers.

The participants will have the opportunity to visit the Avio industrial site of Rivalta di Torino. The visit will start in the historical exhibition hall, where several old aircraft engines are on show tracing the history of Avio technology since the pioneering years of aviation, through the second world war and the old war period, lasting with the latest developments. During the visit, the participants will stop in from of several additional exhibition areas where they will see actual aircraft engine modules designed and produced by Avio: accessory gearboxes, power gearboxes, low pressure turbine modules all of them as fully assembled units and as single, major components.

An exhibition stand is dedicated to the most up-to-date achievements of Avio following its R&D activities: innovative 'green-engine' architectures, lean combustors, one-piece components made by direct metal deposition (either through laser or electron-beam as energy sources).

#### **SKF**

##### **Super Precision Bearing Factory and AVIO Factory**

The Super-precision bearing factory, in Villar Perosa, has 240 employees and produces about 500.000 bearings per year.

The Super-precision bearings are used above all when working conditions are very demanding as for low working temperature, high precision, high stiffness, low noise and long service life.

The main reference industry for the factory is Machine Tool, even if they can be used in many different applications such as metalcutting machinery spindles, woodworking machinery spindles, high speed rolling mills, printing machines, turbochargers, vacuum pumps and others.

In Aeroengine Villar Perosa factory are produced bearings for aviation to equip some among the most common engine motors, like SNECMA CFM 56. We are qualified to produce part numbers for some of the most famous airplanes, like, for example, Boeing 737, Airbus or Boeing 747. The experience in engineering and production of avio bearings and the utilization of special steel, fitting hard working conditions, has driven us to work also for helicopters. SKF Aeroengine Villar Perosa is particularly well introduced in that industry and has, among its customers, relevant manufacturers like Agusta, ZFL, Eurocopter and others.

##### **Solution Factory**

SKF Solution Factory in Moncalieri is the place where SKF identifies and solves customer challenges. We bring people, service and technologies together to create customer solutions for improved operational asset performance.

The main services of SKF Solution Factory are: Asset diagnostic Services, Engineering, Reliability Consulting, Condition based maintenance, Mechanical Services, Remanufacturing, Customized Products, Product support, Trainings.

##### **Airasca Factory**

Airasca factory is near Turin and it is the SKF largest Italian factory: 70,000 sqm and more than 800 employees. Airasca factory is dedicated to the wheel hub: here the full range of hub bearing units (HBU) is produced. The production flow includes the turning of the forged components, the heat treatment by induction, the grinding and honing of the grooves and the assembling of the HBU. The most important customers are Fiat, General Motors, Ferrari, BMW, Audi, Toyota, Maserati, Porsche, Volkswagen, ...

The site is ISO/TS 16949:2009 (Quality), ISO 14001:2004 (Environment) and OHSAS 18001:2007 (Safety) certified.

### TURIN AND PIEDMONT

The history and the charm of the Piedmont are told by manors, castles, the abbeys, the royal residences, piazzas and villages witness of art and tradition, breathtaking landscapes, by many museums.

Among capital cities of Europe, Torino is the one that best expresses the design idea of the great Baroque and Enlightenment. Turin is also the monumental testimony of the Savoy dynasty, through the extraordinary palaces and royal villas, like Venaria, Stupinigi, Racconigi, and the great churches and museums.

The Egyptian Museum, recently refurbished and second in Europe for number of exhibits after Cairo, the Cinema Museum in the Mole Antonelliana, the Museum of the Lingotto are unique in the world.

Piedmont is the region of the Langhe hills shaped by where they produce some of the finest wine in the world. The charm of the mountains and mountain valleys constitute a great attraction for skiing and other mountain sports. A combination of natural beauty and works of art deserve a trip to Piedmont.

### MAIN MUSEUMS IN TORINO

**Showing your WTC congress badge at the ticket office desk of the listed below Museums, you can obtain a reduced priced tickets.**

#### **Torino and the “National Cinema Museum”**

The National Cinema Museum, the tallest Museum in the world, is located inside the Mole Antonelliana, the tower representing the city of Turin. The exhibition covers 3.200 squared meters, 5 floors and a spectacular elevator offering a view of the Temple Hall and a breath-taking city panorama.

Hours:

Tuesday to Friday 09:00 – 20:00

Saturday 09:00 – 23:00

#### **Torino and the “Museo dell’Automobile”**

Being handed over to the Municipality of Torino in March 2011 after a period of 4 years, the Museum was architecturally renovated in building, surfaces and exhibition design. It offers over 150 models of cars produced by the world's most popular and renowned manufactures. The museum mission has been to tell the story of automobiles over the last two centuries, both under a national and an international point of view, using examples provided by traditions and society.

Hours:

Monday 10:00 – 14:00, afternoon closed

Tuesday 14:00 – 19:00

Wednesday, Thursday and Sunday 10:00 – 19:00

Friday and Saturday 10:00 – 21:00

**Monday 9<sup>th</sup> September - MAIN HALL ROMA**

**OPENING ADDRESSES**

09:00 – 10:00

**Prof. Terenziano Raparelli**, *Organizing Committee Chair*

**Prof. Enrico Ciulli**, *President of the Italian Tribology Association, Program Committee Chair*

**Prof. H. Peter Jost**, *President of the International Tribology Council*

**Prof. Roberto Bassani**, *Honorary President of the Italian Tribology Association*

**Prof. Marco Gilli**, *Rector of Politecnico di Torino*

**Ing. Aurelio Nervo**, *Managing Director SKF Industrie S.p.A.*

**Ing. Aldo Marangoni**, *Head of EMEA Region Powertrain Engineering, FIAT-Chrysler Group*

**Mr. Alan Begg**, *Senior Vice President SKF Group Technology Development*

**PLENARY LECTURE**

10:00 – 10:50

**The Big-Bang in the Lab**

**Dr. Paolo Giubellino**, *ALICE Experiment Spokesperson, CERN & INFN*

**PLENARY TALKS**

11:20 – 12:00

**Rolling Bearing Tribology: Successful Past – Bright Future**

**Prof. Efstathios Ioannides**, *Imperial College, London, United Kingdom*

12:00 – 12:40

**Tribology in Nanomanufacturing – The Interaction between Nanoparticles and Polished Surface during the Manufacture of Near Perfect Smooth (NPS) Surface**

**Prof. Jianbin Luo**, *State Key Laboratory of Tribology, Tsinghua University, Beijing, China*

14:00 – 14:40

**Biomimetics: Bioinspired Superhydrophobic, Self-Cleaning/Antifouling and Low Drag Surfaces for Green Tribology**

**Prof. Bharat Bhushan**, *Ohio State University, Columbus, OH, United States*

14:40 – 15:20

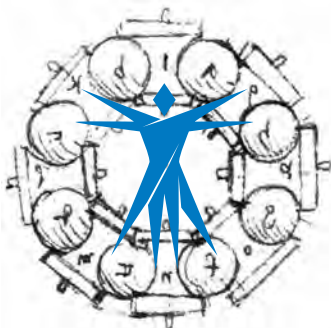
**Nanoparticles and Transfer Film Layer Related to Sliding Wear of Polymer Nanocomposites against Steel**

**Prof. Klaus Friedrich**, *Institute for Composite Materials, Technical University of Kaiserslautern, Germany*

15:20 – 16:00

**Space Tribology: Experiments in Low Earth Orbit**

**Prof. W. Gregory Sawyer**, *University of Florida, Gainesville, FL, United States*







**Paolo Giubellino**

*ALICE Experiment Spokesperson, CERN-Geneva, Switzerland & INFN-Torino, Italy*

Paolo Giubellino, is an experimental Physicist working on High-Energy Nuclear Collisions. Currently he is leading the ALICE experiment at CERN, international collaboration of 1300 scientists from 138 scientific institutions from 36 countries.

After his studies at studies at Torino University and a Fulbright fellowship at the University of California, he has worked mostly at CERN and at the Torino section of the Italian National Institute for Nuclear Physics (INFN), where he holds a position as Research Director. In 2000, he has been awarded the title of Doctor in Physics and Mathematics (Habilitation) by the Dubna Academic Council (Russia).

He has dedicated most of his scientific life to the Physics of High-Energy Heavy-Ion collisions, in which a state of ultra- dense and hot matter like the one prevailing in the first microseconds of life of our Universe is created. He has participated in numerous experimental projects first at the CERN SPS and, since the beginning of the program, at the Large Hadron Collider. He has carried several responsibility positions in the ALICE Collaboration since its creation in the early nineties, to be eventually elected deputy spokesperson from 2004 to 2010 and spokesperson since Jan 1<sup>st</sup> 2011. On July 17, 2013, he was elected with a very large majority for a second term as spokesperson of the Collaboration.

Throughout his career he has accompanied his studies of nuclear physics with the development of technologies for particle detection and is since Aug. 2000 member of the Instrumentation Panel of the International Committee for Future Accelerators (ICFA).

He serves in many scientific committees and panels in France, Germany, Russia, the United States, Mexico, Spain, the Czech Republic, the Republic of Korea and South Africa and is currently Chair of the G-PAC of GSI, the largest nuclear physics laboratory in Germany, and member of the Conseil Scientifique of IN2P3 (National Institute of Nuclear and Particle Physics), France. He has been active in International collaboration, and has promoted and had key roles in several programs funded by the European Union, NATO and numerous bilateral agreements. He also serves in the International Advisory Committee of many scientific conferences worldwide.

Author of over 200 scientific papers, he has been awarded several recognitions, among which the Medal of the Ukrainian Academy of Sciences, the Medal of the Particles and Fields section of the Mexican Physical Society and the Honorable Mention of the Ministry of Education, Science, Research and Sport of the Slovak Republic. In 2012, he has received from the Italian President Napolitano the title of "commendatore" ("commander", second-highest honorific title in the Republic) for scientific merits. In 2013 he has been awarded the prestigious "Enrico Fermi" Prize, the highest recognition of the Italian Physical Society.



**Efstathios Ioannides**

*Imperial College London, United Kingdom*

Prof. Ioannides was awarded an MSc in Mechanical-Electrical Engineering, (Technical University of Athens) in 1965, an MSC, DIC (University of London/Imperial College) in 1967 and a Ph.D. (University of London/Imperial College) in 1974. After a spell of post-doctoral work at Imperial College he joined the SKF Engineering & Research Centre (ERC) in 1981 and from March 1995 to his retirement in July 2009 he was the SKF Group Product R&D Director based in in the Netherlands. From 1988 he has been a Visiting Professor in the Mechanical Engineering Department of the Imperial College of Science, Technology and Medicine.

He is a Fellow of the Institution of Mechanical Engineers (United Kingdom) and a Fellow of the American Society of Mechanical Engineers.

He has published approximately 120 papers in scientific journals.

His recent awards are the 2008 Tribology Gold Medal, administered by the United Kingdom Institution of Mechanical Engineers (IMechE) and the 2010 Leonardo da Vinci International Award established by the Italian Association of Industrial Designers (AIPI).



**Jianbin Luo**

*State Key Laboratory of Tribology, Tsinghua University, Beijing, China*

Prof. Jianbin Luo is a member of Chinese Academy of Sciences and a Yangtze River Scholar Distinguished Professor of Tsinghua University, Beijing, China.

Prof. Luo received his BEng degree from Northeastern University in 1982, and got his MEng degree from Xi'an University of Architecture and Technology in 1988. In 1994, he received his PhD degree from Tsinghua University and then joined the faculty of Tsinghua University. He was honored as "Yangtze River Scholar Distinguished Professor" from 2002 and elected as a member of Chinese Academy of Sciences in 2011. Prof. Luo is currently the director of State Key Laboratory of Tribology (SKLT) and the head of the Department of Mechanical Engineering, Tsinghua University. He is also the vice president of International Tribology Council and the chairman of Technical Committee for Tribology of IFToMM. He was the chief scientist of two "973" projects (National Key Basic Research Program), and was also the director of Tribology Institute of Chinese Mechanical Engineering Society from 2008 to 2012. In addition, he is the editor-in-chief of the English journal "Friction".

Prof. Luo has been engaged in the research of thin film lubrication and nanomanufacturing for more than 20 years. He was awarded the STLE International Award (2013), the Chinese National Technology Progress Prize (2008), the Chinese National Natural Science Prize (2001), and the Chinese National Invention Prize (1996). He was invited to give talks as a keynote or plenary speaker for 14 times on the international conferences. Till now, he has published more than 200 pieces of papers and two books in the fields of tribology and nanomanufacturing, and got more than 20 pieces of invention patents.



**Bharat Bhushan**

*Ohio Eminent Scholar and The Howard D. Winbigler Professor*

*Ohio State University, Columbus, OH, U.S.A.*

*Microsyst. Technologies*

Dr. Bharat Bhushan received an M.S. in mechanical engineering from the Massachusetts Institute of Technology in 1971, an M.S. in mechanics and a Ph.D. in mechanical engineering from the University of Colorado at Boulder in 1973 and 1976, respectively, an MBA from Rensselaer Polytechnic Institute at Troy, NY in 1980, Doctor Technicae from the University of Trondheim at Trondheim, Norway in 1990, a Doctor of Technical Sciences from the Warsaw University of Technology at Warsaw, Poland in 1996, and Doctor Honouris Causa from the National Academy of Sciences at Gomel, Belarus in 2000 and University of Kragujevac, Serbia in 2011. He is presently an Ohio Eminent Scholar and The Howard D. Winbigler Professor in the College of Engineering, and the Director of the Nanoprobe Laboratory for Bio- & Nanotechnology and Biomimetics (NLB<sup>2</sup>) at the Ohio State University, Columbus, Ohio. His research interests include fundamental studies with a focus on scanning probe techniques in the interdisciplinary areas of bio/nanotribology, bio/nanomechanics and bio/nanomaterials characterization and applications to bio/nanotechnology, and biomimetics. He is considered by some a pioneer of the tribology and mechanics of magnetic storage devices. He has authored 8 books, 90+ handbook chapters, 800+ scientific papers (h-index – 68+; ISI Highly Cited Researcher in Materials Science since 2007 and in Biology and Biochemistry since 2013; and ISI Top 5% Cited Authors for Journals in Chemistry since 2011). He has also edited 50+ books and holds 19 U.S. and foreign patents. He is co-editor of Springer NanoScience and Technology Series and co-editor of Microsystem Technologies. He has given more than 400 invited presentations on six continents and more than 200 keynote/plenary addresses at major international conferences. Dr. Bhushan is an accomplished organizer. He organized the 1st Symposium on Tribology and Mechanics of Magnetic Storage Systems in 1984 and the 1st Int. Symposium on Advances in Information Storage Systems in 1990, both of which are now held annually. He organized two international NATO institutes in Europe. He is the founder of an ASME Information Storage Division founded in 1993. His biography has been listed in over two dozen Who's Who books. He is the recipient of various international fellowships including the Alexander von Humboldt Research Prize for Senior Scientists. He is a foreign member of the Russian Academy of Engineering and Byelorussian Academy of Engineering. Dr. Bhushan has previously worked for MTI, NY; SKF Industries Inc., PA; and IBM Almaden Research Center, San Jose. He has held visiting professorship at University of California at Berkeley, University of Cambridge, Technical University Vienna, University of Paris, ETH Zürich and EPFL Lausanne. He is currently a visiting professor at KFUPM, Saudi Arabia, Tsinghua Univ. and Harbin Inst., China, Univ. of Kragujevac, Serbia and Univ. of Southampton.



**Klaus Friedrich**

*Institute for Composite Materials (IVW GmbH), Technical University of Kaiserslautern, Germany*

K. Friedrich graduated in "Manufacturing Technology" at the University of Applied Sciences (Dortmund) and in "Mechanical Engineering" at the Ruhr-University Bochum in Germany. Here, he also earned in 1978 his PhD- Degree in "Materials Science". After industrial experience in the construction of machine elements, he was associated in 1980 as a Visiting Assistant Professor with the Center for Composite Materials, University of Delaware, United States. Afterwards, i.e. between 1982 and 1990, he worked as a Professor for Polymers and Composites at the Technical University Hamburg-Harburg, Germany.

In August 1990, K. Friedrich became Research Director for Materials Science at the Institute for Composite Materials (IVW), University of Kaiserslautern, Germany. He acts also as a Scientific Board Member of various international journals in the fields of materials science, composites, and tribology. Together with his co-workers he has published more than 800 papers in refereed journals, books and conference proceedings. According to ISI HighlyCited.com, Professor Friedrich is listed as a highly cited researcher in materials science. At present, he has an h-index of 60, according to Google scholar. Further, he is editor of five books on "Friction and Wear of Polymer Composites", "Application of Fracture Mechanics to Composite Materials", "Advances in Composites Tribology", "Polymer Composites: From Nano- to Macro-Scale", and "Tribology of Polymeric Nanocomposites: Friction and Wear of Bulk Materials and Coatings", respectively. He holds three honorary professorships from distinguished Chinese universities, and two honorary Dr.-degrees. In 2005, Prof. Friedrich was honoured as a World Fellow of the International Committee on Composite Materials (ICCM). Between 2006 and 2007 he spent an International Professorial Fellowship at the University of Sydney. Now, i.e. after his retirement from the director position of IVW, Prof. Friedrich acts as a research consultant for various institutes and industrial companies, and he is a part time professor at the King Saud University, Riyadh, Saudi Arabia.



**W. Gregory Sawyer**

*University of Florida, Gainesville, FL, United States*

Professor W. Gregory Sawyer is a Distinguished Teaching Scholar and N. C. Ebaugh Professor of Mechanical and Aerospace Engineering at the University of Florida. His research interests are in Materials Tribology and Surface Science. Greg has published over 100 journal papers, and was a part of the team that conducted 8 active tribology experiments on the International Space Station. His research interests are in micro- and nano-tribology, life prediction, nanocomposites, sliding electrical contacts, and bio-tribology. Greg has also developed educational software that implements molecular dynamics simulations and games to allow users to interact with atoms; this software was the focus of a TED presentation that Greg gave in 1998, and articles that appeared in the journals Scientific American and Science.

## SESSIONS AT A GLANCE

Monday 9<sup>th</sup>

|       | ROOM 1<br>TORINO                                      | ROOM 2<br>PISA                                               | ROOM 3<br>MILANO             | ROOM 4<br>VENEZIA                     | ROOM 5<br>NAPOLI                                      | ROOM 6<br>FIRENZE                                   |
|-------|-------------------------------------------------------|--------------------------------------------------------------|------------------------------|---------------------------------------|-------------------------------------------------------|-----------------------------------------------------|
| 08:30 |                                                       |                                                              |                              |                                       |                                                       |                                                     |
| 09:00 |                                                       |                                                              |                              |                                       |                                                       |                                                     |
| 09:30 |                                                       |                                                              |                              |                                       |                                                       |                                                     |
| 10:00 |                                                       |                                                              |                              |                                       |                                                       |                                                     |
| 10:50 |                                                       |                                                              |                              |                                       |                                                       |                                                     |
|       | Coffee break                                          |                                                              |                              |                                       |                                                       |                                                     |
| 11:20 |                                                       |                                                              |                              |                                       |                                                       |                                                     |
| 11:30 |                                                       |                                                              |                              |                                       |                                                       |                                                     |
| 12:00 |                                                       |                                                              |                              |                                       |                                                       |                                                     |
| 12:40 |                                                       |                                                              |                              |                                       |                                                       |                                                     |
|       | Lunch Time                                            |                                                              |                              |                                       |                                                       |                                                     |
| 14:00 |                                                       |                                                              |                              |                                       |                                                       |                                                     |
| 14:30 |                                                       |                                                              |                              |                                       |                                                       |                                                     |
| 15:00 |                                                       |                                                              |                              |                                       |                                                       |                                                     |
| 15:30 |                                                       |                                                              |                              |                                       |                                                       |                                                     |
| 16:00 |                                                       |                                                              |                              |                                       |                                                       |                                                     |
|       | Coffee break                                          |                                                              |                              |                                       |                                                       |                                                     |
| 16:30 | <b>Ecotribology</b>                                   | <b>Biotribology</b>                                          | <b>Surface Tribology</b>     | <b>Surface Tribology</b>              | <b>Dry Friction and Wear</b>                          | <b>Lubricants and Additives</b>                     |
| 17:00 |                                                       |                                                              |                              |                                       |                                                       |                                                     |
| 17:30 | <b>MO1-ET1</b><br>Tribology for Energy Conservation I | <b>MO1-BT1</b><br>Lubricants and Lubrication in Biotribology | <b>MO1-ST1</b><br>Coatings 1 | <b>MO1-ST2</b><br>Contact Mechanics 1 | <b>MO1-FW1</b><br>Anti-wear Technology & Case Studies | <b>MO1-LA1</b><br>Lubricants Chemistry and Rheology |
| 18:00 |                                                       |                                                              |                              |                                       |                                                       |                                                     |
| 18:30 | <i>page 28</i>                                        | <i>page 28</i>                                               | <i>page 28</i>               | <i>page 28</i>                        | <i>page 29</i>                                        | <i>page 29</i>                                      |

# SESSIONS AT A GLANCE

Monday 9<sup>th</sup>

|       | ROOM 7<br>BARI                                    | ROOM 8<br>PALERMO                                            | ROOM 9<br>BOLOGNA                | ROOM 10<br>PERUGIA                                        | MAIN HALL<br>ROMA | ATRIUM |
|-------|---------------------------------------------------|--------------------------------------------------------------|----------------------------------|-----------------------------------------------------------|-------------------|--------|
| 08:30 |                                                   |                                                              |                                  |                                                           |                   |        |
| 09:00 |                                                   |                                                              |                                  |                                                           |                   |        |
| 09:30 |                                                   |                                                              |                                  |                                                           | Opening Addresses |        |
| 10:00 |                                                   |                                                              |                                  |                                                           | Plenary Lecture   |        |
| 10:50 |                                                   |                                                              |                                  |                                                           |                   |        |
|       | Coffee break                                      |                                                              |                                  |                                                           |                   |        |
| 11:20 |                                                   |                                                              |                                  |                                                           |                   |        |
| 11:30 |                                                   |                                                              |                                  |                                                           | Plenary Talks     |        |
| 12:00 |                                                   |                                                              |                                  |                                                           |                   |        |
| 12:40 |                                                   |                                                              |                                  |                                                           |                   |        |
|       | Lunch Time                                        |                                                              |                                  |                                                           |                   |        |
| 14:00 |                                                   |                                                              |                                  |                                                           |                   |        |
| 14:30 |                                                   |                                                              |                                  |                                                           |                   |        |
| 15:00 |                                                   |                                                              |                                  |                                                           | Plenary Talks     |        |
| 15:30 |                                                   |                                                              |                                  |                                                           |                   |        |
| 16:00 |                                                   |                                                              |                                  |                                                           |                   |        |
|       | Coffee break                                      |                                                              |                                  |                                                           |                   |        |
| 16:30 |                                                   |                                                              |                                  |                                                           |                   |        |
| 17:00 | <b>STLE/ASME<br/>Lubrication<br/>Fundamentals</b> | <b>VIENNANO'13<br/>Nanotechnology</b>                        | <b>Bearings</b>                  | <b>ECOTRIB 2013<br/>Tribology of<br/>Machine Elements</b> |                   |        |
| 17:30 | MO1-LF1<br>EHL Modelling I                        | MO1-VI1<br>Nanostructure and<br>Friction Contact -<br>Part A | MO1-BE1<br>Fluid-Film Bearings 1 | MO1-EC1<br>Automotive<br>Tribology 1                      |                   |        |
| 18:00 |                                                   |                                                              |                                  |                                                           |                   |        |
| 18:30 | page 29                                           | page 29                                                      | page 30                          | page 30                                                   |                   |        |

## SESSIONS AT A GLANCE

Tuesday 10<sup>th</sup>

|       | ROOM 1<br>TORINO                                        | ROOM 2<br>PISA                                                        | ROOM 3<br>MILANO             | ROOM 4<br>VENEZIA                              | ROOM 5<br>NAPOLI                                                      | ROOM 6<br>FIRENZE                    |
|-------|---------------------------------------------------------|-----------------------------------------------------------------------|------------------------------|------------------------------------------------|-----------------------------------------------------------------------|--------------------------------------|
| 08:30 | <b>Ecotribology</b>                                     | <b>Biotribology</b>                                                   | <b>Surface Tribology</b>     | <b>Surface Tribology</b>                       | <b>Dry Friction and Wear</b>                                          | <b>Lubricants and Additives</b>      |
| 09:00 |                                                         |                                                                       |                              |                                                |                                                                       |                                      |
| 09:30 | <b>TU1-ET2</b><br>Tribology for Energy Conservation II  | <b>TU1-BT2</b><br>Artificial Joints: Wear I                           | <b>TU1-ST3</b><br>Coatings 2 | <b>TU1-ST4</b><br>Contact Mechanics 2          | <b>TU1-FW2</b><br>Theory of Friction and Wear, Numerical Simulation 1 | <b>TU1-LA2</b><br>Solid Lubricants   |
| 10:00 | <i>page 31</i>                                          | <i>page 31</i>                                                        | <i>page 33</i>               | <i>page 34</i>                                 | <i>page 35</i>                                                        | <i>page 37</i>                       |
| 10:30 | Coffee break                                            |                                                                       |                              |                                                |                                                                       |                                      |
| 11:00 | <b>Ecotribology</b>                                     | <b>Biotribology</b>                                                   | <b>Surface Tribology</b>     | <b>Surface Tribology</b>                       | <b>Dry Friction and Wear</b>                                          | <b>Lubricants and Additives</b>      |
| 11:30 |                                                         |                                                                       |                              |                                                |                                                                       |                                      |
| 12:00 | <b>TU2-ET3</b><br>Environmentally Friendly Tribology    | <b>TU2-BT3</b><br>Artificial Joints: Wear II                          | <b>TU2-ST5</b><br>Coatings 3 | <b>TU2-ST6</b><br>Contact Mechanics 3          | <b>TU2-FW3</b><br>Theory of Friction and Wear, Numerical Simulation 2 | <b>TU2-LA3</b><br>Tribocchemistry I  |
| 12:30 | <i>page 31</i>                                          | <i>page 32</i>                                                        | <i>page 34</i>               | <i>page 34</i>                                 | <i>page 36</i>                                                        | <i>page 37</i>                       |
| 13:00 | Lunch Time                                              |                                                                       |                              |                                                |                                                                       |                                      |
| 14:00 | <b>Ecotribology</b>                                     | <b>Biotribology</b>                                                   | <b>Surface Tribology</b>     | <b>Surface Tribology</b>                       | <b>Dry Friction and Wear</b>                                          | <b>Lubricants and Additives</b>      |
| 14:30 |                                                         |                                                                       |                              |                                                |                                                                       |                                      |
| 15:00 | <b>TU3-ET4</b><br>Environmentally Compatible Lubricants | <b>TU3-BT4</b><br>Artificial Joints: Testing                          | <b>TU3-ST7</b><br>Coatings 4 | <b>TU3-ST8</b><br>Surface Evolution and Wear 1 | <b>TU3-FW4</b><br>Theory of Friction and Wear, Numerical Simulation 3 | <b>TU3-LA4</b><br>Tribocchemistry II |
| 15:30 | <i>page 31</i>                                          | <i>page 32</i>                                                        | <i>page 34</i>               | <i>page 35</i>                                 | <i>page 36</i>                                                        | <i>page 37</i>                       |
| 16:00 | Coffee break                                            |                                                                       |                              |                                                |                                                                       |                                      |
| 16:30 | <b>Tribology of Materials</b>                           | <b>Biotribology</b>                                                   | <b>Surface Tribology</b>     | <b>Surface Tribology</b>                       | <b>Dry Friction and Wear</b>                                          | <b>Lubricants and Additives</b>      |
| 17:00 |                                                         |                                                                       |                              |                                                |                                                                       |                                      |
| 17:30 | <b>TU4-MT1</b><br>Metals 1                              | <b>TU4-BT5</b><br>Artificial Joints: Surfaces, Structure and Coatings | <b>TU4-ST9</b><br>Coatings 5 | <b>TU4-ST10</b><br>Tribocorrosion              | <b>TU4-FW5</b><br>Theory of Friction and Wear, Numerical Simulation 4 | <b>TU4-LA5</b><br>Additives I        |
| 18:00 |                                                         |                                                                       |                              |                                                |                                                                       |                                      |
| 18:30 | <i>page 44</i>                                          | <i>page 32</i>                                                        | <i>page 35</i>               | <i>page 35</i>                                 | <i>page 36</i>                                                        | <i>page 37</i>                       |
| 18:50 |                                                         |                                                                       |                              |                                                |                                                                       |                                      |



# SESSIONS AT A GLANCE

Tuesday 10<sup>th</sup>

|       | ROOM 7<br>BARI                                          | ROOM 8<br>PALERMO                                                       | ROOM 9<br>BOLOGNA                          | ROOM 10<br>PERUGIA                                        | MAIN HALL<br>ROMA                         | ATRIUM                          |
|-------|---------------------------------------------------------|-------------------------------------------------------------------------|--------------------------------------------|-----------------------------------------------------------|-------------------------------------------|---------------------------------|
| 08:30 | <b>STLE/ASME<br/>Lubrication<br/>Fundamentals</b>       | <b>VIENNANO'13<br/>Nanotechnology</b>                                   | <b>Bearings</b>                            | <b>ECOTRIB 2013<br/>Tribology of Machine<br/>Elements</b> |                                           |                                 |
| 09:00 |                                                         |                                                                         |                                            |                                                           |                                           |                                 |
| 09:30 | <b>TU1-LF2</b><br>Boundary and Thin<br>Film Lubrication | <b>TU1-VI2</b><br>Nanostructure and<br>Friction Contact<br>Part B       | <b>TU1-BE2</b><br>Rolling Bearings 1       | <b>TU1-EC2</b><br>Transmissions 1                         |                                           |                                 |
| 10:00 | <i>page 39</i>                                          | <i>page 40</i>                                                          | <i>page 41</i>                             | <i>page 42</i>                                            |                                           |                                 |
| 10:30 | Coffee break                                            |                                                                         |                                            |                                                           |                                           | <b>Poster Session</b>           |
| 11:00 | <b>STLE/ASME<br/>Lubrication<br/>Fundamentals</b>       | <b>VIENNANO'13<br/>Nanotechnology</b>                                   | <b>Bearings</b>                            | <b>ECOTRIB 2013<br/>Tribology of Machine<br/>Elements</b> |                                           | <b>PS1-ET</b><br><i>page 31</i> |
| 11:30 |                                                         |                                                                         |                                            |                                                           |                                           | <b>PS1-BT</b><br><i>page 33</i> |
| 12:00 | <b>TU2-LF3</b><br>Starved and<br>Cavitated Lubrication  | <b>TU2-VI3</b><br>Nanotribology<br>Modelling and<br>Theoretical Studies | <b>TU2-BE3</b><br>Fluid-Film<br>Bearings 2 | <b>TU2-EC3</b><br>Transmissions 2                         |                                           | <b>PS1-BM</b><br><i>page 33</i> |
| 12:30 | <i>page 39</i>                                          | <i>page 40</i>                                                          | <i>page 41</i>                             | <i>page 42</i>                                            |                                           | <b>PS1-LA</b><br><i>page 38</i> |
| 13:00 | Lunch Time                                              |                                                                         |                                            |                                                           |                                           | <b>PS1-LF</b><br><i>page 40</i> |
| 14:00 | <b>STLE/ASME<br/>Lubrication<br/>Fundamentals</b>       | <b>VIENNANO'13</b>                                                      | <b>Bearings</b>                            | <b>ECOTRIB 2013<br/>Tribology of Machine<br/>Elements</b> | <b>AddNano Workshop</b><br><i>page 44</i> | <b>PS1-EC</b><br><i>page 43</i> |
| 14:30 |                                                         |                                                                         |                                            |                                                           |                                           |                                 |
| 15:00 | <b>TU3-LF4</b><br>Hydrodynamic and<br>Journal Bearings  | <b>TU3-VI4</b><br>Nano-Particles as<br>Lubricant Additive               | <b>TU3-BE4</b><br>Rolling Bearings 2       | <b>TU3-EC4</b><br>Transmissions 3                         |                                           |                                 |
| 15:30 | <i>page 39</i>                                          | <i>page 40</i>                                                          | <i>page 42</i>                             | <i>page 43</i>                                            |                                           |                                 |
| 16:00 | Coffee break                                            |                                                                         |                                            |                                                           |                                           |                                 |
| 16:30 | <b>STLE/ASME<br/>Lubrication<br/>Fundamentals</b>       | <b>VIENNANO'13<br/>Nanotechnology</b>                                   | <b>Bearings</b>                            | <b>ECOTRIB 2013<br/>Tribology of Machine<br/>Elements</b> |                                           |                                 |
| 17:00 |                                                         |                                                                         |                                            |                                                           |                                           |                                 |
| 17:30 | <b>TU4-LF5</b><br>EHL Modelling II                      | <b>TU4-VI5</b><br>Nanocontacts and<br>Coatings                          | <b>TU4-BE5</b><br>Rolling Bearings 3       | <b>TU4-EC5</b><br>Automotive<br>Tribology 2               |                                           |                                 |
| 18:00 |                                                         |                                                                         |                                            |                                                           |                                           |                                 |
| 18:30 | <i>page 39</i>                                          | <i>page 41</i>                                                          | <i>page 42</i>                             | <i>page 43</i>                                            |                                           |                                 |
| 18:50 |                                                         |                                                                         |                                            |                                                           |                                           |                                 |

## SESSIONS AT A GLANCE

### Wednesday 11<sup>th</sup>

|       | ROOM 1<br>TORINO                       | ROOM 2<br>PISA                                                                                         | ROOM 3<br>MILANO                                    | ROOM 4<br>VENEZIA                                     | ROOM 5<br>NAPOLI                                                      | ROOM 6<br>FIRENZE                  |
|-------|----------------------------------------|--------------------------------------------------------------------------------------------------------|-----------------------------------------------------|-------------------------------------------------------|-----------------------------------------------------------------------|------------------------------------|
| 08:30 | <b>Tribology of Materials</b>          | <b>Biotribology</b>                                                                                    | <b>Surface Tribology</b>                            | <b>Surface Tribology</b>                              | <b>Dry Friction and Wear</b>                                          | <b>Lubricants and Additives</b>    |
| 09:00 |                                        |                                                                                                        |                                                     |                                                       |                                                                       |                                    |
| 09:30 | <b>WE1-MT2</b><br>Metals 2             | <b>WE1-BT6</b><br>Lubrication in Natural Joints                                                        | <b>WE1-ST11</b><br>Coatings 6                       | <b>WE1-ST12</b><br>Roughness 1                        | <b>WE1-FW6</b><br>Theory of Friction and Wear, Numerical Simulation 5 | <b>WE1-LA6</b><br>Additives II     |
| 10:00 | <i>page 54</i>                         | <i>page 45</i>                                                                                         | <i>page 46</i>                                      | <i>page 46</i>                                        | <i>page 47</i>                                                        | <i>page 48</i>                     |
| 10:30 | Coffee break                           |                                                                                                        |                                                     |                                                       |                                                                       |                                    |
| 11:00 | <b>Tribology of Materials</b>          | <b>Biotribology</b>                                                                                    | <b>Surface Tribology</b>                            | <b>Surface Tribology</b>                              | <b>Dry Friction and Wear</b>                                          | <b>Lubricants and Additives</b>    |
| 11:30 |                                        |                                                                                                        |                                                     |                                                       |                                                                       |                                    |
| 12:00 | <b>WE2-MT3</b><br>Polymers 1           | <b>WE2-BT7</b><br>Tribology of the Mouth                                                               | <b>WE2-ST13</b><br>Contact Mechanics 4              | <b>WE2-ST14</b><br>Surface Evolution and Wear 2       | <b>WE2-FW7</b><br>Mechanisms of Wear 1                                | <b>WE2-LA7</b><br>Ionic Liquids I  |
| 12:30 | <i>page 54</i>                         | <i>page 45</i>                                                                                         | <i>page 46</i>                                      | <i>page 46</i>                                        | <i>page 47</i>                                                        | <i>page 48</i>                     |
| 13:00 | Lunch Time                             |                                                                                                        |                                                     |                                                       |                                                                       |                                    |
| 14:00 | <b>Tribology of Materials</b>          | <b>Biotribology</b>                                                                                    | <b>Tribology</b>                                    | <b>Biomimetics</b>                                    | <b>Dry Friction and Wear</b>                                          | <b>Lubricants and Additives</b>    |
| 14:30 |                                        |                                                                                                        |                                                     |                                                       |                                                                       |                                    |
| 15:00 | <b>WE3-MT4</b><br>Ceramics             | <b>WE3-BT8</b><br>Biotribology General                                                                 | <b>WE3-ST15</b><br><i>In Situ</i> Formed Tribofilms | <b>WE3-BM1</b><br>Bioinspiration in Macro-engineering | <b>WE3-FW8</b><br>Mechanisms of Wear 2                                | <b>WE3-LA8</b><br>Ionic Liquids II |
| 15:30 | <i>page 54</i>                         | <i>page 45</i>                                                                                         | <i>page 47</i>                                      | <i>page 46</i>                                        | <i>page 48</i>                                                        | <i>page 49</i>                     |
| 15:40 | Coffee break                           |                                                                                                        |                                                     |                                                       |                                                                       |                                    |
| 16:10 | <b>Tribology of Materials</b>          | <b>Ecotribology</b>                                                                                    | <b>Surface Tribology</b>                            | <b>Surface Tribology</b>                              | <b>Dry Friction and Wear</b>                                          | <b>Lubricants and Additives</b>    |
| 16:30 |                                        |                                                                                                        |                                                     |                                                       |                                                                       |                                    |
| 17:00 | <b>WE4-MT5</b><br>Involved Phenomena 1 | <b>WE4-ET5</b><br>Tribology for Life Green Tribology<br><b>WE4</b><br>Panel Discussion on Ecotribology | <b>WE4-ST16</b><br>Roughness 2                      | <b>WE4-ST17</b><br>Surface Treatments 1               | <b>WE4-FW9</b><br>Mechanisms of Wear 3                                | <b>WE4-LA9</b><br>Greases          |
| 17:30 | <i>page 54</i>                         | <i>page 45</i>                                                                                         | <i>page 47</i>                                      | <i>page 47</i>                                        | <i>page 48</i>                                                        | <i>page 49</i>                     |

# SESSIONS AT A GLANCE

Wednesday 11<sup>th</sup>

|       | ROOM 7<br>BARI                                      | ROOM 8<br>PALERMO                                                 | ROOM 9<br>BOLOGNA                                        | ROOM 10<br>PERUGIA                                                  | MAIN HALL<br>ROMA | ATRIUM                          |
|-------|-----------------------------------------------------|-------------------------------------------------------------------|----------------------------------------------------------|---------------------------------------------------------------------|-------------------|---------------------------------|
| 08:30 | <b>STLE/ASME<br/>Lubrication<br/>Fundamentals</b>   | <b>VIENNANO'13<br/>Nanotechnology</b>                             | <b>Bearings</b>                                          | <b>ECOTRIB 2013<br/>Tribology of Machine<br/>Elements</b>           |                   |                                 |
| 09:00 | <b>WE1-LF6</b><br>Textured and Rough<br>Surfaces I  | <b>WE1-VI6</b><br>Measurement and<br>Testing in the<br>Nano-Range | <b>WE1-BE6</b><br>Gas Bearings 1                         | <b>WE1-EC6</b><br>Automotive<br>Tribology 3                         |                   |                                 |
| 09:30 |                                                     |                                                                   |                                                          |                                                                     |                   |                                 |
| 10:00 | <i>page 49</i>                                      | <i>page 50</i>                                                    | <i>page 51</i>                                           | <i>page 52</i>                                                      |                   |                                 |
| 10:30 | Coffee break                                        |                                                                   |                                                          |                                                                     |                   |                                 |
| 11:00 | <b>STLE/ASME<br/>Lubrication<br/>Fundamentals</b>   | <b>VIENNANO'13<br/>Nanotechnology</b>                             | <b>Bearings</b>                                          | <b>ECOTRIB 2013<br/>Tribology of Machine<br/>Elements</b>           |                   |                                 |
| 11:30 | <b>WE2-LF7</b><br>Textured and Rough<br>Surfaces II | <b>WE2-VI7</b><br>Special<br>Nanotribological<br>Systems          | <b>WE2-BE7</b><br>Rolling Bearings 4                     | <b>WE2-EC7</b><br>Automotive<br>Tribology 4                         |                   | <b>Poster Session</b>           |
| 12:00 |                                                     |                                                                   |                                                          |                                                                     |                   | <b>PS2-VI</b><br><i>page 50</i> |
| 12:30 | <i>page 49</i>                                      | <i>page 50</i>                                                    | <i>page 51</i>                                           | <i>page 52</i>                                                      |                   | <b>PS2-MF</b><br><i>page 53</i> |
| 13:00 | Lunch Time                                          |                                                                   |                                                          |                                                                     |                   | <b>PS2-MT</b><br><i>page 54</i> |
| 14:00 | <b>Tribology in<br/>Manufacturing</b>               | <b>VIENNANO'13<br/>Nanotechnology</b>                             | <b>Bearings</b>                                          | <b>ECOTRIB 2013<br/>Tribology of Machine<br/>Elements</b>           |                   |                                 |
| 14:30 | <b>WE3-MF1</b><br>Surface and Contact<br>Conditions | <b>WE3-VI8</b><br>Nano-Tribology<br>Lubrication<br>Mechanisms     | <b>WE3-BE8</b><br>Condition Monitoring<br>and Diagnostic | <b>WE3-EC8</b><br>2020 Interface:<br>DLC with Low SAPS<br>Additives |                   |                                 |
| 15:00 |                                                     |                                                                   |                                                          |                                                                     |                   |                                 |
| 15:30 | <i>page 53</i>                                      | <i>page 50</i>                                                    | <i>page 51</i>                                           | <i>page 52</i>                                                      |                   |                                 |
| 15:40 | Coffee break                                        |                                                                   |                                                          |                                                                     |                   |                                 |
| 16:10 | <b>Tribology in<br/>Manufacturing</b>               | <b>Joint Mechanics</b>                                            | <b>Bearings</b>                                          | <b>ECOTRIB 2013<br/>Tribology of Machine<br/>Elements</b>           |                   |                                 |
| 16:30 | <b>WE4-MF2</b><br>Wear                              | <b>WE4-JM1</b><br>Passive and Active<br>Frictional Joints         | <b>WE4-BE9</b><br>Fluid-Film Bearings 3                  | <b>WE4-EC9</b><br>Seals 1                                           |                   |                                 |
| 17:00 | <i>page 53</i>                                      | <i>page 56</i>                                                    | <i>page 51</i>                                           | <i>page 52</i>                                                      |                   |                                 |
| 17:30 |                                                     |                                                                   |                                                          |                                                                     |                   |                                 |

## SESSIONS AT A GLANCE

### Thursday 12<sup>th</sup>

|       | ROOM 1<br>TORINO                             | ROOM 2<br>PISA                                            | ROOM 3<br>MILANO                       | ROOM 4<br>VENEZIA                       | ROOM 5<br>NAPOLI                                         | ROOM 6<br>FIRENZE                      |
|-------|----------------------------------------------|-----------------------------------------------------------|----------------------------------------|-----------------------------------------|----------------------------------------------------------|----------------------------------------|
| 08:30 | <b>Tribology of Materials</b>                | <b>Biotribology</b>                                       | <b>Surface Tribology</b>               | <b>Surface Tribology</b>                | <b>Dry Friction and Wear</b>                             | <b>Lubricants and Additives</b>        |
| 09:00 | <b>TH1-MT6</b><br>Involved Phenomena 2       | <b>TH1-BT9</b><br>Tactile Tribology I                     | <b>TH1-ST18</b><br>Contact Mechanics 5 | <b>TH1-ST19</b><br>Texturing 1          | <b>TH1-FW10</b><br>Experiment, Equipment, Test Methods 1 | <b>TH1-LA10</b><br>Tribotechnology III |
| 09:30 |                                              |                                                           |                                        |                                         |                                                          |                                        |
| 10:00 | <i>page 67</i>                               | <i>page 57</i>                                            | <i>page 58</i>                         | <i>page 58</i>                          | <i>page 61</i>                                           | <i>page 63</i>                         |
| 10:30 | Coffee break                                 |                                                           |                                        |                                         |                                                          |                                        |
| 11:00 | <b>Tribology of Materials</b>                | <b>Biotribology</b>                                       | <b>Surface Tribology</b>               | <b>Surface Tribology</b>                | <b>Dry Friction and Wear</b>                             | <b>Lubricants and Additives</b>        |
| 11:30 | <b>TH2-MT7</b><br>Nano-fluids and Composites | <b>TH2-BT10</b><br>Tactile Tribology II                   | <b>TH2-ST20</b><br>Coatings 7          | <b>TH2-ST21</b><br>Texturing 2          | <b>TH2-FW11</b><br>Experiment, Equipment, Test Methods 2 | <b>TH2-LA11</b><br>LUBMAT I            |
| 12:00 |                                              |                                                           |                                        |                                         |                                                          |                                        |
| 12:30 | <i>page 68</i>                               | <i>page 57</i>                                            | <i>page 58</i>                         | <i>page 58</i>                          | <i>page 61</i>                                           | <i>page 63</i>                         |
| 13:00 | Lunch Time                                   |                                                           |                                        |                                         |                                                          |                                        |
| 14:00 | <b>Tribology of Materials</b>                | <b>Biotribology</b>                                       | <b>Surface Tribology</b>               | <b>Surface Tribology</b>                | <b>Dry Friction and Wear</b>                             | <b>Lubricants and Additives</b>        |
| 14:30 | <b>TH3-MT8</b><br>General Issues             | <b>TH3-BT11</b><br>Hydrogels                              | <b>TH3-ST22</b><br>Coatings 8          | <b>TH3-ST23</b><br>Texturing 3          | <b>TH3-FW12</b><br>Experiment, Equipment, Test Methods 3 | <b>TH3-LA12</b><br>LUBMAT II           |
| 15:00 |                                              |                                                           |                                        |                                         |                                                          |                                        |
| 15:30 | <i>page 68</i>                               | <i>page 57</i>                                            | <i>page 59</i>                         | <i>page 59</i>                          | <i>page 62</i>                                           | <i>page 63</i>                         |
| 16:00 | Coffee break                                 |                                                           |                                        |                                         |                                                          |                                        |
| 16:30 | <b>Tribology of Materials</b>                | <b>Biotribology</b>                                       | <b>Surface Tribology</b>               | <b>Surface Tribology</b>                | <b>Dry Friction and Wear</b>                             | <b>Lubricants and Additives</b>        |
| 17:00 | <b>TH4-MT9</b><br>Polymers 2                 | <b>TH4-BT12</b><br>Hydrogels, Scaffolds and Soft Contacts | <b>TH4-ST24</b><br>Surface Analysis    | <b>TH4-ST25</b><br>Surface Treatments 2 | <b>TH4-FW13</b><br>Experiment, Equipment, Test Methods 4 | <b>TH4-LA13</b><br>LUBMAT III          |
| 17:30 |                                              |                                                           |                                        |                                         |                                                          |                                        |
| 18:00 |                                              |                                                           |                                        |                                         |                                                          |                                        |
| 18:30 | <i>page 68</i>                               | <i>page 57</i>                                            | <i>page 59</i>                         | <i>page 59</i>                          | <i>page 62</i>                                           | <i>page 64</i>                         |
| 18:50 |                                              |                                                           |                                        |                                         |                                                          |                                        |

# SESSIONS AT A GLANCE

Thursday 12<sup>th</sup>

|       | ROOM 7<br>BARI                                     | ROOM 8<br>PALERMO                                                | ROOM 9<br>BOLOGNA                        | ROOM 10<br>PERUGIA                                        | MAIN HALL<br>ROMA | ATRIUM                          |
|-------|----------------------------------------------------|------------------------------------------------------------------|------------------------------------------|-----------------------------------------------------------|-------------------|---------------------------------|
| 08:30 | <b>STLE/ASME<br/>Lubrication<br/>Fundamentals</b>  | <b>Novel Aspects<br/>in Tribology</b>                            | <b>Bearings</b>                          | <b>ECOTRIB 2013<br/>Tribology of<br/>Machine Elements</b> |                   |                                 |
| 09:00 | <b>TH1-LF8</b><br>EHL Measurement                  | <b>TH1-NT1</b><br>Novel Tribosystems<br>and Lubrication          | <b>TH1-BE10</b><br>Rolling Bearings 5    | <b>TH1-EC10</b><br>Tribodesign and<br>Maintenance         |                   |                                 |
| 09:30 |                                                    |                                                                  |                                          |                                                           |                   |                                 |
| 10:00 | <i>page 64</i>                                     | <i>page 69</i>                                                   | <i>page 65</i>                           | <i>page 66</i>                                            |                   |                                 |
| 10:30 | Coffee break                                       |                                                                  |                                          |                                                           |                   |                                 |
| 11:00 | <b>Tribology in<br/>Manufacturing</b>              | <b>Novel Aspects<br/>in Tribology</b>                            | <b>Bearings</b>                          | <b>ECOTRIB 2013<br/>Tribology of<br/>Machine Elements</b> |                   | <b>Poster Session</b>           |
| 11:30 | <b>TH2-MF3</b><br>Metal Forming                    | <b>TH2-NT2</b><br>Novel Techniques                               | <b>TH2-BE11</b><br>Gas Bearings 2        | <b>TH2-EC11</b><br>Friction in Machine<br>Components      |                   | <b>PS3-ST</b><br><i>page 60</i> |
| 12:00 |                                                    |                                                                  |                                          |                                                           |                   | <b>PS3-FW</b><br><i>page 62</i> |
| 12:30 | <i>page 67</i>                                     | <i>page 69</i>                                                   | <i>page 65</i>                           | <i>page 66</i>                                            |                   | <b>PS3-BE</b><br><i>page 65</i> |
| 13:00 | Lunch Time                                         |                                                                  |                                          |                                                           |                   | <b>PS3-JM</b><br><i>page 69</i> |
| 14:00 | <b>Tribology in<br/>Manufacturing</b>              | <b>Novel Aspects<br/>in Tribology</b>                            | <b>Bearings</b>                          | <b>ECOTRIB 2013<br/>Tribology of<br/>Machine Elements</b> |                   | <b>PS3-NT</b><br><i>page 70</i> |
| 14:30 | <b>TH3-MF4</b><br>Machining and<br>Cutting Systems | <b>TH3-NT3</b><br>Novel Materials and<br>Phenomena               | <b>TH3-BE12</b><br>Magnetic Levitation   | <b>TH3-EC12</b><br>Rolling-based<br>Applications          |                   |                                 |
| 15:00 |                                                    |                                                                  |                                          |                                                           |                   |                                 |
| 15:30 | <i>page 67</i>                                     | <i>page 69</i>                                                   | <i>page 65</i>                           | <i>page 66</i>                                            |                   |                                 |
| 16:00 | Coffee break                                       |                                                                  |                                          |                                                           |                   |                                 |
| 16:30 | <b>STLE/ASME<br/>Lubrication<br/>Fundamentals</b>  | <b>Joint Mechanics</b>                                           | <b>Bearings</b>                          | <b>ECOTRIB 2013<br/>Tribology of<br/>Machine Elements</b> |                   |                                 |
| 17:00 | <b>TH4-LF9</b><br>Lubricants<br>and Additives      | <b>TH4-JM2</b><br>Tribology and Wear<br>within Frictional Joints | <b>TH4-BE13</b><br>Fluid-Film Bearings 4 | <b>TH4-EC13</b><br>Seals 2                                |                   |                                 |
| 17:30 |                                                    |                                                                  |                                          |                                                           |                   |                                 |
| 18:00 |                                                    |                                                                  |                                          |                                                           |                   |                                 |
| 18:30 | <i>page 64</i>                                     | <i>page 69</i>                                                   | <i>page 65</i>                           | <i>page 66</i>                                            |                   |                                 |
| 18:50 |                                                    |                                                                  |                                          |                                                           |                   |                                 |

## SESSIONS AT A GLANCE

### Friday 13<sup>th</sup>

|       | ROOM 1<br>TORINO              | ROOM 2<br>PISA                                                        | ROOM 3<br>MILANO               | ROOM 4<br>VENEZIA                                                              | ROOM 5<br>NAPOLI                                                           | ROOM 6<br>FIRENZE                                                                      |
|-------|-------------------------------|-----------------------------------------------------------------------|--------------------------------|--------------------------------------------------------------------------------|----------------------------------------------------------------------------|----------------------------------------------------------------------------------------|
| 08:30 | <b>Tribology of Materials</b> | <b>Dry Friction and Wear</b>                                          | <b>Surface Tribology</b>       | <b>Biomimetics</b>                                                             | <b>Dry Friction and Wear</b>                                               | <b>Lubricants and Additives</b>                                                        |
| 09:00 | <b>FR1-MT10</b><br>Surfaces   | <b>FR1-FW14</b><br>Friction at the Nano,<br>Micro and Macro<br>Scales | <b>FR1-ST26</b><br>Texturing 4 | <b>FR1-BM2</b><br>Superhydrophobic,<br>Self-cleaning, Low<br>Friction Surfaces | <b>FR1-FW15</b><br>Control and<br>Modification of<br>Frictional Properties | <b>FR1-LA14</b><br>Lubricants                                                          |
| 09:30 |                               |                                                                       |                                |                                                                                |                                                                            |                                                                                        |
| 10:00 | <i>page 74</i>                | <i>page 72</i>                                                        | <i>page 71</i>                 | <i>page 71</i>                                                                 | <i>page 72</i>                                                             | <i>page 73</i>                                                                         |
| 10:30 | Coffee break                  |                                                                       |                                |                                                                                |                                                                            |                                                                                        |
| 11:00 | <b>Tribology of Materials</b> | <b>Dry Friction and Wear</b>                                          | <b>Surface Tribology</b>       | <b>Surface Tribology</b>                                                       | <b>Dry Friction and Wear</b>                                               | <b>Biomimetics</b>                                                                     |
| 11:30 | <b>FR2-MT11</b><br>Coatings   | <b>FR2-FW16</b><br>Surface Tribology –<br>Coatings                    | <b>FR2-ST27</b><br>Texturing 5 | <b>FR2-ST28</b><br>Coatings 9                                                  | <b>FR2-FW17</b><br>Tribology of Materials                                  | <b>FR2-BM3</b><br>Microstructured<br>Surfaces with<br>Superior Adhesive<br>Performance |
| 12:00 |                               |                                                                       |                                |                                                                                |                                                                            |                                                                                        |
| 12:30 | <i>page 75</i>                | <i>page 72</i>                                                        | <i>page 71</i>                 | <i>page 72</i>                                                                 | <i>page 72</i>                                                             | <i>page 71</i>                                                                         |
| 13:00 | Closure                       |                                                                       |                                |                                                                                |                                                                            |                                                                                        |
| 14:00 |                               |                                                                       |                                |                                                                                |                                                                            |                                                                                        |



## SESSIONS AT A GLANCE

Friday 13<sup>th</sup>

|       | ROOM 7<br>BARI                                        | ROOM 8<br>PALERMO                     | ROOM 9<br>BOLOGNA                        | ROOM 10<br>PERUGIA                                                | MAIN HALL<br>ROMA | ATRIUM |
|-------|-------------------------------------------------------|---------------------------------------|------------------------------------------|-------------------------------------------------------------------|-------------------|--------|
| 08:30 | <b>Bearings</b>                                       | <b>Novel Aspects<br/>in Tribology</b> | <b>Bearings</b>                          | <b>Joint Mechanics</b>                                            |                   |        |
| 09:00 | <b>FR1-BE14</b><br>Rolling Bearings 6                 | <b>FR1-NT4</b><br>Novel Applications  | <b>FR1-BE15</b><br>Fluid-Film Bearings 5 | <b>FR1-JM3</b><br>Friction Damping in<br>Aerospace<br>Application |                   |        |
| 09:30 |                                                       |                                       |                                          |                                                                   |                   |        |
| 10:00 | <i>page 73</i>                                        | <i>page 75</i>                        | <i>page 73</i>                           | <i>page 75</i>                                                    |                   |        |
| 10:30 | Coffee break                                          |                                       |                                          |                                                                   |                   |        |
| 11:00 | <b>Bearings</b>                                       | <b>Novel Aspects<br/>in Tribology</b> | <b>Bearings</b>                          | <b>ECOTRIB 2013<br/>Tribology of<br/>Machine Elements</b>         |                   |        |
| 11:30 | <b>FR2-BE16</b><br>Fluid-Film and Rolling<br>Bearings | <b>FR2-NT5</b><br>New Frontiers       | <b>FR2-BE17</b><br>Fluid-Film Bearings 6 | <b>FR2-EC14</b><br>Wear                                           |                   |        |
| 12:00 |                                                       |                                       |                                          |                                                                   |                   |        |
| 12:30 | <i>page 74</i>                                        | <i>page 75</i>                        | <i>page 74</i>                           | <i>page 74</i>                                                    |                   |        |
| 13:00 | Closure                                               |                                       |                                          |                                                                   |                   |        |
| 14:00 |                                                       |                                       |                                          |                                                                   |                   |        |

Monday, September 9<sup>th</sup>

## ET – Ecotribology

## MO1-ET1 Tribology for Energy Conservation I

ROOM 1 TORINO • 16:30 – 18:30

Chair: Ille C. Gebeshuber, *Universiti Kebangsaan, Bangi, Malaysia*1318 **Keynote: Green Tribology at Sea**Robert J.K. Wood, *University of Southampton, Southampton, United Kingdom*1079 **Engine Tribology: From F1 Performance on Track to Energy Efficiency on Road**Louis Mourier, Paul Crofts, *Mercedes AMG High Performance Powertrains, Brixworth, United Kingdom*, Mario Motta, Giuseppe Forastiero, Pietro Salino, *Petronas Lubricants International, Villastellone (To), Italy*105 **New Method to Achieve Superlubricity with Glycerol and Acid Solutions**Jinjin Li, Chenhui Zhang, Jianbin Luo, *Tsinghua University, Beijing, China*126 **Superlubricity: from Phosphoric Acid to Mixture of Acids and Polyhydroxy Alcohols Solutions**Chenhui Zhang, Jinjin Li, Jianbin Luo, *Tsinghua University, Beijing, China*1311 **The Tribology of Elastomeric-Lip Seals – Reducing Emissions, Preventing Leakage, Saving the Ecology**Frank Bauer, *Universität Stuttgart, Stuttgart, Germany*522 **Tribological and Economic Assessment of Hydraulic Oils Refortified**Jianfang Liu, Kali Gu, Yuan Zhao, Jian Li, *Wuhan Research Institute of Materials Protection, Wuhan, China*

## BT – Biotribology

## MO1-BT1 Lubricants and Lubrication in Biotribology

ROOM 2 PISA • 16:30 – 18:30

Chair: Mark Rutland, *KTH, Sweden*188 **Injectable Lubricants for Orthopaedic Implants**Kirsi Pakkanen, Seunghwan Lee, *Technical University of Denmark, Kgs. Lyngby, Denmark*1228 **Role of Salivary Film Structure in Biolubrication**Deepak H. Veeragowda, *University of Groningen, Groningen, Netherlands*, Thomas Chudoba, *Advanced Surface Mechanics GmbH, Radeberg, Germany*, Henk J. Busscher, Prashant K. Sharma, Henny C. van der Mei, *University of Groningen, Groningen, Netherlands*691 **Lubrication of Artificial Articular Joints**Connor Myant, Philippa Cann, *Imperial College London, London, United Kingdom*1290 **Biotribology Simulation System**S.N. Xu, *Wuhan University of Science & Technology, Wuhan, China*, H.Y. Guo, *Xi'an Jiaotong University, Xi'an, China*, L.L. Guo, *United Manufacturing Group, Yinchuan, China*, X. Zhang, H. Xu, F.C. Wang, *Xi'an Jiaotong University, Xi'an, China*938 **Effect of Phospholipids on Wear and Friction of Ultra-High Molecular Weight Polyethylene**Ryohei Oide, Takashi Morioka, Yoshinori Sawae, *Kyushu University, Fukuoka, Japan*207 **The Effect of Temperature on Tribological Properties of Chemically Modified Biobased Lubricant**Nurin W.M. Zulkifli, M.A. Kalam, H.H. Masjuki, *University of Malaya, Kuala Lumpur, Malaysia*, R. Yunus, *University Putra Malaysia, Serdang, Malaysia*

## ST – Surface Tribology

## MO1-ST1 Coatings 1

ROOM 3 MILANO • 16:30 – 18:30

Chair: Javier Barriga, *IK4-Tekniker, Eibar, Spain*634 **Study on Metal Doping Effect on Tribological Properties of DLC**Hirochika Fukuda, Kenta Oshima, Auezhan Amanov, Ryo Tsuboi, Shinya Sasaki, *Tokyo University of Science, Tokyo, Japan*1004 **MoS<sub>2</sub>-DLC Nanocomposite Solid Lubricant Coated by a PECVD-PVD Hybrid Deposition Method**Takanori Takeno, Satoshi Yoshida, Kazuyoshi Nishigaki, Hiroyuki Miki, Toshiyuki Takagi, Koshi Adachi, *Tohoku University, Sendai, Japan*1005 **Sliding Contact Analysis between a Spherical Particle and DLC Coated Steel Surface**Tae-Jo Park, Jun-Hyuk Lee, *Gyeongsang National University, Jinju, Republic of Korea*1041 **A Low Friction Dual-Layer Carbon Film on 6H-SiC Wafer Using Carbide-Derived Carbon Process with Subsequent Chemical Vapor Deposition**Jian Sui, Fuyan Liu, Junyan Zhang, Jinjun Lu, *Chinese Academy of Sciences, Lanzhou, China*1116 **Raman Study of DLC Films Prepared by Bipolar PBII&D**Junho Choi, Takayuki Hibi, Takahisa Kato, *University of Tokyo, Tokyo, Japan*, Masahiro Kawaguchi, *Tokyo Metropolitan Industrial Technology Research Institute, Tokyo, Japan*1253 **The Effect of Coating Characteristics on the Performance of a-C:H and ta-C Coatings**Helena Ronkainen, Anssi Laukkanen, Kenneth Holmberg, *VTT Technical Research Centre of Finland, Espoo, Finland*, Makoto Kano, T. Horiuchi, *Kanagawa Industrial Technology Center, Ebina, Japan*, T. Suzuki, *Keyo University, Tokyo, Japan*

## MO1-ST2 Contact Mechanics 1

ROOM 4 VENEZIA • 16:30 – 18:30

Chair: Daniele Dini, *Imperial College London, United Kingdom*24 **Adhesive Contact between a True Rigid Sphere and an Elastic Half-Space**Jiunn-Jong Wu, *Chang Gung University, Tao-Yuan, Taiwan*180 **Development of an Innovative Adhesion Model for Railway Applications**Benedetto Allotta, Enrico Meli, Luca Pugi, Alessandro Ridolfi, Andrea Rindi, *University of Florence, Florence, Italy*566 **Micro Contact Analysis in Hydrodynamic Joints**Kamel G. Mahmoud, Oliver Knaus, *AVL List GmbH, Graz, Austria*829 **Adhesive Contact of Transversally-isotropic and Prestressed Elastic Solids**Feodor M. Borodich, *Cardiff University, Cardiff, United Kingdom*, Boris A. Galanov, *Institute for Problems in Materials Science of NAS of Ukraine, Kiev, Ukraine*, Leon M. Keer, *Northwestern University, Evanston, IL, United States*, Maria Suarez-Alvarez, *Cardiff University, Cardiff, United Kingdom*1033 **Three-Dimensional Analysis of Multilayered Rough Surface Contact**Jessica T. Nyqvist, Amir Kadiric, Richard S. Sayles, Efsthios Ioannides, *Imperial College London, London, United Kingdom*1081 **Aspects of Modeling Adhesion with Surface Topography**Simon Medina, Daniele Dini, *Imperial College London, London, United Kingdom*

## FW – Dry Friction and Wear

## MO1-FW1 Anti-wear Technology &amp; Case Studies

ROOM 5 NAPOLI • 16:30 – 18:30

Chair: Waldemar Tuszyński, *Institute for Sustainable Technologies, Radom, Poland*

- 151 Replacement of Hard Cr on AISI 316L Steel in Sliding Contacts for the Pharmaceutical Industry: Failure Analysis and Dry Sliding Tests**  
 Lorella Ceschini, Alessandro Marconi, Carla Martini, *University of Bologna, Bologna, Italy*
- 381 Friction and Wear Behavior of Wear-resistant Belt in Drill Joint for Deep and Ultra-deep Wells**  
 Kai Zhang, Deguo Wang, Zhenquan Wang, Shuhai Liu, Siwei Zhang, *China University of Petroleum, Changping, China*
- 894 Iron-Based Sintered Coatings – Potential of Minimizing Downtime and Maintenance Cost on the Basis of Agricultural Harvesting Machines**  
 Michael Lugbauer, Alois Kröll, *Busatis GmbH, Purgstall, Austria*
- 495 High-speed Sliding Wear Behaviour of PEEK Coating**  
 Hifumi Tabata, Masaaki Yamane, Mitsuo Sano, *IHI Corporation, Yokohama, Japan*
- 891 Microstructural and Tribological Characterization of Gas Oxinitrided and Ion Nitrided 42CrMo4 Steel**  
 Massimo Lorusso, Daniele Ugues, *Politecnico di Torino, Torino, Italy*, Luigi Cislighi, *TTN S.p.A., Nerviano (Mi), Italy*
- 500 Tribological Properties of Ag- and Au-doped MoCN Coatings in the Temperature Range of 25-700°C**  
 Dmitry V. Shtansky, Andrey V. Bondarev, Philipp V. Kiryukhantsev-Korneev, *National University of Science and Technology "MISIS", Moscow, Russian Federation*, Cristina T. Rojas, Vanda Godinho, Asuncion Fernandez, *Instituto de Ciencia de Materiales de Sevilla CSIC-US, Sevilla, Spain*

## LA – Lubricants and Additives

## MO1-LA1 Lubricants Chemistry and Rheology

ROOM 6 FIRENZE • 16:30 – 18:30

Chair: Adolfo Senatore, *University of Salerno, Italy*

- 36 Use of Chemically Activated Polymer as Additive in Lubricants for Wire Ropes**  
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- 83 Energy Efficient Industrial Lubricants**  
 David Blain, Angela Galiano-Roth, *ExxonMobil Research and Engineering, Paulsboro, NJ, United States*, Kevin Harrington, Richard Russo, *ExxonMobil Fuels and Lubricants, Fairfax, VA, United States*
- 795 Correlation between Molecular Interaction and Traction Property of Polyglycols**  
 Koji Takiwatari, *Ichinoseki National College of Technology, ichinoseki, Japan*, Shinya Sato, Yasushi Hoshi, Hidetaka Nanao, Shigeyuki Mori, *Iwate University, Morioka, Japan*
- 851 Formation Process of Adsorbed Layer by Additives and Its Viscoelastic Property**  
 Kentaro Tanaka, Katsumi Iwamoto, *Tokyo University of Marine Science and Technology, Tokyo, Japan*
- 865 A Rheological Study of Viscosity Index Improvers (VII) in Base Oils Under Severe Conditions**  
 Charlotte Mary, David Philippon, *INSA-Lyon, Villeurbanne, France*, Delphine Laurent, *Total Marketing, & Services CREs, Solaize, France*, Scott Bair, *Georgia Institute of Technology, Atlanta, GA, United States*, Philippe Vergne, *INSA-Lyon, Villeurbanne, France*

## 744 In-situ Surface Chemistry of Lubricant Films Using X-ray Absorption Near Edge Spectroscopy

Ardian Morina, Hongyuan Zhao, *University of Leeds, Leeds, United Kingdom*, Fred Mosselmans, *Diamond Light Source Ltd., Oxford, United Kingdom*

## LF – STLE/ASME – Lubrication Fundamentals

## MO1-LF1 EHL Modelling I

ROOM 7 BARI • 16:30 – 18:30

Chair: Motohiro Kaneta, *Brno University of Technology, Czech Republic*

- 809 Multi-scale Modeling of Lubricated Contacts: a Study on the Velocity Boundary Condition at the Wall-fluid Interface**  
 Daniele Savio, Nicolas Fillot, Philippe Vergne, *Université de Lyon, Villeurbanne, France*, Hartmut Hetzler, Wolfgang Seemann, *Karlsruhe Institute of Technology, Karlsruhe, Germany*, Rihard Pasaribu, Guillermo Morales-Espejel, *SKF Engineering and Research Centre, Nieuwegein, Netherlands*
- 2 Quantification of Friction Regimes in Elastohydrodynamic Lubrication**  
 Wassim Habchi, *Lebanese American University, Dep. of Ind. & Mech. Eng., Byblos, Lebanon*, Scott Bair, *Georgia Institute of Technology, Atlanta, GA, United States*, Philippe Vergne, *Université de Lyon, Lyon, France*
- 1204 Particle-Laden Flows in Elastohydrodynamic Lubrication**  
 Christina Twist, Qian Wang, Chengjiao Yu, *Northwestern University, Evanston, IL, United States*
- 237 On the Numerical Accuracy of Rough Surface EHL Solution**  
 Dong Zhu, *Sichuan University, Chengdu, China*, Yuchuan Liu, Qian Wang, *Northwestern University, Evanston, IL, United States*
- 312 Transient Thermal Elastohydrodynamic Simulation of Involute Helical Gears under Mixed Friction Conditions**  
 Lars Bobach, Ronny Beilicke, Dirk Bartel, Ludger Deters, *Otto-von-Guericke Universität, Magdeburg, Germany*
- 613 Elastohydrodynamic Simulation of Grease Lubrication**  
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## VI – VIENNANO'13-Nanotechnology

## MO1-VI1 Nanostructure and Friction Contact - Part A

ROOM 8 PALERMO • 16:30 – 18:30

Chair: Wilfried Bartz, *Tribology and Lubrication Engineering, Denkerdorf, Germany*

- 855 Effect of Molecular Modification on the Frictional Property of Nano-patterned Surface**  
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- 115 Optimization of Friction and Adhesion Behavior of Ultrathin Films for Nanotechnological Applications**  
 Lukasz Ocypa, Marcin Michalowski, Jaroslaw Linke, Dominik Nolbert, Zygmunt Rymuza, *Warsaw University of Technology, Warsaw, Poland*, Wolfgang Vollnhofer, Christoph Eisenmenger-Sittner, *Technische Universität Wien, Wien, Austria*
- 116 Tribological Properties of Ultrathin DLC-Coated Nanotextured Surface on a PET Film**  
 Hiroshi Tani, Hideyuki Takahashi, Shinji Koganezawa, Norio Tagawa, *Kansai University, Suita, Japan*

- 979 Frictional Behavior of Nanostructured Carbon Films Fabricated by Electron-Ion Hybrid Irradiation**  
Chao Wang, *Shenzhen University, Shenzhen, China*, Xue Fan, *Xi'an Jiaotong University, Xi'an, China*, Gang Xu, Dongfeng Diao, *Shenzhen University, Shenzhen, China*
- 672 Influence of Liquid on the Nanostructuring of Powdered Lamellar Tribofilms**  
Georges Minatchy, Laurence Romana, *Université des Antilles et de la Guyane, Pointe à Pitre, Guadeloupe, France*, Nadiège Nomedé-Martyr, *Faculté Universitaire de Notre Dame de la Paix, Namur, Belgium*, Philippe Bilas, Philippe Thomas, Jean-louis Mansot, *Université des Antilles et de la Guyane, Pointe à Pitre, Guadeloupe, France*
- 558 Coarsened Third Body Grains Alleviate Sliding Between Pure Nanocrystalline Surfaces**  
Pedro A. Romero, Tommi T. Järvi, Nils Beckmann, Michael Moseler, *Fraunhofer Institute for Mechanics of Materials IWM, Freiburg, Germany*

## BE – Bearings

### MO1-BE1 Fluid-Film Bearings 1 ROOM 9 BOLOGNA • 16:30 – 18:30

Chair: Mamoru Oike, *Ishinomaki Senshu University, Japan*

- 781 Effects of 3D Surface Roughness and Lubricant Shear Thinning and Viscoelastic Properties on Transient-Thermohydrodynamic Behavior of a Big-End Bearing**  
Tirumalesh Nagaraju, K.M. Jagadeesha, *PES College of Engineering, Mandya, India*
- 864 Couple Stress and Poro-elasticity Effects on Squeeze Film Behaviour**  
Mohamed Nabhani, Mohamed El Khelifi, *University Hassan II Mohammedia, Mohammedia, Morocco*, Benyebka Bou-Said, *INSA-Lyon, Villeurbanne, France*
- 450 Evaluation of Numerical Methods for the Analysis of Hydrodynamic Bearings**  
Tomasz Woloszynski, Pawel Podsiadlo, Gwidon W. Stachowiak, *Curtin University, Perth, Australia*
- 1101 Sector-pad Thrust Bearings with Rectangular Dimples: Comparison between Experiments and CFD Thermohydrodynamic Simulations**  
Christos I. Papadopoulos, *National Technical University of Athens, Zografos, Greece*, Yann Henry, Jean Bouyer, *Université de Poitiers, Futuroscope Chasseneuil, France*, Lambros Kaiktsis, *National Technical University of Athens, Zografos, Greece*, Michel Fillon, *Université de Poitiers, Futuroscope Chasseneuil, France*
- 1119 Reflections on Journal Bearings Performance with Surface Texturing**  
Azzedine Dadouche, Martin J. Conlon, *National Research Council Canada, Ottawa, Canada*
- 983 Experimental Investigation on Hydrodynamic Parallel Surface Thrust Bearings with Textured Pads**  
Yann Henry, Jean Bouyer, Michel Fillon, *Université de Poitiers, Futuroscope Chasseneuil, France*

## EC – ECOTRIB 2013 Tribology of Machine Elements

### MO1-EC1 Automotive Tribology 1 ROOM 10 PERUGIA • 16:30 – 18:30

Chair: Martin Priest, *University of Leeds, United Kingdom*

- 814 The Effect of 3D Deformations of a Cylinder Liner on the Tribological Performance of a Piston Ring-Cylinder Liner System**  
Markus Söderfjäll, Andreas Almqvist, Roland Larsson, Patrik Isaksson, Andrew Spencer, *Luleå University of Technology, Luleå, Sweden*
- 1014 Film Thickness Predictions and Measurements of a Flexible Piston Skirt**  
Bryn Littlefair, Miguel De La Cruz, *Loughborough University, Loughborough, United Kingdom*, Robin Mills, *University of Sheffield, Sheffield, United Kingdom*, Stephanos Theodossiadis, Homer Rahnejat, *Loughborough University, Loughborough, United Kingdom*, Robert Dwyer-Joyce, *University of Sheffield, Sheffield, United Kingdom*
- 1258 Identification of the Limit States of Tribological Systems to Estimate Failure Modes of Aviation Turbine Engines**  
Marek Zboński, *Air Force Institute of Technology, Warszawa, Poland*
- 1274 Basic Tests on Circular Eccentric Cam-follower Pairs**  
Enrico Ciulli, *University of Pisa, Pisa, Italy*, Francesco Fazzolari, *AMTesting s.r.l., S. Piero a Grado (Pi), Italy*, Bruno Piccigallo, *Accademia Navale, Livorno, Italy*
- 1281 Investigation on the Tribological Behavior of Thermal Sprayed Coatings Applied to Cylinder Liners – Influence of Chromium Content on Wear Resistance of Plasma Transferred Wire Arc Coatings**  
Alexander Dudás, Mirko Demmler, Kay Schintzel, *Széchenyi István University, Győr, Hungary*
- 1045 Degradation Mechanism of Water Contaminated Automatic Transmission Fluid (ATF) in Wet Clutch System**  
Nowshir Fatima, Allan Holmgren, Pär Marklund, Aji P. Mathew, Roland Larsson, *Luleå University of Technology, Luleå, Sweden*



Tuesday, September 10<sup>th</sup>

## ET - Ecotribology

## TU1-ET2 Tribology for Energy Conservation II

ROOM 1 TORINO • 08:30 – 10:30

Chair: Zygmunt Rymuza, *Warsaw University of Technology, Poland*649 **Keynote: MEMS/NEMS and BioMEMS/BioNEMS Materials and Devices and Biomimetics**Bharat Bhushan, *The Ohio State University, Columbus, OH, United States*1111 **Influence of Ethanol on Piston Assembly Lubricant Composition and Friction in an Automotive Gasoline Engine**Martin Priest, Prashan R. De Silva, Richard C. Coy, *University of Leeds, Leeds, United Kingdom*, Robert I Taylor, *Shell Research Ltd, Chester, United Kingdom*137 **Atomic-Scale Friction and Energy Dissipation in Multilayer Graphene**Hui Wang, Liang Xu, Yuan-zhong Hu, *Tsinghua University, Beijing, China*127 **Global Impact of Friction on Energy Consumption, Environment and Economy**Kenneth Holmberg, Peter Andersson, Roope Siilasto, *VTT Technical Research Centre of Finland, Espoo, Finland*, Ali Erdemir, *Argonne National Laboratory, Argonne, IL, United States*245 **CAE Simulation of IC Engine Friction**Ming-Tang Ma, Jianhong Li, Fuqiang Xu, *AVL List Technical Center Co. Ltd, Shanghai, China*348 **Controllable Superlubricity of Glycerol Solution via Environment Humidity**Zhe Chen, Liran Ma, Jinjin Li, Dan Guo, Yuhong Liu, Jianbin Luo, *Tsinghua University, Beijing, China*

## TU2-ET3 Environmentally Friendly Tribology

ROOM 1 TORINO • 11:00 – 13:00

Chair: Wilfried Bartz, *Tribology and Lubrication Engineering, Denkerdorf, Germany*160 **Tribochemistry of Stearic Acid and its Lubricating Behavior Sensitivity to Base Oil**Christine Matta, Sophie Loehle, Clotilde Minfray, Thierry Le Mogne, Jean-Michel Martin, *École Centrale de Lyon, Écully, France*, Raphaelae Iovine, Carine Pizard, *TOTAL, Solaize Research Center, Solaize, France*, Akira Miyamoto, *Tohoku University, Sendai, Japan*991 **Low Friction System Using Carbon Fiber Reinforced Plastics**Wataru Sato, Takanori Takeno, Koshi Adachi, *Tohoku University, Sendai, Japan*995 **Surface Texture to Improve Friction Properties by Forming Smoother Surface on Silicon-based Ceramics in Water**Yuta Nishikawa, Koji Noguchi, Takanori Takeno, Koshi Adachi, *Tohoku University, Sendai, Japan*1096 **Nanointerface for Superior Tribological Properties of Silicon Carbide in Water**Koshi Adachi, *Tohoku University, Sendai, Japan*162 **Friction Based Renewable Fuel Technology**Evgeny Deulin, *Bauman Moscow State Technical University, Moscow, Russian Federation*201 **Hydration Lubrication at Solid Surfaces**Liran Ma, *Tsinghua University, Beijing, China*, Anastasia Gaisinskaya, Nir Kampf, Jacob Klein, *Weizmann Institute, Rehovot, Israel*

## TU3-ET4 Environmentally Compatible Lubricants

ROOM 1 TORINO • 14:00 – 16:00

Chair: Friedrich Franek, *Vienna University of Technology, Austria*1182 **The Tribological Performance of Bio-Based Room Temperature Ionic Liquid Lubricants: A Possible Next Step in Biolubricant Technology**Carlton J. Reeves, Pradeep L. Menezes, Michael R. Lovell, Tien-Chien Jen, Sarah L. Garvey, Mark L. Dietz, *University of Wisconsin-Milwaukee, Milwaukee, WI, United States*1250 **Lubrication and Wear Characteristics of Triolein and Tristearin under High Temperature Condition**Hiroki Mano, Atsushi Korenaga, Yuko Hiibi, Tsuguyori Ohana, *National Institute of Advanced Industrial Science & Technology (AIST), Tsukuba, Japan*1314 **Origins of Extreme Boundary Lubrication by Phosphatidylcholine Liposomes**Raya Sorkin, Jacob Klein, *Weizmann Institute of Science, Rehovot, Israel*748 **Environmental Problems of Lubricants Chemistry**Oleg P. Parenago, *Russian Academy of Sciences, Moscow, Russian Federation*477 **Tribological Properties of Aluminium Alloys in Environmentally Acceptable Hydraulic Fluids**Takuya Nakase, *Tokyo University of Science, Tokyo, Japan*, Mathias Woydt, *Federal Institute for Materials Research and Testing (BAM), Berlin, Germany*, Shinji Kato, *KYB Corporation, Kanagawa, Japan*, Hironobu Oe, Shinya Sasaki, *Tokyo University of Science, Tokyo, Japan*182 **Skin-friction Drag Reduction by Transverse Micro V-grooves on a Surface**Jiadao Wang, Bao Wang, Beibei Feng, Gang Zhou, Darong Chen, *Tsinghua University, Beijing, China*

## PS1-ET Posters

ATRIUM • 09:00 – 16:30

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## BT – Biotribology

## TU1-BT2 Artificial Joints: Wear I

ROOM 2 PISA • 08:30 – 10:30

Chair: Yu Yan, *University of Science and Technology Beijing, China*514 **Could Tribology Explain Early Femoral Neck Fracture Following Hip Resurfacing?**Thomas Joyce, James Lord, David Langton, *Newcastle University, Newcastle upon Tyne, United Kingdom*, Antoni Nargol, *University Hospital of North Tees, Stockton on Tees, United Kingdom*, Derek Meek, *Southern General Hospital, Glasgow, United Kingdom*907 **On the Load Transfer Mechanism in MOM Total Hip Prostheses with Self-directed Balls.**Virgil Florescu, *Institute of Civil Engineering, Bucharest, Romania*, Lucian Capitanu, *Institute of Solid Mechanics of the Romanian Academy, Bucharest, Romania*1129 **Prevent/Limit The Edge Loading in Total Hip Replacement**Ehsanollah Torabi Kachousangi, Reyhaneh Asadirad, Ken Mao, *University of Warwick, Coventry, United Kingdom*

**272 Surface Wear Analysis of the Polyethylene Components of Ex-Vivo Knee Prostheses**

Emma Kennard, Susan C. Scholes, *Newcastle University, Newcastle upon Tyne, United Kingdom*, Rajkumar Gangadharan, David Weir, Jim Holland, David Deehan, *Freeman Hospital, Newcastle upon Tyne, United Kingdom*, Thomas J. Joyce, *Newcastle University, Newcastle upon Tyne, United Kingdom*

**418 Reciprocal Wear Patterns Reflect Unique Patient Specific Undersurface Tribological Behaviour in Knee Replacement**

Richard J. Holleyman, Susan Scholes, Emma Kennard, Martin Bone, David Weir, Jim Holland, Thomas Joyce, David Deehan, *University of Newcastle upon Tyne, Newcastle upon Tyne, United Kingdom*

**579 Boundary Lubrication of Stainless Steel and CoCrMo Materials Based on Phosphorous or Boron Containing Additives**

Jincan Yan, Xiangqiong Zeng, Emile van der Heide, *University of Twente, Twente, Netherlands*, Tianhui Ren, *Shanghai Jiao Tong University, Shanghai, China*

**TU2-BT3 Artificial Joints: Wear II**

ROOM 2 PISA • 11:00 – 13:00

Chair: Connor Myant, *Imperial College London, United Kingdom*

**503 Keynote: The Correlation between Wear Volumes and Ion Concentrations in Metal-on-metal Hip Resurfacings**

Thomas Joyce, James Lord, David Langton, *Newcastle University, Newcastle upon Tyne, United Kingdom*, Antoni Nargol, *University Hospital of North Tees, Stockton on Tees, United Kingdom*

**520 Details of the Wear Scar on Failed Metal-on-metal Hip Prostheses**

Thomas Joyce, James Lord, David Langton, *Newcastle University, Newcastle upon Tyne, United Kingdom*, Antoni Nargol, *University Hospital of North Tees, Stockton on Tees, United Kingdom*

**529 The Role of Surface Roughness on the Initiation and Propagation of Fretting-corrosion of Cemented Femoral Stems**

Michael Bryant, *University of Leeds, Leeds, United Kingdom*, Richard Farrar, Robert Freeman, Ken Brummitt, *DePuy International, Leeds, United Kingdom*, Anne Neville, *University of Leeds, Leeds, United Kingdom*

**751 The Influence of Continuous and Intermittent Sliding on the Release of Ions from Cobalt Chromium Surfaces**

James Hesketh, Andrew Beadling, Duncan Dowson, Anne Neville, *University of Leeds, Leeds, United Kingdom*

**1205 Study of Innovative Surface Modifications for Ti-13Nb-13Zr alloy: Assessment of Wear and Corrosion Behavior**

Caroline Richard, *Université François Rabelais de Tours, Tours, France*, Geetha Manivasagam, *Vellore Institute of Technology, Vellore, India*, Jessem Landoulsi, *Université Pierre et Marie Curie - Paris VI, Paris, France*

**273 Topographical Analysis of Femoral Components of ex vivo Total Knee Replacements**

Susan C. Scholes, Emma Kennard, *Newcastle University, Newcastle upon Tyne, United Kingdom*, Rajkumar Gangadharan, David Weir, Jim Holland, David Deehan, *Freeman Hospital, Newcastle upon Tyne, United Kingdom*, Thomas J. Joyce, *Newcastle University, Newcastle upon Tyne, United Kingdom*

**TU3-BT4 Artificial Joints: Testing**

ROOM 2 PISA • 14:00 – 16:00

Chair: Thomas Joyce, *Newcastle University, United Kingdom*

**163 First Wear Results from a Unique Multi-Station Shoulder Joint Simulator**

Simon Smith, Lisa Li, Garth Johnson, Thomas Joyce, *Newcastle University, Newcastle upon Tyne, United Kingdom*

**745 A Biotribo-acoustic Testing Method for Ceramic Orthopaedic Biomaterials**

Zikai Hua, Yongwei Fan, *Shanghai University, Shanghai, China*

**1266 Estimation of Wear Factors of MoM Hip Implants from Simulator Tests**

Lorenza Mattei, Francesca Di Puccio, Enrico Ciulli, *University of Pisa, Pisa, Italy*

**609 Pre-clinical Testing of Total Disc Replacements Using a Stratified Approach**

Philip J. Hyde, John Fisher, Richard M. Hall, *University of Leeds, Leeds, United Kingdom*

**1142 Wear of PEEK and CFR-PEEK against Metallic Counterfaces under Different Contact Pressure Conditions**

Claire L. Bockett, Louise M. Jennings, John Fisher, *University of Leeds, Leeds, United Kingdom*

**858 Wear Prediction of Acetabulum Inserts due to Multiple Human Routine Activities**

Lucian Capitanu, *Institute of Solid Mechanics of the Romanian Academy, Bucharest, Romania*, Virgil Florescu, *Institute of Civil Engineering, Bucharest, Romania*

**TU4-BT5 Artificial Joints: Surfaces, Structure and Coatings**

ROOM 2 PISA • 16:30 – 18:50

Chair: Teruo Murakami, *Kyushu University, Fukuoka, Japan*

**607 The Effects of DLC Coatings on Reciprocating Sliding Conditions and Wear of CoCrMo Alloy**

Kontinen T. Yrjö, Tiainen Velli-Matti, *ORTON Research Institute, Helsinki, Finland*, Eva Zdravecká, Miroslav Ondáč, *Technical University in Košice, Košice, Slovak Republic*, Marian Marton, Marian Vojs, Marian Veselý, *Slovak University of Technology, Bratislava, Slovak Republic*

**1235 Surface Texturing in Artificial Hip Joints for Friction and Wear Control I: Experiments**

Patrick S.M. Dougherty, Gagan Srivastava, Recep Onler, Burak Ozdoganlar, C. Fred Higgs, *Carnegie Mellon University, Pittsburgh, PA, United States*

**1237 Surface Texturing in Artificial Hip Joints for Friction and Wear Control II: Modeling**

Gagan Srivastava, Patrick S.M. Dougherty, C. Fred Higgs, *Carnegie Mellon University, Pittsburgh, PA, United States*

**303 Tribological and Bio-compatible Properties of Combined Micro and Nano Hierarchical Texturing Co-Cr-Mo Surface**

Liguo Qin, Bin Liu, Ping Lin, Hui Zhang, Guangneng Dong, *Xi'an Jiaotong University, Xi'an, China*

**439 To Increase the Hydrophobicity, Non-stickiness and Wear Resistance of DLC Surface by Surface Texturing Using Laser Ablation Process**

P.W. Shum, Z.F. Zhou, K.Y. Li, *City University of Hong Kong, Hong Kong*

**447 Tribological Properties of UHMWPE Grafted with PMPC Brushes at High Contact Stress**

Dangsheng Xiong, Yaling Deng, Yuanyuan Yang, *Nanjing University of Science and Technology, Nanjing, China*

**309 Behavior of Adsorbed Albumin Film on CoCrMo Alloy under In-situ Observation**

Kazuhiro Nakashima, Yoshinori Sawae, Teruo Murakami, *Kyushu University, Fukuoka, Japan*, Stefano Mischler, *École Polytechnique Fédérale de Lausanne, Lausanne, Switzerland*

## PS1-BT Posters

ATRIUM • 09:00 – 16:30

- 140 Preparation and Tribological Properties of Grafted Polymer Brushes on Anodic Oxidized Titanium Alloy**  
Kun Wang, Dangsheng Xiong, Yuanyuan Yang, *Nanjing University of Science and Technology, Nanjing, China*
- 174 Tribological Properties of UHMWPE Grafted with AA as Artificial Joint**  
Yaling Deng, Dangsheng Xiong, Jiabo Jin, *Nanjing University of Science and Technology, Nanjing, China*
- 284 Study of Nanocrystallines on Artificial Hip Implants Surfaces Induced by Bio-tribo-corrosion Processes**  
Yu Yan, Linghe Wang, Yanjing Su, Lijie Qiao, *University of Science and Technology Beijing, Beijing, China*
- 300 The influence of Protein Adsorption on Generation of Fretting Wear at the Sem-cement Interface**  
Hongyu Zhang, *Tsinghua University, Beijing, China*, Shaohua Zhang, *State Key Laboratory of Tribology, Beijing, China*
- 333 Conformation and Formation Mechanism of Durable Self-assembled HDPa Bilayers on Titanium Alloy Substrate**  
Caixia Zhang, Yuhong Liu, Pengxiao Liu, *State Key Laboratory of Tribology, Beijing, China*, Shizhu Wen, *State Key Laboratory of Tribology, Beijing, China*
- 431 Effect of CPP-ACP on the Remineralization of Acid-eroded Human Tooth Enamel: Nanomechanical Properties and Microtribological Behaviour Study**  
Liang Zheng, Jing Zheng, Linmao Qian, Zhongrong Zhou, *Southwest Jiaotong University, Chengdu, China*
- 493 Study of Lubricating Mechanisms in Artificial Hip Joints**  
Martin Vrbka, Ivan Krupka, Martin Hartl, *Brno University of Technology, Brno, Czech Republic*, Jiří Gallo, *University Hospital Olomouc, Olomouc, Czech Republic*
- 536 Comparative Friction and Wear Behavior between Titanium Alloys Ti-6Al-7Nb and Ti-6Al-4V**  
Mamoun Fellah, Mohammed Labaiz, Omar Assala, *Badji Mokhtar University, Annaba, Algeria*, Alain Iost, *Laboratory of metallurgy and materials science ENSAM, Lille, France*
- 551 Influence of Sn in the Tribocorrosion and Electrochemical Behavior of  $\beta$  Titanium Biomedical Alloys Obtained by Powder Metallurgy**  
Virginia Guiñón Pina Pina, Alba Dalmau, Francisco Devesa, Vicente Amigó, Anna Igual Muñoz, *Universidad Politécnica de Valencia, Valencia, Spain*
- 631 A lamellar-roller-bearings Lubrication Model on the Cartilage Surface**  
Zenon Pawlak, *Tribochemistry Consulting, Salt Lake City, UT, United States*, Wiesław Urbaniak, *Kazimierz Wielki University, Bydgoszcz, Poland*, Kehinde Q. Yusuf, I.O. Afara, *Adekunle Oloyede, Queensland University of Technology, Brisbane, Australia*
- 655 Critical Squeaking Friction with Ceramic Bearings**  
N. Fan, M.M. Morlock, N.E. Bishop, G. Huber, N. Hoffman, Michele Ciavarella, *TUHH Hamburg University of Technology, Hamburg, Germany*, G.X. Chen, *Southwest Jiaotong University, Chengdu, China*, F. Witt, *TUHH Hamburg University of Technology, Hamburg, Germany*
- 685 Measurement of Protein Adsorption in Thin Film Lubrication of Simulated Synovial Fluids**  
Feng Guo, Xia Li, *Qingdao Technological University, Qingdao, China*, Patrick Wong, *City University of Hong Kong, Hong Kong, China*
- 776 BioloX® Delta-on-BioloX® Delta Ceramic Hip Retrievals: Raman and Fluorescence Characterization**  
Enrico Modena, Paola Taddei, *University of Bologna, Bologna, Italy*, Saverio Affatato, *Rizzoli Orthopaedic Institute, Bologna, Italy*

- 835 Sensibility Evaluation Based on the Measurement of Friction between Finger Skin and Case of Cellular Phone**  
Jin-Hwak Park, Young-Ze Lee, *Sungkyunkwan University, Suwon, Republic of Korea*
- 879 Tribological Tests of Particular Dental Materials**  
Anna Dobrowolska, Wojciech Wieleba, *Wrocław University of Technology, Wrocław, Poland*, Tomasz Dabrowa, *Wrocław Medical University, Wrocław, Poland*
- 994 The Experimental Methods of Measuring and Calculating Friction in Knee Endoprosthesis**  
Piotr Kowalewski, Wojciech Wieleba, Dymitry Capanidis, *Wrocław University of Technology, Wrocław, Poland*
- 1123 Procedural Approach on Using XRD to Qualify the Surface Roughness**  
Giovanni Berti, *University of Pisa, Pisa, Italy*, Francesco De Marco, Maria E. Del Seppia, *XRD-Tools s.r.l., Pisa, Italy*
- 1152 Friction Determination between Dental Enamel and Glass in Different Conditions**  
Gheorghe Frunza, "Stefan cel Mare" *University of Suceava, Suceava, Romania*, Mihai C. Frunza, *University of Medicine and Pharmacy "Carol Davila", Bucharest, Romania*
- 1265 Experimental and Numerical Analysis of UHMWPE Acetabular Cups after Wear Test: a Preliminary Study**  
Francesca Di Puccio, Lorenza Mattei, *University of Pisa, Pisa, Italy*, Mario D'Acunto, *Institute of Structure of Matter ISM-CNR, Roma, Italy*, Santina Battaglia, Saverio Affatato, *Istituto Ortopedico Rizzoli, Bologna, Italy*, Randa Ishak, *University of Pisa, Pisa, Italy*, Simone Dinarelli, *Institute of Structure of Matter ISM-CNR, Roma, Italy*, Heinz Amenitsch, *Academy of Science of Austria, Graz, Austria*

## BM – Biomimetics

## PS1-BM Posters

ATRIUM • 09:00 – 16:30

- 1054 Wetting and Tribological Behavior of Micro, Nano & Hierarchical Patterned Poly-Methyl-Metha-Acrylic (PMMA) Surfaces**  
Shuxue Piao, Nagaraj Chelliah Machavallan, Il-Joo Cho, Kyung-Young Jhang, Eui-Sung Yoon, *Republic of Korea*

## ST – Surface Tribology

## TU1-ST3 Coatings 2

ROOM 3 MILANO • 08:30 – 10:30

Chair: José Daniel Biasoli de Mello, *Universidade Federal de Uberlândia, MG, Brazil*

- 144 Effect of Intercalated Compounds into MoS<sub>2</sub> Matrices on Mechanical and Tribological Properties**  
Nathalie M. Renevier, *University of Central Lancashire, Preston, United Kingdom*, Xiaoling Li, *University of Birmingham, Birmingham, United Kingdom*, Xiaoling Zhen-Teer, *Miba, Droitzwich, United Kingdom*
- 149 The Effect of Coating Characteristics on the Performance of a-c:H And ta-c Coatings**  
Lauri Kilpi, Peter Andersson, Timo J. Hakala, Helena Ronkainen, *VTT Technical Research Centre of Finland, Espoo, Finland*, Sanna Tervakangas, *DIARC-Technology Inc., Espoo, Finland*, Jussi Oksanen, Jari Koskinen, *Aalto University, Espoo, Finland*
- 190 Friction Characteristics between CVD Diamond Film and Stainless Steel under Un-lubricated Vacuum Condition**  
Kenta Nakamura, Kenji Tamaoki, *Tokyo Metropolitan Industrial Technology Research Institute, Tokyo, Japan*, Kazutaka Kanda, *Fukui University of Technology, Fukui, Japan*



- 195 High Temperature Tribological Behavior of ta-C and a-C:H Coatings**  
Xingrui Deng, Hiroyuki Kousaka, Takayuki Tokoroyama, Noritsugu Umehara, *Nagoya University, Nagoya, Japan*
- 382 Assessment of the Thermo-Oxidative Stability of Silicon Oxide-Doped Diamond-Like Carbon by In Situ Environmental X-ray Photoelectron Spectroscopy**  
Filippo Mangolini, James Hilbert, Jennifer R. Lukes, Robert W. Carpick, *University of Pennsylvania, Philadelphia, PA, United States*
- 718 Zirconium Carbonitrides for Tribological Applications**  
Javier Barriga, Unai R. de Gopegui, Cristina Zubizarreta, *IK4-Tekniker, Eibar, Spain*

**TU1-ST4 Contact Mechanics 2****ROOM 4 VENEZIA • 08:30 – 10:30**Chair: Michael M. Khonsari, *Louisiana State University, Baton Rouge, LA, United States*

- 23 Method of Reduction of Dimensionality. Foundations and Case Studies: Rolling Noise, Friction of Elastomers and Ultrasonic Actuators**  
Valentin L. Popov, Mikhail Popov, Qiang Li, *Berlin University of Technology, Berlin, Germany*, Andrey Dimaki, *Russian Academy of Sciences, Tomsk, Russian Federation*, Ha X. Nguyen, *University of Oldenburg, Oldenburg, Germany*, Elena Teidelt, *Berlin University of Technology, Berlin, Germany*
- 136 Deterministic Analysis of Contacts - From Roughness to Inhomogeneity**  
Yuan-zhong Hu, *Tsinghua University, Beijing, China*
- 821 The Multifractal Analysis of the Fatigue Fracture under the Process of Friction**  
Arif M. Pashayev, Ahad Kh. Janahmadov, Natig G. Javadov, M.Y. Javadov, *Azerbaijan Engineering Academy, Baku, Azerbaijan*
- 909 A Numerical and Experimental Model for the Tribological Design of a Variable Displacement Oil Pump**  
Andrea Barbetti, Maurizio Moriglia, Matteo Gasperini, Nicola Novi, Raffaele Squarcini, *Pierburg Pump Technology S.p.A., Livorno, Italy*
- 943 Modeling of Friction in Contact of Viscoelastic Bodies with Textured Surfaces**  
Irina Goryacheva, *Russian Academy of Sciences, Moscow, Russian Federation*

**TU2-ST5 Coatings 3****ROOM 3 MILANO • 11:00 – 13:00**Chair: Victor Brizmer, *SKF Engineering & Research Centre, Nieuwegein, Netherlands*

- 478 Role of Temperature on the Ultra-low Friction and Wear of Diamond-like Carbon under Oil Boundary Lubrication**  
Haci A. Tasdemir, Masaharu Wakayama, Takayuki Tokoroyama, Hiroyuki Kousaka, Noritsugu Umehara, *Nagoya University, Nagoya, Japan*, Yutaka Mabuchi, Tsuyoshi Higuchi, *Nissan Motor Co., Japan*
- 853 Load-dependent Friction Behavior of Metal Diamondlike-carbon Nano-composite Coatings**  
Minoru Goto, *Ube National College of Technology, Ube, Japan*, Julien Fontaine, Sandrine Bec, *École Centrale de Lyon, Écully, France*, Kosuke Ito, *Nihon University, Koriyama, Japan*, Takanori Takeno, Hiroyuki Miki, *Tohoku University, Sendai, Japan*
- 887 Molecular Dynamics Simulations of the Growth of Hydrogenated Amorphous Carbon Films**  
Yinan Chen, Tianbao Ma, *Tsinghua University, Beijing, China*

- 959 Graphene Nanocrystal Size Effect on Frictional Behavior of Carbon Film Fabricated by Electron Irradiation in Electron Cyclotron Resonance Plasma**  
Cheng Chen, Dongfeng Diao, *Xi'an Jiaotong University, Xi'an, China*
- 1086 Influence of Loading Rate on Running-in Behavior of Diamond-like Carbon Films**  
Tomomi Honda, Keitaro Yoshida, Toshiro Miyajima, Yoshiro Iwai, *University of Fukui, Fukui, Japan*, Takatoshi Shinyoshi, Yosio Fuwa, *Toyota Motor Co. Ltd., Toyota, Japan*
- 1322 Design and Preparation of Nanostructured Carbon Films and High-tech Applications**  
Liping Wang, *Chinese Academy of Science, Lanzhou, China*

**TU2-ST6 Contact Mechanics 3****ROOM 4 VENEZIA • 11:00 – 13:00**Chair: Isaac Etsion, *Technion, Haifa, Israel*

- 387 Measurement of Friction Coefficient Involved in Cylindrical Gear Teeth Meshing**  
Vincenzo Solimine, Davide Crivello, *Oerlikon Graziano, Rivoli (To), Italy*
- 452 Examination of the Surface of a Ball Bearing Used in an Automobile Transmission for a Long Period**  
Kenji Matsumoto, *Honda R & D Co., Ltd, Haga, Japan*, Naoaki Yoshida, *Kyushu University, Kasuga, Japan*, Akira Sasaki, *Maintek Consultant of Maintenance Technology, Yokohama, Japan*
- 586 Tribological Aspects of Diagnosis of Technical Condition of Aircraft Engines Reducer-drives, Conducted in Long-term Usage**  
Lyudmila Shabalinskaya, Valery Zhuk, *Central Institute of Aviation Motors - P.I. Baranov, Moscow, Russian Federation*
- 799 Digital Image Correlation to Analyse Stick-slip Behaviour of Tyre Tread Block**  
Ari Tuononen, *Aalto university, Espoo, Finland*
- 1020 Influence of the Pitch Point Position on Tooth Flanks Wear**  
Mileta Ristivojevic, Tatjana Lazovic, Aleksandar Vencel, *University of Belgrade, Belgrade, Serbia*
- 1030 Mechanical and Thermal Contact of Regular Surfaces with Gas-Filled Interstitial Gaps**  
Kostyantyn Chumak, Bogdan Slobodian, Rostyslav Martynyak, *National Academy of Sciences of Ukraine, Lviv, Ukraine*

**TU3-ST7 Coatings 4****ROOM 3 MILANO • 14:00 – 16:00**Chair: Daniel Nélías, *INSA-Lyon, Villeurbanne, France*

- 910 Physical and Chemical Processes Affecting Performance of Super-low Friction Carbon Nitride Coatings in Various Gaseous Environments**  
Feodor M. Borodich, *Cardiff University, Cardiff, United Kingdom*
- 1010 Effect of Relative Humidity on Super-low Friction of Carbon Nitride Coatings in N<sub>2</sub> Gas Environment**  
Naohiro Yamada, Kyosuke Sato, Takanori Takeno, Koshi Adachi, *Tohoku University, Sendai, Japan*
- 689 PVD Coatings for Automotive & Precision Wear Components**  
Ruud Jacobs, Dave Doerwald, Roel Tietema, Thomas Krug, *Hauzer Techno Coating BV, Venlo, Netherlands*
- 356 Effect of S/Mo Ratio on Friction and Wear Characteristics in Air of Molybdenum Disulfide Sputtered Films**  
Kazunari Matsuzaki, Iwao Sasaki, Michiaki Ikeda, Kenji Matsuda, *Kyushu Institute of Technology, Kitakyushu, Japan*

**403 Tribological Properties of HVOF Sprayed WC-Ni Coatings**  
Monika Madej, Dariusz Ozimina, *Kielce University of Technology, Kielce, Poland*

**135 Nanoparticle-wall Collision in Fluid Jet and its Effect on Material Removal**  
Xuefeng Xu, *Beijing Forestry University, Beijing, China*, Jianbin Luo, *Tsinghua University, Beijing, China*

#### TU3-ST8 Surface Evolution and Wear 1 ROOM 4 VENEZIA • 14:00 – 16:00

*Chair: Irina Goryacheva, Russian Academy of Sciences, Moscow, Russian Federation*

**122 Quantification of Micro-pitting During Running-in Using 3D Surface Parameters**  
Stephane Tchoundjeu Ngatchou, Francois Robbe-Valloire, Tony Da Silva Botelho, *Supméca, Saint-Ouen, France*, Frederic Jarnias, *TOTAL, Research Centre of Solaize, Solaize, France*

**441 Experimental Investigation of the Tribology of the Dimple/Gimbal Interface**  
Youyi Fu, Young Woo Seo, Benjamin Suen, Karcher Morris, Frank Talke, *University of California, San Diego, La Jolla, CA, United States*

**702 The Plastic Deformation and Wear of Copper in Micro-Slurry-jet Erosion Test**  
Masayoshi Abo, Masaki Kobayashi, Masaru Higa, Satoshi Kakunai, *University of Hyogo, Himeji, Japan*

**888 Improvement of the Cavitation Erosion Resistance of an UNS S31803 Duplex Stainless Steel by High Temperature Gas Nitriding**  
Luis B. Varela Jiménez, Luis Espitia, André Tschitschin, *University of São Paulo, São Paulo, Brazil*

**1105 Fatigue Wear of Elastic Coatings in Contact with Periodic System of sliders: Modeling for Constant and for Time-dependent Load**  
Elena Torskaya, *Russian Academy of Sciences, Moscow, Russian Federation*

**1209 Design of a Twin Disc Test Machine**  
Paolo Repola, Salvatore Manconi, Michele Amorena, *AM Testing srl, San Piero a Grado (Pi), Italy*, Enrico Ciulli, *Università di Pisa, Pisa, Italy*, Marco Facchini, *Avio Propulsione Aerospaziale S.p.A., Rivalta (To), Italy*

#### TU4-ST9 Coatings 5 ROOM 3 MILANO • 16:30 – 18:50

*Chair: Guillermo Morales-Espejel, SKF Engineering & Research Centre, Nieuwegein, Netherlands*

**18 Super Low Friction of Fullerene Like Carbon Films and Application en Engine for Energy Saving and Emission Reduction**

Junyan Zhang, *Chinese Academy of Sciences, Lanzhou, China*

**42 Spectroscopic Study of Boundary Lubricated WDLC Coatings**  
Liuquan Yang, Anne Neville, *University of Leeds, Leeds, United Kingdom*, Alisdair Brown, Paul Ransom, *Afton Chemical Limited, Bracknell, United Kingdom*, Ardian Morina, *University of Leeds, Leeds, United Kingdom*

**123 Super Low Friction of DLC Coating with Selected Lubricant**  
Makoto Kano, Kentaro Yoshida, *Kanagawa Industrial Technology Center, Ebina, Japan*, Jean Michel Martin, Maria Isabel De Barros Bouchet, *École Centrale de Lyon, Écully, France*

**145 Influence of Hydrogen Content on DLC Tribological Behavior: Tests in Mineral Base Oil**  
Choumad Ould, Christophe Héau, *IREIS-HEF, Andrézieux-Bouthéon, France*, Julien Fontaine, *École Centrale de Lyon, Écully, France*, Christophe Donnet, *Université Jean Monnet, Saint-Etienne, France*

**279 Relation between Deposition Parameters and Properties of DLC Films by Using CVD with Pulsed-DC Plasma**

Hirofuka Ito, Kenji Yamamoto, *Kobe Steel LTD., Kobe, Japan*

**485 Characteristics of the Transformed Layer of DLC after Friction Testing under Boundary Lubrication in Additive-free Mineral Based Oil**

Nor A. B. Masripan, *Nagoya University, Nagoya, Japan*, Yosuke Tsukiyama, *Niigata University, Niigata, Japan*, Kenji Ohara, Noritsugu Umehara, Hiroyuki Kousaka, Takayuki Tokoroyama, *Nagoya University, Nagoya, Japan*, Shigeru Inami, Koji Zushi, *Daido Metal Co. Ltd, Inuyama, Japan*

**754 Tribological Properties of Microwave Assisted PECVD DLC Coatings**

Louise Austin, Anne Neville, Tomasz Liskiewicz, *Leeds University, Leeds, United Kingdom*

#### TU4-ST10 Tribocorrosion ROOM 4 VENEZIA • 16:30 – 18:50

*Chair: Giovanni Bolelli, Università di Modena e Reggio Emilia, Modena, Italy*

**553 Corrosive Wear Behavior of the Carbon Steel in Oil-water System**

Deli Duan, Shu Li, Ziyang Hu, *Chinese Academy of Sciences, Shenyang, China*

**720 Tribocorrosion Response of TaN Coatings in Biological Environments**

Raquel Bayón, Lucia Mendizabal, Unai R. de Gopegui, Javier Barriga, *IK4-Tekniker, Eibar, Spain*

**1008 Study of Sliding Bearing Lubricated in Ultra Pure Water**  
Kenichi Sugiyama, Junya Kawabata, *Ebara corporation, Fujisawa, Japan*

**1100 Tribocorrosion of ZrN and TiAlN Hard Coatings against Alumina Reinforced Polymers**  
Josef Brenner, Hakan Gocerler, Manel Rodriguez Ripoll, *AC<sup>2</sup>T Research GmbH, Wiener Neustadt, Austria*

**1147 Tribocorrosive Wear Phenomena Occurring in Oilfield Application**

Andreas Trausmuth, Ewald Badisch, Fabian Weigel, Rainer Jahn, *AC<sup>2</sup>T Research GmbH, Wiener Neustadt, Austria*, Gerald Zehethofer, *OMV Exploration & Production GmbH, Gänserndorf, Austria*, Thomas Vogl, *Voestalpine Tubulars GmbH & Co KG, Kindberg-Aumühl, Austria*

**488 Corrosion and Tribological Properties of Compositionally Gradient CrNx Coatings in Water Solutions**

Fei Zhou, Qianzhi Wang, Jizhou Kong, *Nanjing University of Aeronautics and Astronautics, Nanjing, China*

**834 Corrosion and Tribological Behavior of DLC Films on Titanium Alloy**

Tiago Falcade, *Federal University of Rio Grande do Sul, Porto Alegre, Brazil*, Viviane Turq, Jean Pierre Bonino, Florence Ansart, *Université de Toulouse, Toulouse, France*, Célia de Fraga Malfatti, *Federal University of Rio Grande do Sul, Porto Alegre, Brazil*

#### FW – Dry Friction and Wear

##### TU1-FW2 Theory of Friction and Wear, Numerical Simulation 1 ROOM 5 NAPOLI • 08:30 – 10:30

*Chair: Thomas G. Mathia, École Centrale de Lyon, Écully, France*

**347 First-Principles and Tight-Binding Quantum Chemical Molecular Dynamics Studies for Low Friction Mechanism of Carbon Nitride Coatings**

Seiichiro Sato, Shandan Bai, Takeshi Ishikawa, Yuji Higuchi, Nobuki Ozawa, Koshi Adachi, *Tohoku University, Sendai, Japan*, Jean-Michel Martin, *École Centrale de Lyon, Écully, France*, Momoji Kubo, *Tohoku University, Sendai, Japan*

- 12 Assessment of Sliding Friction of a Nanostructured Solid Lubricant Film by Numerical Simulation with the Method of Movable Cellular Automata (MCA)**  
Werner Österle, *Federal Institute for Materials Research and Testing, Berlin, Germany*, Andrey I. Dmitriev, *Institute of Strength Physics and Materials Science, Tomsk, Russian Federation*, Heinz Kloß, *Federal Institute for Materials Research and Testing, Berlin, Germany*
- 70 Development of a New Wear Model for the Study of Wheel and Rail Profile Evolution on Complex Railway Nets**  
Mirko Ignesti, Alice Innocenti, Lorenzo Marini, Enrico Meli, Andrea Rindi, *Florence University, Florence, Italy*
- 72 Generalised Energy Model of Sliding Friction Coefficient and Regularities of Tribosystem Evolution**  
Sergey V. Fedorov, *Kaliningrad State Technical University, Kaliningrad, Russian Federation*
- 86 Adhesive Wear and Static Friction of an Elastic-plastic Cylinder in Contact with a Rigid Flat**  
Xi Shi, Aizhong Wu, Changming Zhu, *Shanghai Jiao Tong University, Shanghai, China*
- 141 Thermodynamics and Friction Mechanism Analysis of DLC Films on H13 Steel under High Temperature**  
Qunfeng Zeng, Xi'an Jiaotong University, Xi'an, China, Osman Eryilmaz, *Argonne National Laboratory, Argonne, IL, United States*, Guangneng Dong, Li Luo, *Xi'an Jiaotong University, Xi'an, China*

**TU2-FW3 Theory of Friction and Wear, Numerical Simulation 2**  
**ROOM 5 NAPOLI • 11:00 – 13:00**

*Chair: Giovanni Bolelli, Università di Modena e Reggio Emilia, Modena, Italy*

- 214 A Friction Physical Model for the Estimation of Hysteretic Dissipations Arising at the Contact between Rigid Indenters and Visco-Elastic Materials**  
Flavio Farroni, Michele Russo, Riccardo Russo, Francesco Timponi, *University Of Naples Federico II, Naples, Italy*
- 225 Kinematic Analysis of Particles in Three-Body-Contacts**  
Kristin M. de Payrebrune, Matthias Kröger, *Technische Universität Bergakademie Freiberg, Freiberg, Germany*
- 271 Development and Accuracy of Ultra-Accelerated Quantum Chemical Molecular Dynamics Method for a Variety of Tribological Applications**  
Akira Miyamoto, Ryuji Miura, Ai Suzuki, Nozomu Hatakeyama, Sumio Kozawa, Mark C. Williams, *Tohoku University, Sendai, Japan*, Sophie Loehle, Clotilde Minfray, Jean M. Martin, *École Centrale de Lyon, Écully, France*
- 345 Friction Model for the Counter Surface Design of Pneumatic Cylinder Seals**  
Martin Zimmermann, *Leibniz Universität Hannover, Hannover, Germany*, Armin Hermann, Matthias Wangenheim, *Freudenberg Sealing Technologies, Schwalmstadt, Germany*
- 389 Wear of Supported Graphene**  
Andreas Klemenz, *Fraunhofer Institute for Mechanics of Materials IWM, Freiburg, Germany*, Lars Pastewka, *Johns Hopkins University, Baltimore, MD, United States*, Arnaud Caron, Balakrishna S. Ganeshamurty, Roland Bennewitz, *INM-Leibnitz Institute for new Materials, Saarbrücken, Germany*, Michael Moseler, *University of Freiburg, Freiburg, Germany*
- 392 Onset and Evolution of the Sliding: Key Role of the Local Contact Dynamics**  
Mariano Di Bartolomeo, *"La Sapienza" University of Rome, Rome, Italy*, Francesco Massi, *Université de Lyon, Villeurbanne, France*, Laurent Baillet, *Joseph Fourier University, Grenoble, St. Martin D'Heres, France*, Annalisa Fregolent, Antonio Culla, *"La Sapienza" University of Rome, Rome, Italy*, Yves Berthier, *Université de Lyon, Villeurbanne, France*

**TU3-FW4 Theory of Friction and Wear, Numerical Simulation 3**  
**ROOM 5 NAPOLI • 14:00 – 16:00**

*Chair: Luca Lusvarghi, Università di Modena e Reggio Emilia, Modena, Italy*

- 426 Influence of Different Deformation Properties of a Friction Pair on the Real Contact Area under the Thermo-mechanical Coupling**  
Jianmeng Huang, Chenghui Gao, *Fuzhou University, Fuzhou, China*
- 554 Renormalization Group Approach to Dissipative System**  
Shoichi Ichinose, *University of Shizuoka, Shizuoka, Japan*
- 563 Transient Thermal Diffusion in Elliptic Contacts**  
Elisabetta Fava, Marco Barbieri, *Università di Modena e Reggio Emilia, Modena, Italy*
- 571 A Mesoscopic Model for the Wear in Tetrahedral Amorphous Carbon under Shear**  
Julian von Lautz, Lars Pastewka, Michael Moseler, *Fraunhofer Institute for Mechanics of Materials IWM, Freiburg, Germany*
- 584 Load-dependent Friction Behaviors and Structural Transition Kinetics of Amorphous Carbon Films**  
Tian-Bao Ma, *Tsinghua University, Beijing, China*
- 1036 Effect of Choice of Doping Element on the Sliding Mechanisms of Sputtered WS Coatings – a High Resolution TEM/EELS Study**  
Fredrik Gustavsson, *Uppsala University, Uppsala, Sweden*, Matthieu Bugnet, *McMaster University, Hamilton, Canada*, Tomas Polcar, *University of Southampton, Southampton, United Kingdom*, Albano Cavaleiro, *University of Coimbra, Coimbra, Portugal*, Staffan Jacobson, *Uppsala University, Uppsala, Sweden*

**TU4-FW5 Theory of Friction and Wear, Numerical Simulation 4**  
**ROOM 5 NAPOLI • 16:30 – 18:50**

*Chair: Jeffrey Streator, Georgia Institute of Technology, Atlanta, GA, United States*

- 600 Frictional Properties of Multilayer Graphene by Ab initio and Classical Molecular Dynamics Calculations**  
Marco Reguzzoni, *Università di Modena e Reggio Emilia, Modena, Italy*, Annalisa Fasolino, *Radboud University, Nijmegen, Netherlands*, Elisa Molinari, Maria C. Righi, *Università di Modena e Reggio Emilia, Modena, Italy*
- 665 Ultralow Friction of H and F-terminated DLC Films under UHV. A Computational Study**  
Shandan Bai, Seiichiro Sato, Takeshi Ishikawa, Yuji Higuchi, Nobuki Ozawa, Koshi Adachi, *Tohoku University, Sendai, Japan*, Jean Michel Martin, *École Centrale de Lyon, Écully, France*, Momiji Kubo, *Tohoku University, Sendai, Japan*
- 710 Non-linear Hysteretic Instability in Rotating Machinery**  
Francesco Sorge, *Università di Palermo, Palermo, Italy*
- 866 Modal Dynamic Instabilities Generated by Frictional Contacts**  
Jacopo Brunetti, Francesco Massi, Aurélien Saulot, *INSA-Lyon, Villeurbanne, France*, Walter D'Ambrogio, *Università di Roma "La Sapienza", Roma, Italy*
- 886 Role of Damping on Contact Instability Scenarios**  
Davide Tonazzi, Francesco Massi, Antonio Culla, Annalisa Fregolent, *"La Sapienza" University of Rome, Rome, Italy*, Yves Berthier, *INSA-Lyon, Villeurbanne, France*
- 588 Table Tennis Rubber: Tribological Characterization**  
Michael Varenberg, *Technion – IIT, Haifa, Israel*, Alexander Varenberg, *Bateman Litwin Co., Yokneam, Israel*
- 668 Temperature and Velocity Dependences in the Tomlinson/Prandtl Model for Atomic Sliding Friction**  
Sergio Manzi, Octavio Furlong, *Universidad Nacional de San Luis, San Luis, Argentina*, Wilfred Tysoe, *University of Wisconsin-Milwaukee, Milwaukee, WI, United States*



## LA – Lubricants and Additives

## TU1-LA2 Solid Lubricants

ROOM 6 FIRENZE • 08:30 – 10:30

Chair: Gwidon Stachowiak, Curtin University, Perth, Australia

**741 Advances in Novel Nanolubrication Additives for Improved Friction and Wear Properties**

Ali Erdemir, Argonne National Laboratory, Argonne, IL, United States

**919 ToF-SIMS Investigation of MoS<sub>2</sub> Based Coatings after Friction Test under Vacuum**

Guillaume Colas, Aurélien Saulot, David Philippon, Claude Godeau, Yves Berthier, INSA-Lyon, Villeurbanne, France, Didier Léonard, Université Claude Bernard-Lyon 1, Villeurbanne, France

**1038 Influence of Surface Roughness in MoS<sub>2</sub>-nanotube-assisted Lubrication of Self-mated DLC and Steel Contacts**

Janez Kogovšek, University of Ljubljana, Ljubljana, Slovenia, Maja Remškar, Jožef Stefan Institute, Ljubljana, Slovenia, Mitjan Kalin, University of Ljubljana, Ljubljana, Slovenia

**952 Characteristics of Electroconductive Solid Lubricant Films for Space Applications**

Koji Matsumoto, Japan Aerospace Exploration Agency, Chofu, Japan, Ayaka Takahashi, Teikyo University, Utsunomiya, Japan, Hiroshi Shiomi, Satomi Kawamoto, Japan Aerospace Exploration Agency, Chofu, Japan

**1149 Tribological and Electrical Contact Behavior of Cu-DLC Nanocomposite Coating on Copper-based Substrate**

Ryoichi Hombo, DENSO Corporation, Kariya, Japan, Takanori Takeno, Tohoku University, Sendai, Japan, Julien Fontaine, École Centrale de Lyon, Écully, France, Hiroyuki Miki, Tohoku University, Sendai, Japan, Naoki Kato, Takahiro Nozu, Naruhiko Inayoshi, DENSO Corporation, Kariya, Japan, Michel Belin, École Centrale de Lyon, Écully, France

**1026 Chemical Characterization of Boundary Films by TOF-SIMS**

Hidetaka Nanao, Shigeyuki Mori, Iwate university, Morioka, Japan

## TU2-LA3 Tribochemistry I

ROOM 6 FIRENZE • 11:00 – 13:00

Chair: Jean-Louis Mansot, Université des Antilles et de la Guyane, Pointe à Pitre, France

**971 Keynote: Three-body Tribocorrosion Studies of Multiphase Alloys – Benefits and Limitations**

Grazyna Stachowiak, Mobin Salasi, Gwidon Stachowiak, Curtin University, Bentley, Australia

**87 Antagonism between Phosphites and Sulfides Additives explained by Gas Phase Lubrication**

Maria Isabel De Barros Bouchet, École Centrale de Lyon, Écully, France, Samuel Mambingo-Doumbé, TOTAL company, Solaize, France, Thierry Le Mogne, École Centrale de Lyon, Écully, France, Alain Bouffet, TOTAL company, Solaize, France, Jean-Michel Martin, École Centrale de Lyon, Écully, France

**1197 MS Tribometry for the Study of Lubricants**

Edurne Berriozabal, Marcello Conte, Amaya Igartua, IK-4 Tekniker, Eibar, Spain

**580 The Tribological Performance, the Tribochemical Analysis of Novel Borate Esters as Lubricant Additives in Vegetable Oil**

Jincan Yan, Shanghai Jiao Tong University, Shanghai, China, Xiangqiong Zeng, Emile van der Heide, University of Twente, Twente, Netherlands, Tianhui Ren, Shanghai Jiao Tong University, Shanghai, China

**701 The Tribological Characteristics of ZDDP, Detergent and an Organic Antiwear Additive when Lubricating Ferrous and Aluminium-Silicon Surfaces**

Michael Burkinshaw, Cummins Turbo Technologies, Huddersfield, United Kingdom, Anne Neville, Ardian Morina, University of Leeds, Leeds, United Kingdom, Andrew Greenall, Shell Global Solutions, Hamburg, Germany, Mike Sutton, Lubrizol Limited, Derby, United Kingdom

**726 New Biofuel for Low Friction in Piston Ring Cylinder Liner Contact**

Cyrielle Forest, Maria Isabel De Barros Bouchet, École Centrale Lyon, Écully, France, Michaël Mazarin, TOTAL Supply &amp; Marketing, Solaize, France, Jean-Michel Martin, École Centrale Lyon, Écully, France

## TU3-LA4 Tribochemistry II

ROOM 6 FIRENZE • 14:00 – 16:00

Chair: Wilfred Tysoe, University of Wisconsin-Milwaukee, WI, United States

**1023 Keynote: Decomposition of Hydrocarbon Oil on Nascent Steel Surface During Lubrication**

Shigeyuki Mori, I. Tada, Hidetaka Nanao, Kimihiro Kobayashi, Iwate university, Morioka, Japan

**332 Atomistic Simulations of Tribochemical Reactions at Carbon Surfaces**

Gianpietro Moras, Lars Pastewka, Narasimham Mulakaluri, Peter Gumbsch, Michael Moseler, Fraunhofer Institute for Mechanics of Materials IWM, Freiburg, Germany

**833 Lubricant Friction Modifier Performance Retention – Tribological Studies**

Frank J. DeBlase, Faith A. Corbo, Chemtura Corporation, Naugatuck, CT, United States

**706 The Influence of Boundary Lubrication Film on the Micropitting of Gears**

Takuya Ohno, Yukitoshi Fujinami, Masahiro Kobessho, Idemitsu Kosan Co., Ltd., Ichihara, Japan

**208 The Application of Quantitative Structure Tribo-ability Relationship Model**

Xinlei Gao, Wuhan Polytechnic University, Wuhan, China, Kang Dai, South-Central University for Nationalities, Wuhan, China, Wanzhen Gao, Wuhan Research Institute of Materials Protection, Wuhan, China, Zhan Wang, Tingting Wang, Wuhan Polytechnic University, Wuhan, China

**1034 Viscosity Effects in Wet Clutch Systems**Alexander Grafl, Astrid Lebel, AC<sup>2</sup>T Research GmbH, Wiener Neustadt, Austria

## TU4-LA5 Additives I

ROOM 6 FIRENZE • 16:30 – 18:50

Chair: Christian Scholz, BAM Federal Institute for Materials Research and Testing, Berlin, Germany

**45 Size Controlled Preparation of Nickel Nanoparticles in Base Oil and Evaluation of their Tribological Properties**

Yanfeng Chen, Shengmao Zhang, Guangbin Yang, Pingyu Zhang, Zhijun Zhang, Henan University, Kaifeng, China

**364 Participation of Suspended Nanoparticles in Tribofilm Formation**

Juozas Padgurskas, Raimondas Kreivaitis, A. Stulginskis University, Kauno Raj, Lithuania, Svajus J. Asadauskas, Center for Physical Sciences and Technology, Vilnius, Lithuania

**464 Potentiality of MoDTC as Friction Modifier for Diesel Engine Oils**

Yukiya Moriizumi, Akihiro Kotaka, Kenji Yamamoto, Kazuhiro Umehara, Noriyoshi Tanaka, ADEKA Corporation, Arakawaku, Japan

- 773 On the Friction Reduction Mechanism Introduced by Graphene Nanosheets as Additive in Oil Lubricated Contacts**  
Vincenzo D'Agostino, Adolfo Senatore, Vincenzo Petrone, Paolo Ciambelli, Maria Sarno, Claudia Cirillo, *University of Salerno, Fisciano (Sa), Italy*
- 391 Application of Time-of-Flight Secondary Ion Mass Spectrometry for the Investigation of Boundary Layers Built up by Gear Oil Additives under Tribological Stress**  
Dieter Lipinsky, Christoph Mayer, *Westfälische Wilhelms-Universität, Münster, Germany*, Florian Wohlleber, Hermann Pflaum, Karsten Stahl, *Technische Universität München, Garching, Germany*, Heinrich F. Arlinghaus, *Westfälische Wilhelms-Universität, Münster, Germany*
- 687 The Study on Antiseizure Performance for Al-Si Alloys with ZnDTP-free Engine Oil**  
Yasunori Shimizu, Junya Iwasaki, Hiroshi Fujita, *Idemitsu Kosan Co. Ltd., Tokyo, Japan*
- 737 How Commercial Gear Oils Behave in Rolling-Sliding and Pure Sliding Contacts**  
Balasubramaniam Vengudusamy, Alexander Grafl, *AC<sup>2</sup>T Research GmbH, Wiener Neustadt, Austria*, Franz Novotny-Farkas, *OMV Refining & Marketing GmbH, Vienna, Austria*, Werner Schöffmann, *Magna Powertrain AG & Co KG, Lannach, Austria*
- PS1-LA Posters**  
**ATRIUM • 09:00 – 16:30**
- 32 Optimizing Lubricant Viscosity Profile for Maximum Fuel Economy**  
Daniella Baxter, Sonia Oberoi, Stuart Briggs, Isabella Goldmints, *Infineum USA, Linden, NJ, United States*
- 53 Graphene-like Molybdenum Diselenide Nanoparticles as High-performance Nanolubricant Additives**  
Kostyantyn E. Grinkevych, Leonid M. Kulikov, Natalia B. Konig, *Institute for Problems of Materials Science of NASU, Kyiv, Ukraine*, E. I. Gershman, *Russian New University, Moscow, Russian Federation*, Ivan V. Tkachenko, *Institute for Problems of Materials Science of NASU, Kyiv, Ukraine*, I. S. Gershman, *Railway Research Institute, Moscow, Russian Federation*
- 92 Response of Naphthenic Oils to Viscosity Index Improvers**  
Luis Bastard-Zambrano, Linda Malm, *Nynas AB, Nynashamn, Sweden*
- 121 Rust Preventing Properties of Amino Acids and Their 1,3,5-triazine Derivatives**  
Seung-Hyun Yoo, Young-Wun Kim, Keunwoo Chung, Nam-Kyun Kim, *Korea Research Institute of Chemical Technology, Daejeon, Republic of Korea*, Joon-Seop Kim, *Chosun University, Gwangju, Republic of Korea*
- 297 Effect of Nanoparticles on Wear Properties of Lubricating Oils (Case of Ag, Cu and Ni Nanoparticles)**  
Masakazu Nakasako, Hiroki Kakiyama, Makoto Kamakura, Nobuhiko Tomioka, *Bab-Hitachi Industrial Co., Kure, Japan*
- 298 Application of Nanotechnology for High Performance Solid Lubricant Coatings**  
Marco Enger, *Mannheim University of Applied Sciences, Mannheim, Germany*, Pavol Blažkovič, *Slovak University of Technology, Bratislava, Slovak Republic*, Paul Feinle, *Mannheim University of Applied Sciences, Mannheim, Germany*
- 368 Friction and Wear Behavior of TiN/a-C:H:W Coatings under Dry Sliding and Lubrication Conditions with an Ionic Liquid as a Lubricant**  
Dariusz Ozimina, Monika Madej, *Kielce University of Technology, Kielce, Poland*, Krystyna Marczevska – Boczkowska, *Lublin University of Technology, Lublin, Poland*, Michał Styp-Rekowski, Maciej Matuszewski, *University of Technology and Life Sciences in Bydgoszcz, Bydgoszcz, Poland*
- 463 Investigation of the Production of Good Quality and High Stability Base Oil from Fischer-Tropsch Paraffin Mixture**  
György Pölcsmann, Jenő Hancsók, *University of Pannonia, Veszprém, Hungary*
- 545 Evaluation of Neat Cutting Oils in Tribological Test Rigs and Their Performance Validation in the Field**  
P.V. Joseph, Simmi Datta, M.K. Dubey, R. Mahapatra, Deepak Saxena, E. Sayanna, B. Basu, *Indian Oil Corporation Limited, Faridabad, India*
- 587 Development of Multifunctional Additives (Based on Fatty Acid Methyl Ester and Polyisobutylene Succinic Anhydride)**  
Jenő Hancsók, László Bartha, György Pölcsmann, *University of Pannonia, Veszprém, Hungary*, Ádám Beck, *MOL Hungarian Oil and Gas Plc., Százhalombatta, Hungary*, Ákos Nemesnyik, *MOL LUB Ltd., Almásfüzitő, Hungary*
- 610 Influence of Geomaterials on Improvement of Tribotechnical Properties of Friction Pairs**  
Margarita A. Skotnikova, Nikolay A. Krylov, Evgeny K. Ivanov, Alexander V. Sokolov, Elena V. Homchenko, *St. Petersburg Polytechnical university, St. Petersburg, Russian Federation*
- 648 Friction Properties of Fluorinated Carbons**  
Philippe Thomas, Jean-Louis Mansot, *Université des Antilles et de la Guyane, Pointe à Pitre, Guadeloupe, France*, Karl Delbé, *Équipe Interfaces et Matériaux Fonctionnels, Tarbes, France*, Audrey Sauldubois, Philippe Bilas, Laurence Romana, *Université des Antilles et de la Guyane, Pointe à Pitre, Guadeloupe, France*, Laurent Legras, *EDF - R&D, Moret sur Loing, France*, Marc Dubois, Katia Guerin, A. Hamwi, *Université Blaise Pascal de Clermont-Ferrand, Aubière, France*
- 667 Rheological and Tribological Characterization of a New Acylated Chitosan-based Biodegradable Lubricating Grease Formulation: a Comparative Study with Traditional Lithium and Calcium Greases**  
Rubén Sánchez, Concepción Valencia, José M. Franco, *Universidad de Huelva, Huelva, Spain*
- 674 A New Test for the Qualitative and Quantitative Discrimination between Automotive Transmission and Axle Oils**  
Waldemar Tuszyński, Marian Szczerek, Edyta Osuch-Slomka, *Institute for Sustainable Technologies – National Research Institute, Radom, Poland*
- 750 Evaluation of Oil Drain Interval for Buses in Urban Traffic with Respect to Local Operating Conditions**  
Zoran Timotijevic, Slavko Bacevac, *Petroleum Industry of Serbia, Belgrade, Serbia*, Simona Corsi, *Gazpromneft Lubricants Italia S.p.A., Roma, Italy*
- 765 Influence of Calcium Detergent on Wet Clutch Durability**  
Toshiaki Iwai, Toshihiko Ichihashi, *Idemitsu Kosan Co. Ltd, Ichihara, Japan*, Mitsugu Kudo, *Idemitsu Kosan Co. Ltd, Tokyo, Japan*, Masatoshi Miyagawa, Nobuyuki Katayama, *F.C.C.Co. Ltd., Hamamatsu, Japan*, Tomoaki Iwai, *Kanazawa University, Kanazawa, Japan*
- 787 Self-anticorrosion Performance of Polyurethane Microcapsule Containing Triazole Corrosion Inhibitor**  
Eunjo Koh, Young-Wun Kim, Keunwoo Chung, Nam Kyun Kim, Jihoon Shin, *Korea Research Institute of Chemical Technology, Daejeon, Republic of Korea*
- 796 Influence of Polymer Structure on Frictional Properties**  
Kazuo Tagawa, Kohei Masuda, *JX Nippon Oil & Energy Corporation, Yokohama, Japan*, Masayoshi Muraki, *Shonan Institute of Technology, Fujisawa, Japan*
- 903 Research on the Kinetics of the Lithium Grease Thixotropic Microstructure Reconstruction**  
Maciej Paszkowski, Sylwia Olsztyńska-Janus, *Wrocław University of Technology, Wrocław, Poland*

- 1019 Black is Black .... A Heavy Viscous Oil for Lubricating Greases**  
Mehdi Fathi-Najafi, Rene Abrahams, Linda Malm, *Nynas AB, Nynäshamn, Sweden*
- 1071 Research on Friction Properties between Self-lubricating Al<sub>2</sub>O<sub>3</sub>/TiC/CaF<sub>2</sub> and Al<sub>2</sub>O<sub>3</sub>/TiC Ceramic Composites Used as Conical Dies**  
Xuefeng Yang, Peilong Song, Jie Gu, Tao Ma, Shouren Wang, Yanjun Wang, Liying Yang, *University of Jinan, Jinan, China*
- 1316 The Temperature-viscosity Behavior of VI Improvers and Their Influence on the Fuel Efficiency of Engine Oil**  
Jennifer Holtzinger, Frank Lauterwasser, Christoph Wincierz, Phillip A. Hutchinson, Dmitriy Shakhvorostov, *Evonik Industries AG, Darmstadt, Germany*

## LF – STLE/ASME – Lubrication Fundamentals

### TU1-LF2 Boundary and Thin Film Lubrication

ROOM 7 BARI • 08:30 – 10:30

Chair: Ashlie Martini, *University of California, Merced, CA, United States*

- 1242 NEMD Simulations of Confined Liquids under Pressure and Shear**  
Chiara Gattinoni, *Imperial College London, London, United Kingdom*, Chris Lorenz, *King's College London, London, United Kingdom*, David M. Heyes, Daniele Dini, *Imperial College London, London, United Kingdom*
- 1065 De-mystifying the Load-independent Derjaguin-offset in Various Boundary-Lubricated Nanosystems**  
Stefan Eder, András Vernes, Georg Vorlaufer, *AC<sup>2</sup>T Research GmbH, Wiener Neustadt, Austria*, Gerhard Betz, *Vienna University of Technology, Vienna, Austria*
- 644 Lubricant Flow-reflow on the Air Bearing Surface in a Hard Disk Drive**  
Alejandro Rodriguez Mendez, David B. Bogoy, *University of California Berkeley, Berkeley, CA, United States*
- 630 Probing the Molecularly-thin Lubricated Disk Surface Using Thermal Fly-height Control Sliders to Study Recording Head Wear**  
Yung-Kan Chen, *University of California Berkeley, Berkeley, CA, United States*, Aravind N. Murthy, Remmelt Pit, *HGST a Western Digital Company, San Jose, CA, United States*, David B. Bogoy, *University of California Berkeley, Berkeley, CA, United States*
- 965 A Novel Approach to Evaluate a Solid-liquid Interfacial Slip in Lubricated Contacts of DLC**  
Marko Polajnar, Mitjan Kalin, *University of Ljubljana, Ljubljana, Slovenia*
- 1214 In Situ Raman Micro Spectrometry Investigation of Boundary Dynamic Tribologic Contacts**  
Audrey Molza, A. Sauldubois, P. Bilas, Yves Bercion, J.L. Mansot, *Université des Antilles et de la Guyane, Pointe à Pitre, France*

### TU2-LF3 Starved and Cavitated Lubrication

ROOM 7 BARI • 11:00 – 13:00

Chair: Philippa Cann, *Imperial College London, United Kingdom*

- 733 A Model Considering non-fully Filled Gaps for Systems under Starved Lubrication**  
Michael Müller, Georg-Peter Ostermeyer, Florian Bubser, *Braunschweig University of Technology, Braunschweig, Germany*
- 768 Occurrence of Starvation: Stationary and Transient Approaches**  
Florian Brémond, Denis Mazuyer, Juliette Cayer-Barrio, *École Centrale de Lyon, Écully, France*

- 972 An Analysis of Starved EHL Point Contacts with Reflow**  
Takashi Nogi, *Japan Aerospace Exploration Agency, Chofu, Japan*
- 129 CFD Modelling of Cavitation Phenomenon in Piston Ring/Cylinder Liner Conjunction**  
Hamed Shahmohamadi, Ramin Rahmani, Homer Rahnejat, Colin Garner, *Loughborough University, Loughborough, United Kingdom*
- 831 Preliminary Investigation of the Impact Pressure from a Single Cavitation Water Bubble on a Solid Boundary Wall, Using Experimental, Analytical and Numerical Methods**  
Iakovos Tzanakis, *Bournemouth University, Bournemouth, United Kingdom*, Anastasios Georgoulas, Dimitrios Fytanidis, *Democritus University of Thrace, Xanthi, Greece*, Mark Hadfield, *Bournemouth University, Bournemouth, United Kingdom*, Nikolaos Kotsovinos, *Democritus University of Thrace, Xanthi, Greece*
- 1212 Surface Roughness Effects in Starved EHL Contacts**  
David Kostal, Petr Sperka, Ivan Krupka, Martin Hartl, *Brno University of Technology, Brno, Czech Republic*

### TU3-LF4 Hydrodynamic and Journal Bearings

ROOM 7 BARI • 14:00 – 16:00

Chair: Jeffrey Streator, *Georgia Institute of Technology, Atlanta, GA, United States*

- 1222 Framework for the Fluid-Structure Interaction Numerical Simulation with Application to the Generalized Reynolds and Stokes Equations: Compliant-Wall Journal Bearing (Large Wall Deformations)**  
Troy A. Snyder, Minel J. Braun, *University of Akron, Akron, OH, United States*
- 621 Boundary Effect on Hydrodynamic Lubricated Contact**  
L. Guo, P.L. Wong, *City University of Hong Kong, Hong Kong, China*, F. Guo, *Qingdao Technological University, Qingdao, China*
- 154 The Mechanisms of Load Generation between Parallel Surfaces**  
Noel Brunetiere, Bernard Tournier, *University of Poitiers, Futuroscope Chasseneuil, France*
- 717 Experimental Study on the Effects of Oil Groove Location on Temperature and Pressure Profile in Journal Bearing Lubrication**  
Mohamad A. Ahmad, Salmiah Kasolang, *Universiti Teknologi MARA, Shah Alam, Malaysia*, Robert Dwyer-Joyce, *University of Sheffield, Sheffield, United Kingdom*
- 716 Experimental Study on the Effects of Oil Groove Location on Film Thickness and Viscosity Profile in Hydrodynamic Journal Bearings**  
Mohamad A. Ahmad, Salmiah Kasolang, *Universiti Teknologi MARA, Shah Alam, Malaysia*, Robert Dwyer-Joyce, *University of Sheffield, Sheffield, United Kingdom*
- 593 Piston Ring Pounding Analysis and Possible Solution**  
Quanbao Zhou, *Changan UK R&D Centre Ltd, Nottingham, United Kingdom*

### TU4-LF5 EHL Modelling II

ROOM 7 BARI • 16:30 – 18:50

Chair: Dong Zhu, *Sichuan University, Chengdu, China*

- 397 Prediction of Traction in EHL Contacts**  
Ding Wang, Gerhard Poll, *Leibniz University of Hannover, Hannover, Germany*
- 396 Theoretical and Experimental Investigations on EHL Point Contacts with Different Entrainment Velocity Directions**  
Karsten Stahl, Klaus Michaelis, Josef Mayer, Alexander Weigl, Thomas Lohner, *Technische Universität München, Garching, Germany*, Milan Omasta, Martin Hartl, Ivan Krupka, *Brno University of Technology, Brno, Czech Republic*



- 407 Prediction of Stribeck and Traction Curves for Lubricated Elliptical Contacts Including Frictional Heating**  
Radu I. Popovici, Dirk J. Schipper, *University of Twente, Enschede, Netherlands*
- 408 Stribeck and Traction Curves for Elliptical Contacts - Model Validation**  
Radu I. Popovici, Dirk J. Schipper, *University of Twente, Enschede, Netherlands*
- 924 Thermal Conductivity of Lubricating Oil under Elliptical Contact and its Effect on Shear Stress Distribution of EHL Oil Films**  
Toshifumi Mawatari, Bo Zhang, Akira Nakajima, Nobuyoshi Ohno, *Saga University, Saga, Japan*, Motohiro Kaneta, *Brno University of Technology, Brno, Czech Republic*
- 945 The Roller's Maximum Misaligned Angle in Different EHL Working Conditions**  
Zhijian Wang, Xiaoyang Chen, Xuejin Shen, *Shanghai University, Shanghai, China*
- 1286 CFD Modeling and Infrared Measurement of an EHL Line Contact**  
Markus Hartinger, Tom Reddyhoff, *Imperial College London, London, United Kingdom*

**PS1-LF Posters**

ATRIUM • 09:00 – 16:30

- 67 Multiobjective Optimum Design of Porous Air Bearing Using Particle Swarm Optimization Method**  
Nenzi Wang, Chi-Rou Hsu, *Chang Gung University, Tao-Yuan, Taiwan*, Hua-Chih Huang, *Industrial Technology Research Institute, Tai-Chung, Taiwan*
- 472 Rheology and Tribology on a Rheometer: Characterization of Lubricants**  
Frederik Wolf, *Anton Paar Germany GmbH, Ostfildern, Germany*
- 806 Impact of Balancing Wedge Action in Textured Hydrodynamic Bearings**  
Kazuyuki Yagi, Joichi Sugimura, *Kyushu University, Fukuoka, Japan*
- 930 Study on the Transient Elastohydrodynamic Film Formation by the Artificial Surface Pattern Structure**  
Siyoul Jang, *Kookmin University, Seoul, Republic of Korea*, Martin Hartl, Ivan Krupka, *Brno University of Technology, Brno, Czech Republic*
- 962 Role of Interactions on Solid-liquid Interface for Friction Performance of Oil Lubricated Contacts**  
Mitjan Kalin, Marko Polajnar, *University of Ljubljana, Ljubljana, Slovenia*
- 980 A Novel Method to Determine EHL Film Thickness with Optical Interference**  
Qianqian Yang, Yingjun Chen, Tianmao Lai, Ping Huang, *South China University of Technology, Guangzhou, China*

**VI – VIENNANO'13-Nanotechnology****TU1-VI2 Nanostructure and Friction Contact - Part B**

ROOM 8 PALERMO • 08:30 – 10:30

Chair: Friedrich Franek, *Vienna University of Technology, Austria*

- 89 Nano-scale Dissipation of Layered Materials**  
Ernst Meyer, Marcin Kisiel, Gregor Fessler, Thilo Glatzel, Markus Langer, Urs Gysin, Remy Pawlak, Shigeki Kawai, Sweetlana Frey, *University of Basel, Basel, Switzerland*, R. Buzio, A. Gerbi, *CNR-SPIN Institute for Superconductors, Innovative Materials and Device, Genova, Italy*, T.D. Keene, S.X. Liu, S. Descurtins, *University of Berne, Berne, Switzerland*

- 289 Friction Change by Isotopic Lattice-Vibration Shifting of Solid**  
Seiji Kajita, *Toyota Central R&D Labs Inc., Nagakute, Japan*, Hideyuki Watanabe, *National Institute of Advanced Industrial Science and Technology, Tsukuba, Japan*, Mamoru Tohyama, Hitoshi Washizu, Toshihide Ohmori, *Toyota Central R&D Labs Inc., Nagakute, Japan*, Shinichi Shikata, *National Institute of Advanced Industrial Science and Technology, Tsukuba, Japan*
- 80 Speed Dependence of Atomic Friction: Experimental Measurements and Accelerated Atomistic Simulations**  
Ashlie Martini, Zhijiang Ye, *University of California Merced, Merced, CA, United States*, Yalin Dong, *Purdue University, West Lafayette, IN, United States*, Xin Liu, Philip Egberts, Robert Carpick, *University of Pennsylvania, Philadelphia, PA, United States*
- 342 Atomic Scale Exfoliation of Graphene**  
Kouji Miura, Makoto Ishikawa, Masaya Ichikawa, *Aichi University of Education, Kariya, Japan*, Naruo Sasaki, *Seikei University, Musashino, Japan*
- 1218 Adhesion Forces in a Sliding Nano-contact for Rigid and Viscoelastic Materials**  
Olivier Noel, *University of Maine, Le Mans, France*, Pierre-Emmanuel Mazeran, *Universite de Technologie de Compiègne, Compiègne, France*, Hussein Nasrallah, Laure Fabié, *University of Maine, Le Mans, France*
- 611 Effect of Adhesion and Roughness on the Tribological Contact of micron-sized Glass Spheres**  
Thorsten Staedler, Regina Fuchs, Jan Meyer, Xin Jiang, *University of Siegen, Siegen, Germany*

**TU2-VI3 Nanotribology Modelling and Theoretical Studies**

ROOM 8 PALERMO • 11:00 – 13:00

Chair: Friedrich Franek, *Vienna University of Technology, Austria*

- 285 First-principles Study on the Atomic-scale Tunable Friction in Graphene-based Materials**  
Lin-Feng Wang, Tian-Bao Ma, *Tsinghua University, Beijing, China*
- 306 Low Friction Mechanism of Polyelectrolyte Brushes Analyzed by Coarse-Grained Molecular Simulations**  
Hitoshi Washizu, Tomoyuki Kinjo, Hiroaki Yoshida, *Toyota Central R&D Labs., Nagakute, Japan*
- 113 Viscosity of Highly Confined PFPE-Z Nanofilms with Molecular Dynamics**  
Cristian Pirghie, "Stefan cel Mare" *University of Suceava, Suceava, Romania*, Stefan Eder, Georg Vorlauffer, András Vernes, Friedrich Franek, *AC<sup>2</sup>T Research GmbH, Wiener Neustadt, Austria*
- 578 Giving Molecules the Squeeze: Molecular Dynamics Study of the Contact Mechanics Lubricated Asperity Contacts**  
Bradley W. Ewers, James D. Batteas, *Texas A&M University, College Station, TX, United States*
- 786 Friction Anisotropy and Asymmetry in Molecularly Thin Films**  
Ahmad Jabbarzadeh, *University of Sydney, Sydney, Australia*
- 1324 Friction Phase Diagram of Frenkel-Kontorova Atomistic Model**  
Motohisa Hirano, Shin Ito, *Gifu University, Gifu, Japan*

**TU3-VI4 Nano-Particles as Lubricant Additive**

ROOM 8 PALERMO • 14:00 – 16:00

Chair: Wilfried Bartz, *Tribology and Lubrication Engineering, Denkerdorf, Germany*

- 328 Nanomaterials in Lubricants: Myths and Facts**  
Boris Zhmud, *Applied Nano Surfaces Sweden AB, Uppsala, Sweden*, Bogdan Pasalskiy, *Kyiv National University of Trade and Economics, Kyiv, Ukraine*

- 1039 Investigation on Tribological Properties of Nanolubricants with Carbon Nano-horns as Additives at Different Temperatures**  
Valentina Zin, Filippo Agresti, Simona Barison, Laura Colla, Cesare Pagura, Monica Fabrizio, *National Research Council of Italy, Padova, Italy*
- 112 Use of Carbon Nano Fiber (CNF) as a Potential Additive for Enhanced Tribological Properties**  
Paul Mathew, Mohandas Nayak, *John F. Welch Technology Centre, Bangalore, India*, Mallikarjun Karadge, *GE Global Research Centre, Niskayuna, NY, United States*, K. Anand, *John F. Welch Technology Centre, Bangalore, India*
- 46 Preparation, Characterization and Tribological Property of Surface-Modified Calcium Borate Nanoparticles Used as Lubricating Additives**  
Jiusheng Li, *Chinese Academy of Sciences, Shanghai, China*, Xiaohong Xu, *PetroChina Lanzhou Lubricating Oil R&D Institute, Lanzhou, China*
- 294 Investigation of Fullerenes C60 Influence on Tribotechnical and Dynamical Mechanical Properties of Composite Materials Based on Phenilon**  
Alexander I. Burya, *Ukrainian Technological Academy, Dnepropetrovsk, Ukraine*, O.Yu. Kuznetsova, A.D. Derkach, *Dnepropetrovsk State Agrarian University, Dnepropetrovsk, Ukraine*, V.P. Sergiyenko, S.N. Bukharov, *National Academy of Science of Belarus, Gomel, Belarus*
- 1069 Improvement of Tribological Properties of a Lubricant Engine Oil by Addition of Cu, TiO<sub>2</sub> Nanoparticles and Carbon Nano-horns**  
Valentina Zin, Filippo Agresti, Simona Barison, Laura Colla, E. Mercadelli, Monica Fabrizio, *National Research Council, Padova, Italy*

**TU4-VI5 Nanocontacts and Coatings****ROOM 8 PALERMO • 16:30 – 18:50***Chair: Bharat Bhushan, Ohio State University, Columbus, OH, United States*

- 1320 Keynote: Toughening Behavior of Solid Lubricating Films**  
Qunji Xue, Liping Wang, *Chinese Academy of Science, Lanzhou, China*
- 690 Study of Frictional Properties of Epitaxial Graphene on SiC in UHV**  
Diego Marchetto, Martin Dienwiebel, *FhG-KIT MikrotribologieCentrum µTC, Karlsruhe, Germany*
- 929 Reducing Frictions of Carbon Nanotube Film by Normal Modulation -Under micronewton and millinewton Loads-**  
Hiroshi Kinoshita, Masatoshi Kageyama, Yuma Yokoi, Aidil A. Alias, Masahiro Fujii, *Okayama University, Okayama, Japan*
- 1130 Self-patterning Functionality of Nanostripe Surface During Sliding**  
Yasuhisa Ando, Shigenori Fujisawa, Megumi Fukuta, *Tokyo University of Agriculture and Technology, Koganei, Japan*, Miki Nakano, Koji Miyake, *National Institute of Advanced Science and Technology (AIST), Tsukuba, Japan*
- 221 Contributions of Mobile and Bonded Molecules to Dynamic Friction of Nanometer-Thick Perfluoropolyether Films Coated on Magnetic Disk Surfaces**  
Renguo Lu, Hedong Zhang, *Nagoya University, Nagoya, Japan*, Yasunaga Mitsuya, *Nagoya Industrial Science Research Institute, Nagoya, Japan*, Kenji Fukuzawa, Shintaro Itoh, *Nagoya University, Nagoya, Japan*
- 473 TEM Evaluation of Carbon Nitride Coating by S/TEM EELS (Electronic State for Ultra Low Friction Carbon Nitride)**  
Hiroshi Inoue, Shunsuke Muto, Takayuki Tokoroyama, Noritsugu Umehara, *Nagoya University, Nagoya, Japan*

- 240 Study of Nano-burnishing Process on the Base of Atomic and Macro-scale Modeling**  
Andrey I. Dmitriev, *Institute of Strength Physics and Materials Science, Tomsk, Russian Federation*, Viktor P. Kuznetsov, *Kurgan State University, Kurgan, Russian Federation*, Igor Yu. Smolin, Anton Yu. Nikonov, Serguei Psakhie, *Institute of Strength Physics and Materials Science, Tomsk, Russian Federation*

**BE – Bearings****TU1-BE2 Rolling Bearings 1****ROOM 9 BOLOGNA • 08:30 – 10:30***Chair: Spiridon Crețu, Technical University "Gheorghe Asachi", Iași, Romania*

- 592 Fatigue Life Extension of Rolling Element Bearings by Residual Stresses Induced Through Surface Machining**  
Timo Neubauer, Gerhard Poll, Berend Denkena, Oliver Maiß, *Leibniz Universität Hannover, Hannover, Germany*
- 625 CFD Analysis of Drag Loss in High Speed Bearings**  
Jun Wang, *SKF Engineering & Research Centre, Nieuwegein, Netherlands*
- 548 Inner Secrets of the Tapered Roller Bearing**  
Henrik Strand, *Volvo Construction Equipment AB, Eskilstuna, Sweden*
- 1151 A Fully-coupled Finite Volume Solver for Elasto-hydrodynamic Lubrication Problems with Particular Application to Rolling Element Bearings**  
Alireza Hajishafiee, Daniele Dini, Amir Kadiric, Stathis Ioannides, *Imperial College London, London, United Kingdom*
- 265 Influence of Grease Bleed Oil on Ball-on-disc Lubrication**  
Tiago Cousseau, *Universidade do Porto, Porto, Portugal*, Markus Björling, *Luleå University of Technology, Luleå, Sweden*, Beatriz Graça, *Universidade do Porto, Porto, Portugal*, Armando Campos, *Instituto Superior de Engenharia do Porto, Porto, Portugal*, Jorge Seabra, *Universidade do Porto, Porto, Portugal*, Roland Larsson, *Luleå University of Technology, Luleå, Sweden*

**TU2-BE3 Fluid-Film Bearings 2****ROOM 9 BOLOGNA • 11:00 – 13:00***Chair: Stanisław Strzelecki, Institute of Textile Machinery "Polmatex-Cenaro", Łódź, Poland*

- 76 Calculation of Heavy-loaded Tribo-unit Dynamics Considering the Thermal State of Structural Elements and the Rheological Properties of the Lubricant**  
Elena Zadorozhnaya, *South Ural State University, Chelyabinsk, Russian Federation*
- 256 Tribometric Development Tools for Journal Bearings – a Novel Test Adapter**  
Florian Grün, Herbert Krampl, Jürgen Schiffer, Jakob Moder, István Gódor, *Montanuniversität Leoben, Leoben, Austria*, Martin Offenbecher, *Miba Bearing Group, Laakirchen, Austria*
- 352 Wear Calculation of Conrod Bearings**  
Dirk Bartel, Lars Bobach, Ludger Deters, *Otto-von-Guericke Universität, Magdeburg, Germany*
- 437 Improving the Performances of Hydrodynamic Journal Bearings by Anisotropic Slip Boundary**  
Chien-Yu Chen, Hsiang-Chin Jao, Ming-Da Chen, Wang-Long Li, *National Cheng Kung University, Tainan, Taiwan*
- 280 Study on Tribological Properties of Nitrile Butadiene Rubber with Accelerated Aging under Dry Friction Condition**  
Conglin Dong, Chengqing Yuan, Qing Wu, *Wuhan University of Technology, Wuhan, China*

- 440 Experimental Investigation of the Temperature in Micro Gap High Speed Water-Lubricated Hybrid Journal Bearing**  
Pengju Li, Yongsheng Zhu, Youyun Zhang, Pengfei Yue, Yuping Yan, *Xi'an Jiaotong University, Xi'an, China*

**TU3-BE4 Rolling Bearings 2**

**ROOM 9 BOLOGNA • 14:00 – 16:00**

*Chair: Jorge Seabra, Universidade do Porto, Portugal*

- 1270 Smearing Damage in Rolling Element Bearings**  
Mark T. Fowell, Amir Kadiric, *Imperial College London, London, United Kingdom*, Guillermo Morales-Espejel, Lars-Erik Stacke, *SKF Engineering & Research Centre, Nieuwegein, Netherlands*, Efsthios Ioannides, *Imperial College London, London, United Kingdom*
- 1183 An Elastic-Plastic Approach on Misalignment Effects in Cylindrical Roller Bearings**  
Spiridon Crețu, Marcelin Benchea, *Technical University of Iași, Iași, Romania*
- 643 An Experimental Investigation of Rolling Contact Failure within Silicon Nitride Subject to Micro Surface Defects**  
Abdul W. Awan, Mark Hadfield, Ben Thomas, *Bournemouth University, Poole, United Kingdom*, Charlotte Vieillard, Robin Cundill, *SKF Engineering & Research Centre, Nieuwegein, Netherlands*
- 1280 Serial Sectioning, FIB and TEM Investigations of Butterfly and White Etching Crack (WEC) Formation**  
Martin H. Evans, Ling Wang, Robert J.K. Wood, *University of Southampton, Southampton, United Kingdom*
- 1118 Rolling Contact Fatigue Test with Greases in Hydrogen Environment**  
Hiroyoshi Tanaka, Suguru Ikeda, Masaaki Hashimoto, Joichi Sugimura, *Kyushu University, Fukuoka, Japan*
- 1037 Extremely Non-Uniformed Contact Behaviors of Ball and Raceway of Pitch Bearing of Wind Turbine**  
S.N. Xu, *National Research Centre of Bearing Technology, Dalian, China*, H.Y. Guo, *Xi'an Jiaotong University, Xi'an, China*, W. Xu, Y.N. Zhang, *National Research Centre of Bearing Technology, Dalian, China*, X. Zhang, *Xi'an Jiaotong University, Xi'an, China*, F.C. Wang, *National Research Centre of Bearing Technology, Dalian, China*

**TU4-BE5 Rolling Bearings 3**

**ROOM 9 BOLOGNA • 16:30 – 18:50**

*Chair: Amir Kadiric, Imperial College London, United Kingdom*

- 41 Pushing the Boundaries for New Challenges of Rolling Bearings**  
Oliver Koch, Florian Böhm, Ernst Masur, Tobias Mederer, *Schaeffler Technologies AG & Co. KG, Herzogenaurach, Germany*
- 636 Computing Structural Fatigue Damage in Rolling Bearing Cages**  
Pietro Tesini, *SKF Engineering & Research Centre, Göteborg, Sweden*, Thierry Adane, *Development Centre Ball Bearings SKF, Saint-Cyr sur Loire, France*
- 641 Advances in Transient Rolling Bearing Simulation - SKF BEAST**  
Dag Fritzson, Lars-Erik Stacke, *SKF Engineering & Research Centre, Göteborg, Sweden*
- 626 Fluid Flow Simulation of Water Lubricated Ball Bearings at High Rotating Speed**  
Jun Hyeon Jo, Choong Hyun Kim, *Korea Institute of Science and Technology, Seoul, Republic of Korea*

- 729 Detailed Contacts in Dynamic Simulations – a Contradiction?**  
Lars-Erik Stacke, Dag Fritzson, *SKF Engineering & Research Centre, Göteborg, Sweden*, Guillermo Morales-Espejel, *SKF Engineering & Research Centre, Nieuwegein, Netherlands*
- 1315 Simulation Analysis of the Factors Influencing the Lubrication Conditions in a Rolling Element Bearing Set for a Gas Turbine Starter Motor**  
Fabrizio Mandrile, Guido Moschetto, *SKF Industrie S.p.A., Airasca (To), Italy*, Silvio Vasconi, *SKF USA Inc., Landsale, PA, United States*, Francesco Caprioli, *SKF Industrie S.p.A., Airasca (To), Italy*
- 569 The Analysis of Friction Torque Characteristics for Four-point-contact Slewing Bearings**  
Ming Qiu, Long Chen, Yingchun Li, Chenhui Jia, *Henan University of Science and Technology, Luoyang, China*

**EC – ECOTRIB 2013  
Tribology of Machine Elements**

**TU1-EC2 Transmissions 1**

**ROOM 10 PERUGIA • 08:30 – 10:30**

*Chair: Robert I. Taylor, Shell Research Ltd, Chester, United Kingdom*

- 40 Analysis of Lubrication Supply of Gears Lubricated with Greases NLGI 1/2 and the Effects on Load Carrying Capacity and Efficiency**  
Johann-Paul Stemplinger, Karsten Stahl, Bernd-Robert Hoehn, Thomas Tobie, Klaus Michaelis, *Technische Universität München, Munich, Germany*
- 236 The Effect of PVD Coatings on Scuffing and Pitting Resistance of Gears**  
Remigiusz Michalczewski, Marian Szczerek, Waldemar Tuszyński, *National Research Institute, Radom, Poland*, Maksim Antonov, *Tallinn University of Technology, Tallinn, Estonia*
- 318 Energy-Efficiency Improvement of Timing Chain Drives**  
Frederik Krupp, Csaba Fabian, Bernd Sauer, *Technical University of Kaiserslautern, Kaiserslautern, Germany*
- 376 On the Significance of Operating Temperature to the Durability of a Wet Clutch**  
Niklas Lingesten, Pär Marklund, Erik Höglund, *Luleå University of Technology, Luleå, Sweden*
- 774 Improving the Engagement Performance of Automated Dry Clutch through the Analysis of the Influence of the Main Parameters on the Frictional Map**  
Vincenzo D'Agostino, Adolfo Senatore, Mario Pisaturo, *University of Salerno, Fisciano (Sa), Italy*
- 640 Rolling Contact Fatigue Tests on Wheel and Rail Steels**  
Daniel F.C. Peixoto, Diogo M. Ramos, Paulo M.S.T. de Castro, Luis A.A. Ferreira, *University of Porto, Porto, Portugal*

**TU2-EC3 Transmissions 2**

**ROOM 10 PERUGIA • 11:00 – 13:00**

*Chair: Patrick De Baets, Ghent University, Belgium*

- 330 Experimental and Analytical Wear Investigations of Bush- and Roller Chain Drives**  
Daniel Sappok, Alexander Gummer, Bernd Sauer, *University of Kaiserslautern, Kaiserslautern, Germany*
- 38 Wear Resistance of New Blade for Planetary Concrete Mixer**  
Maria Cristina Valigi, Lorenzo Fabi, *University of Perugia, Perugia, Italy*, Ilaria Gasperini, *SI.CO.MA. s.r.l., Società Italiana Costruzione Macchine, Perugia, Italy*
- 339 Progress of PVD Coated Spur Gear Tooth Failure**  
Boris Kržan, Jože Vižintin, *University of Ljubljana, Ljubljana, Slovenia*



- 106 Interactions between Tribology and Dynamics of Automotive Differential Hypoid Gears Considering Thermal Non-Newtonian Mixed Lubrication Effects**  
Mahdi Mohammadpour, Stephanos Theodossiades, Homer Rahnejat, *Loughborough University, Loughborough, United Kingdom*
- 292 Analysis of a High Power Density Gear Transmission Dynamic Behavior in Transient State**  
Haisheng Feng, Liqin Wang, Dezhi Zheng, Le Gu, *Harbin Institute of Technology, Harbin, China*
- 411 A Method for Calculating the Thermal Capacity of Planetary Gears**  
Attila Csobán, Mihály Kozma, *Budapest University of Technology and Economics, Budapest, Hungary*

**TU3-EC4 Transmissions 3**

ROOM 10 PERUGIA • 14:00 – 16:00

Chair: Johann-Paul Stemplinger, *Technische Universität München, Germany*

- 788 Improvement of Lubrication Life of Strain Wave Gearing for Space Applications by Surface Carburizing**  
Kazuaki Maniwa, Shingo Obara, *Japan Aerospace Exploration Agency, Tsukuba, Japan*, Jun'ichi Kurogi, Satoru Kanai, Keiji Ueura, *Harmonic Drive Systems Inc., Azumino, Japan*
- 1059 Influence of Dry Friction on the Irreversibility of Cycloidal Speed Reducer**  
Andrea Tonoli, Nicola Amati, Fabrizio Impinna, Joaquim Girardello Detoni, Sanjarbek Ruzimov, Enrico Gasparin, Kamaliddin Abdivakhidov, *Politecnico di Torino, Torino, Italy*
- 1169 Diagnostics and Prognostics Algorithms for an Aircraft Accessory Gearbox**  
Aida Rezaei, *Queen's University, Kingston, Canada*, Azzedine Dadouche, *National Research Council Canada, Ottawa, Canada*
- 1246 Modelling Lubrication in Gear Pairs**  
Marco Barbieri, Francesco Pellicano, *Università di Modena e Reggio Emilia, Modena, Italy*
- 1289 Load Independent Power Losses of Ordinary Gears: Numerical and Experimental Analysis**  
Franco Concli, Carlo Gorla, *Politecnico di Milano, Milano, Italy*, Karsten Stahl, Bernd-Robert Höhn, Klaus Michaelis, Hansjörg Schultheiß, Johann-Paul Stemplinger, *FZG Gear Research Center, Garching bei München, Germany*

**TU4-EC5 Automotive Tribology 2**

ROOM 10 PERUGIA • 16:30 – 18:50

Chair: Toshiro Hamatake, *Oita University, Japan*

- 820 An investigation about an Automotive DI Solenoid Injector Dynamic Flow Shift in Durability**  
Roberto Bassani, *University of Pisa, Pisa, Italy*, Salvatore Varchetta, *Continental Automotive Italy S.p.A., San Piero a Grado (Pi), Italy*, Massimo De Sanctis, *University of Pisa, Pisa, Italy*
- 217 Influence of Lubricant Degradation on Measured Piston Ring Film Thickness in a Fired Gasoline Reciprocating Engine**  
Rai S Notay, Martin Priest, Malcolm F. Fox, Richard C. Coy, *University of Leeds, Leeds, United Kingdom*
- 246 Numerical and Experimental Investigations of the "Piston-Cylinder" Tribosystem of Diesel Engine**  
Yury Rojdestvensky, Konstantin Gavrilov, Aleksey Doykin, Igor Levanov, *South Ural State University, Chelyabinsk, Russian Federation*
- 360 Measuring Friction in Automotive Engines & Determining the Contributions of the Individual Subsystems**  
Hannes Allmaier, David E. Sander, Franz M. Reich, *Virtual Vehicle Competence Center, Graz, Austria*

- 537 Wear Condition Monitoring for Automotive Engines via OLVF**  
Jiaoyi Wu, Wei Cao, Yali Zhang, Xinyan Mi, Junhong Mao, Youbai Xie, *Xi'an Jiaotong University, Xi'an, China*
- 624 A Non-invasive Approach for Piston Ring Film Thickness Measurement**  
Emin Y. Avan, Robin S. Mills, Robert Dwyer-Joyce, *University of Sheffield, Sheffield, United Kingdom*
- 58 Tribological Behavior of a Line Contact between Rubber and Wax (Application to the Wax-removal of Oil Pipeline Pigging)**  
Guibin Tan, Shuhai Liu, Deguo Wang, Si-wei Zhang, *China University of Petroleum-Beijing, Beijing, China*

**PS1-EC Posters**

TRIUM • 09:00 – 16:30

- 11 Prediction on Friction Characteristics of Industrial Brakes Using Artificial Neural Networks**  
Wojciech Grzegorzek, Stanislaw F. Scieszka, *Silesian University of Technology, Gliwice, Poland*
- 85 Knowledge Integration for Design of Tribo-systems**  
Zhinan Zhang, *Shanghai Jiao Tong University, Shanghai, China*, Bin Wu, *China FAW Group Corporation R&D Center, Changchun, China*, Tonghai Wu, *Xi'an Jiaotong University, Xi'an, China*, Xianghui Meng, Youbai Xie, *Shanghai Jiao Tong University, Shanghai, China*
- 98 A Study of a Belt-type One-way Clutch**  
Keiji Imado, Hironori Nakata, Atsuhiko Shou, Kiyoshi Terada, *Oita University, Oita, Japan*
- 104 Experimental and Numerical Investigation of Thermo-mechanical Instability of the Industrial Disc Brakes**  
Stanislaw F. Scieszka, Marcel Zolnierz, *Silesian University of Technology, Gliwice, Poland*
- 561 Online Wear Monitoring and Working Conditions Recognition of the Piston Rings and Cylinder Liners Using On-Line Visual Ferrography**  
Wei Cao, Jiaoyi Wu, Wei Chen, Guangneng Dong, Youbai Xie, *Xi'an Jiaotong University, Xi'an, China*
- 573 FEM Model of the Moving Seal Based on the 3D Analysis of Surface Topography**  
Valery Poroshin, Dmitry Bogomolov, Anna Anosova, *Moscow State Industrial University, Moscow, Russian Federation*
- 581 Mesoscopic LBM Model of Flow in Thin 2D Channels of Seals Concerning the Wall Roughness Effect**  
Dmitry Bogomolov, Valery Poroshin, Victor Radygin, *Moscow State Industrial University, Moscow, Russian Federation*
- 664 Failure Analysis of the Ventilation Mills in Power Plant and Proposals for their Revitalization**  
Marko Ristic, Jasmina Perisic, *Institute Gosa, Belgrade, Serbia*, Ljiljana Radovanovic, Zivoslav Adamovic, *University in Novi Sad, Zrenjanin, Serbia*
- 837 Wear Monitoring of the Vehicle Brake Pad by Using Ultrasonic Sensors**  
Jong-Hyoung Kim, *Korea Institute of Industrial Technology, Daegu, Republic of Korea*, Yong-Sub Jung, Dawit Z. Segu, Seock-Sam Kim, *Kyungpook National University, Daegu, Republic of Korea*
- 1088 Lubrication Regime Analysis on Sliding Bearing Example**  
Aleksandar Marinkovic, Milos Stankovic, Ljubica Milovic, *University of Belgrade, Belgrade, Serbia*
- 1092 On Friction-drive Model of Metal Belt Continuously Variable Transmission**  
Yuanqiang Tan, Xiaoru Zhang, Jingang Liu, Shiping Yang, Yi Cheng, *University of Xiangtan, Xiangtan, China*

## MT – Tribology of Materials

## TU4-MT1 Metals 1

ROOM 1 TORINO • 16:30 – 18:50

Chair: Sergei Glavatskikh, *KTH Royal Institute of Technology, Stockholm, Sweden*

- 8 The Transition from EHL to BL Region under Friction of Copper with Different Virgin Grain Size**  
Alexey Moshkovich, Aleks Laikhtman, Vladislav Perflyev, Igor Lapsker, Lev Rapoport, *Holon Institute of Technology, Holon, Israel*
- 21 Tribotesting System for Hardmetals Mechanical Characterization**  
Stanislaw F. Scieszka, Wojciech Grzegorzek, Marcel Zolniercz, *Silesian University of Technology, Gliwice, Poland*
- 139 A Study on Sliding Wear Behavior of Ti-6Al-4V against SS316L under Ambient and Vacuum Conditions at Constant Pressure**  
Raj J. Ashok, Anindya Deb, Satish V. Kailas, *Indian Institute of Science, Bangalore, India, Bangalore, India*
- 142 Subsurface Recrystallization Structure Controlling Wear Resistance of Metals**  
Bin Yao, Zhong Han, Ke Lu, *Chinese Academy of Sciences, Shenyang, China*
- 226 Tribological Study of as Cast and Extruded A356-SiC Metal Matrix Composites**  
Somanahally L. Ajit Prasad, Kinnarahalli C. Mohanakumara, *PES College of Engineering, Mandya, India, Madegowda Abhijith, S.C.T. Institute of Technology, Bangalore, India*
- 321 Wear Properties of Sub-microcrystalline Pure Iron Produced by Severe Plastic Deformation**  
Hirotaka Kato, *Fukui National College of Technology, Sabae, Japan*, Yoshikazu Todaka, *Toyohashi University of Technology, Toyohashi, Japan*
- 133 Metal-Working Friction Influence on Metal Properties**  
Evgeny A. Deulin, *Bauman Moscow State Technical University, Moscow, Russian Federation*, Ekaterina Ikonnikova, *Azov Steel Co, Mariupol, Ukraine*

## AddNano – Workshop

MAIN HALL ROMA • 13:30 – 18:00

- 13:30 Welcome
- 14:00 **Introduction to AddNano Project**  
T. Addison, *BHR*
- 14:10 **Fundamentals on nanoparticle synthesis**  
P. Ciambelli, *NANOMATES*
- 14:30 **Fundamentals on Lubrication and Oil formulation**  
Gunther Kraft, *FUCHS Europe*
- 14:50 **Tribological properties of inorganic fullerene-like MoS<sub>2</sub>/WS<sub>2</sub> nanoparticles and their lubrication mechanisms**  
F. Dassenoy, *ECL*
- 15:10 **Dispersion of nanoparticles in oils**  
T. Addison, *BHR*
- 15:30 **Dilutions and stabilization of Nanoparticles in solution**  
E. Gard, *InS*
- 15:50 Break
- 16:10 **Large-scale production of nanoparticles**  
B. Halpert, *NanoMaterials*
- 16:30 **Behaviour of innovative formulated oils in vehicle real driving conditions**  
M. Sgroi, *CRF*
- 16:50 **Engine emissions and compatibility with the after-treatment fullscale system of MoS<sub>2</sub>-additivated lubricant oils**  
D. Fino, *Politecnico di Torino*
- 17:10 **Life Cycle Assessment of nano-additivated lube oils**  
G.A. Blengini, *Politecnico di Torino*
- 17:30 Closing Remarks and Round Table



Wednesday, September 11<sup>th</sup>**ET – Ecotribology****WE4-ET5 Tribology for Life - Green Tribology**

ROOM 2 PISA • 16:10 – 16:50

Chair: Chenhui Zhang, *Tsinghua University, Beijing, China*

- 695 Potential of Banana Leaves as Effective Lubricants for High Temperature Applications – A Preliminary Approach**  
Mariyam J. Ghazali, Jaharah A. Ghani, Syed M.A.H.T. Mazlam, *Universiti Kebangsaan Malaysia, Bangi, Malaysia*
- 958 Development and Evaluation of Water Soluble Green Cutting Fluid**  
Chatra Sathwik, *Indian Institute of Science, Bangalore, India*, Pamarthy Varsha, *SASTRA University, Thanjavur, India*, Satish V. Kailas, *Indian Institute of Science, Bangalore, India*

**WE4 Panel Discussion on Ecotribology**

ROOM 2 PISA • 16:50 – 17:30

Panel Moderator: Oliver Futterknecht, *Technische Universität Wien, Austria*

- 738 Keynote: Impulse Talk: Ecotribology – Development, Prospects and Challenges**  
Ille C. Gebeshuber, *Universiti Kebangsaan Malaysia, Bangi, Malaysia*, Jianbin Luo, *Tsinghua University, Beijing, China*, Braham Prakash, *Luleå University of Technology, Luleå, Sweden*, Zygmunt Rymuza, *Warsaw University of Technology, Warsaw, Poland*

**BT – Biotribology****WE1-BT6 Lubrication in Natural Joints**

ROOM 2 PISA • 08:30 – 10:30

Chair: Seunghwan Lee, *Technical University of Denmark, Lyngby, Denmark*

- 304 Keynote: Role of Human Mucinous Glycoprotein Lubricin in the Boundary Lubrication of Articular Joints**  
Bruno Zappone, *Università della Calabria, Rende, Italy*, Jacob Israelachvili, *University of California - Santa Barbara, Santa Barbara, CA, United States*
- 1000 Towards Understanding Frictional Properties of Articular Joints in Beetle Legs:  $\mu$ CT-based 3D Model and Multi-Body Simulation of Joint Kinematics**  
Steffen Vagts, Henning Haschke, Josef Schlattmann, *Hamburg University of Technology, Hamburg, Germany*, Thomas Kleinteich, Philipp Busshardt, Tom Pullwitt, Stanislav N. Gorb, *Kiel University, Kiel, Germany*
- 343 Observation of the Transition between Soft-EHL and Biphasic Lubrication Mode Using MEMS Pressure Sensor**  
Nobuo Sakai, Hirotaka Awata, *Kyushu Institute of Technology, Kitakyushu, Japan*, Tetsuo Yamaguchi, Yoshinori Sawae, Teruo Murakami, *Kyushu University, Fukuoka, Japan*
- 867 Finite Element Method Simulation in Early Hip Arthritis**  
Danai I. Karampela, Ken Mao, *University of Warwick, Coventry, United Kingdom*
- 925 A Strain-Dependent, Linear Viscoelastic Model of Articular Cartilage**  
Patrick Smyth, Itzhak Green, *Georgia Institute of Technology, Atlanta, GA, United States*, Robert Jackson, Russell R. Hanson, *Auburn University, Auburn, AL, United States*
- 1109 What Keeps Lubricin (PRG4) at the Sliding Cartilage-cartilage Interface under Boundary Lubrication?**  
Sara Ehsani Majd, Roel Kuijer, *University of Groningen, Groningen, Netherlands*, Alexander Köwitsch, Thomas Groth, *Martin Luther University Halle-Wittenberg, Halle, Germany*, Tannin Schmidt, *University of Calgary, Calgary, Canada*, Prashant K. Sharma, *University of Groningen, Groningen, Netherlands*

**WE2-BT7 Tribology of the Mouth**

ROOM 2 PISA • 11:00 – 13:00

Chair: Rowena Crockett, *EMPA, Dübendorf, Switzerland*

- 827 Dinosaur Dentition: Tribology 65 Million Years Ago (Ma)**  
Brandon A. Krick, *University of Florida, Gainesville, FL, United States*, Gregory M. Erickson, *Florida State University, Tallahassee, FL, United States*, W. Gregory Sawyer, *University of Florida, Gainesville, FL, United States*
- 305 Effect of Organic Phase on the Microtribological Behaviour of Human Tooth Enamel**  
Jing Zheng, Longqing Weng, Ming Wen, Linmao Qian, Zhongrong Zhou, *Southwest Jiaotong University, Chengdu, China*
- 501 Investigations on Two-body Wear of Dental Materials with ABREX**  
Jürgen Geis-Gerstorfer, *University of Tübingen, Tübingen, Germany*, Wolfgang Weinhold, *Innowep GmbH, Würzburg, Germany*, Christine Schille, *University of Tübingen, Tübingen, Germany*
- 1287 Lubrication Study of Artificial Salivas for Oral Dryness (Xerostomia)**  
Roberto Vargiolu, Cyril Pailler-Mattei, Hassan Zahouani, *ENISE - École Centrale de Lyon, Saint-Etienne, France*
- 377 Tribological Properties of Mucins: Influence of Purification, pH, Type and Biochemical Degradation**  
Jan B. Madsen, Kirsi I. Pakkanen, Maher Hachem, Birte Svensson, Seunghwan Lee, *Technical University of Denmark, Kgs. Lyngby, Denmark*
- 1201 Mechanical Behavior of Nanofilled Dental Resins Subjected to Cyclic Wear in Liquid Environment**  
Olivier Etienne, Hervé Pelletier, *Université de Strasbourg, Strasbourg, France*, Youri Arntz, *Université de Strasbourg, Illkirch, France*, Damien Favier, Christian Gauthier, *Université de Strasbourg, Strasbourg, France*

**WE3-BT8 Biotribology General**

ROOM 2 PISA • 14:00 – 15:40

Chair: Yoshinori Sawae, *Kyushu University, Fukuoka, Japan*

- 798 Nanotribology of Keratin Fibers in Crossed Geometries**  
Hiroyasu Mizuno, *L'Oréal Recherche, Kawasaki, Japan*, Mark Rutland, *Royal Institute of Technology, Stockholm, Sweden*, Gustavo S. Luengo, *L'Oréal Recherche, Aulnay-Sous-Bois, France*
- 1035 The Effect of Plasma Electrolytic Oxidation on Titanium in the Microstructure, Tribocorrosion Behavior and Cytotoxicity**  
Virginia Sáenz de Viteri, Raquel Bayón, Amaya Igartua, *IK-4 Tekniker, Eibar, Spain*, Miren G. Barandika, *University of Basque Country (UPVIEHU), Vitoria, Spain*
- 681 Micro/nanotribological Properties of Natural and Synthetic Fibers**  
Srinath R. Kistampally, Sriram Sundararajan, *Iowa State University, Ames, IA, United States*
- 153 Sealing Properties of Mechanical Seal for Ventricular Assist Device**  
Koki Kanda, Hirotuna Sato, *Tohoku University, Sendai, Japan*, Keiichiro Kaneshima, Takayuki Miyakoshi, Tomoya Kitano, Hideki Kanebako, *Sun Medical Technology Research Corporation, Nagano, Japan*, Koshi Adachi, *Tohoku University, Sendai, Japan*
- 998 Friction Properties of Mechanical Seal for Ventricular Assist Device**  
Hirotuna Sato, *Tohoku University, Sendai, Japan*, Koki Kanda, *Tohoku University, Sendai, Japan*, Keiichiro Kaneshima, Takayuki Miyakoshi, Tomoya Kitano, Hideki Kanebako, *Sun Medical Technology Research Corporation, Nagano, Japan*, Koshi Adachi, *Tohoku University, Sendai, Japan*

**BM – Biomimetics****WE3-BM1 Bioinspiration in Macro-engineering**

ROOM 4 VENEZIA • 14:00 – 15:40

Chair: Luciano Afferrante, *Politecnico di Bari, Italy*

- 1160 Optimised Design of a Foldable Structure Bio-Inspired by the Structure of Pollen Grains**  
Nicolò Corrado, Cecilia Surace, *Politecnico di Torino, Torino, Italy*, Nicola Pugno, *Università di Trento, Trento, Italy*
- 203 The Regulative Tactic of Frictional and Adhesive Contact of Gecko Foot on Different Slopes**  
Zhouyi Wang, Aihong Ji, Zhendong Dai, *Nanjing University of Aeronautics and Astronautics, Nanjing, China*
- 1141 Production and Mechanical Behavior of Micro-encapsulated Self-healing Cement: a Case Study**  
Paola Antonaci, *Politecnico di Torino, Torino, Italy*, Nicola M. Pugno, *Università di Trento, Trento, Italy*, Jean-Marc C. Tulliani, *Politecnico di Torino, Torino, Italy*

**ST – Surface Tribology****WE1-ST11 Coatings 6**

ROOM 3 MILANO • 08:30 – 10:30

Chair: Stefanie Hanke, *University of Duisburg-Essen, Germany*

- 384 Experimental Investigation into the Cavitation Phenomena at a Slip/non-slip Surface**  
Evan Thomas, *University of Sussex, Brighton, United Kingdom*, Mircea Pascovici, *Politehnica University, Bucharest, Romania*, Karolina Jablonka, Romeo Glovnea, *University of Sussex, Brighton, United Kingdom*
- 606 Tribological Behavior of Al<sub>2</sub>O<sub>3</sub>/SiO<sub>2</sub> Mixed Oxide Coatings Deposited by Sol-gel Route on Stainless Steels**  
Alexis Marsal, Florence Ansart, Viviane Turq, Jean-Pierre Bonino, *Université de Toulouse, Toulouse, France*, Jean-Michel Sobrino, Yan-Ming Chen, Julien Garcia, *Centre Technique des Industries Mécaniques, Senlis, France*
- 954 Stick-Slip Friction of Diamond Tip on Cross-Linking Nanostructured Carbon Film**  
Xue Fan, Liwei Yu, Dongfeng Diao, *Xi'an Jiaotong University, Xi'an, China*
- 1061 Wear Behaviour of Nanoporous Alumina Coatings from Anodic Oxidation**  
Stefanie Hanke, Michael Schymura, Daniel Stickel, Alfons Fischer, *University of Duisburg-Essen, Duisburg, Germany*
- 639 The Effect of High Sliding Speed on Friction in Aqueous Conditions**  
Arnold Ismailov, Erkki Levänen, *Tampere University of Technology, Tampere, Finland*
- 1114 Friction of Ice Sublimating from Rough Surfaces**  
Siegfried Derler, Valentin Strässle, René M. Rossi, Gelu-Marius Rotaru, *Empa - Swiss Federal Laboratories for Materials Science and Technology, St. Gallen, Switzerland*

**WE1-ST12 Roughness 1**

ROOM 4 VENEZIA • 08:30 – 10:30

Chair: Thibaut Chaise, *Université de Lyon, Villeurbanne, France*

- 1245 Wear Examination through Measurement of Surface Topography**  
Pawel Pawlus, Jaroslaw Sep, Lidia Galda, Andrzej Dzierwa, Wieslaw Grabon, Waldemar Koszela, *Rzeszow University of Technology, Rzeszow, Poland*

- 244 Validity of the Sum Surface Assumption in the Case of Static Contact between Rough Periodic Surfaces**  
Ich T. Tran, Francois Robbe-Valloire, Muriel Quillien, *LISMA, Saint-Ouen, France*
- 890 Roughness-induced Optical Properties of Tribological Surfaces**  
Peter Somkuti, András Vernes, *AC<sup>2</sup>T Research GmbH, Wiener Neustadt, Austria*
- 933 Experiment Study on Friction and Adhesion Behaviors of an Equal Rough Surface by Using an AFM**  
Tianmao Lai, Yanfei Fang, Qianqian Yang, Ping Huang, *South China University of Technology, Guangzhou, China*
- 1223 Elastic Contact of Fibrillar Features on Rough Surface**  
Peyman Ansari, Bilsay Sümer, *Hacettepe University, Ankara, Turkey*
- 743 A New Approach for Rough Surface Generation**  
Arthur Francisco, *Université de Poitiers, Angoulême, France*, Noël Brunetière, *Université de Poitiers, Futuroscope Chasseneuil, France*

**WE2-ST13 Contact Mechanics 4**

ROOM 3 MILANO • 11:00 – 13:00

Chair: Valentin L. Popov, *Berlin University of Technology, Germany*

- 220 A Comparative Study of Fretting Modes I and II for Coated Substrates and Plastic Bodies**  
Thibaut Chaise, Benjamin Fulleringer, Daniel Nélías, *Université de Lyon, Villeurbanne, France*
- 614 Fundamental Aspects in Friction and Wear Mechanisms of Hard Amorphous Carbon Coatings**  
Volker Weihnacht, Stefan Makowski, Andreas Leson, *Fraunhofer Institute Material and Beam Technology (IWS), Dresden, Germany*
- 1191 Contact Behavior of the Hard Thin Ceramic Coatings under Cyclic Loading**  
Fjodor Sergejev, Liina Lind, Maksim Antonov, Priidu Peetsalu, Eron Adoberg, *Tallinn University of Technology, Tallinn, Estonia*
- 338 Nano-tribological and Tribo-chemical Properties of Diamond-like Carbon Coatings During Sliding**  
Ming Xu, Longqiu Li, *Harbin Institute of Technology, Harbin, China*, Andrey Ovcharenko, *Western Digital Corporation, San Jose, CA, United States*, Wenping Song, Guangyu Zhang, *Harbin Institute of Technology, Harbin, China*
- 752 Molecular Dynamics Study of Tribological Properties of Ultra-thin Diamond-like Carbon Films Deposited on Diamond Substrates**  
Qingkang Liu, Wenping Song, Longqiu Li, *Harbin Institute of Technology, Harbin, China*, Andrey Ovcharenko, *Western Digital Corporation, San Jose, CA, United States*, Guangyu Zhang, Zhenxiu Hou, Ming Xu, *Harbin Institute of Technology, Harbin, China*
- 1257 Observation of the Real Contact Area of Carbon Nanotube Film**  
Yosuke Tsukiyama, Naoya Fukuda, Isami Nitta, *Niigata University, Niigata, Japan*, Wataru Norimatsu, Michiko Kusunoki, *Nagoya University, Nagoya, Japan*

**WE2-ST14 Surface Evolution and Wear 2**

ROOM 4 VENEZIA • 11:00 – 13:00

Chair: Feodor M. Borodich, *Cardiff University, United Kingdom*

- 186 Waveforms and Frequency Spectrum Analysis of Acoustic Emission Signals from Erosive Wear of Pipeline Materials (X65)**  
Jonathan Ukpai, Richard Barker, Anne Neville, *University of Leeds, Leeds, United Kingdom*
- 202 Representation of Wear Data by Power Curves**  
Abhro Choudhury, Savio Sebastian, *PES Institute of Technology, Bangalore, India*

**659 Comparison of Tribological Behavior of One-process and Two-process Steel Surfaces under Ball-on-disc Tests**

Andrzej Dzierwa, Pawel Pawlus, Rzeszow University of Technology, Rzeszow, Poland, Wieslaw Zelasko, Group of Technical Schools in Lezajsk, Lezajsk, Poland

**238 The Effect of Elastomer Surface Splitting on Stick-Slip Motion**

Yuri Kligerman, Michael Varenberg, Technion - Israel Institute of Technology, Haifa, Israel

**1161 Atomic Origins of Wear in Ionic Solids**

Brandon A. Krick, Kellon R. Marchman, Kathryn Harris, W. Gregory Sawyer, University of Florida, Gainesville, FL, United States

**699 Influence of Surface Dimpling on Tribology of Lubricated Rolling/Sliding Point Contacts Subjected to Short Stroke Reciprocating Motion**

Ullattil Sudeep, N. Tandon, R.K. Pandey, IIT Delhi, New Delhi, India

**WE3-ST15 In Situ Formed Tribofilms**

ROOM 3 MILANO • 14:00 – 15:40

Chair: Yuri Kligerman, Technion, Haifa, Israel

**301 Seeing the Third-body Formation of Metallic Tribosystems by Novel on-line Tribometry**

Martin Dienwiebel, Tim Feser, Spyridon Korres, Karlsruhe Institute of Technology, Pfaffzettel, Germany

**527 Wear Characteristics of Phenolic Resin Matrix Composites with Addition of Metal Oxide**

Katsuya Okayama, Hiroya Kishimoto, ADVICS Co. Ltd., Toyota, Japan, Ken'ichi Hiratsuka, Chiba Institute of Technology, Narashino, Japan

**686 Relationship between Friction Characteristics of Wet Clutches and Concentrations of Additives Obtained by in situ Observation of Oil Films**

Toshihiko Ichihashi, Mitsugu Kudo, Idemitsu Kosan Co. Ltd., Tokyo, Japan, Shigeyuki Mori, Iwate University, Morioka, Japan

**816 In-situ Interface Chemical Characterization of a Boundary Lubricated Contact**

Yugal Rai, Anne Neville, Ardian Morina, University of Leeds, Leeds, United Kingdom

**1193 Transfer of Titanium in Sliding Contacts – New Discoveries and Insights Revealed by in Situ Studies in the SEM**

Jannica Heinrichs, Uppsala University, Uppsala, Sweden, Mikael Olsson, Dalarna University, Borlänge, Sweden, Staffan Jacobson, Uppsala University, Uppsala, Sweden

**WE4-ST16 Roughness 2**

ROOM 3 MILANO • 16:10 – 17:30

Chair: Federico Colombo, Politecnico di Torino, Torino, Italy

**982 Ultraprecision Chemical-mechanical Polishing of GaN with Different Abrasive**

Chunli Zou, Guoshun Pan, Xiaolei Shi, Gong Hua, Tsinghua University, Beijing, China

**469 Investigation on the Acid Final Chemical Mechanical Polishing of Aluminum Alloy**

Hua Gong, Guoshun Pan, Zhonghua Gu, Xinchun Lu, Tsinghua University, Beijing, China

**222 Prediction of the Surface Roughness of Shot Peened Surfaces**

Mandikizino Taro, Thibaut Chaise, Daniel Nélis, Université de Lyon, Villeurbanne, France

**683 Viscoelastic Contact Mechanics: Numerical Simulations with Experimental Validation**

Carmine Putignano, Politecnico di Bari, Bari, Italy, Tom Reddyhoff, Daniele Dini, Imperial College London, London, United Kingdom, Giuseppe Carbone, Politecnico di Bari, Bari, Italy

**WE4-ST17 Surface Treatments 1**

ROOM 4 VENEZIA • 16:10 – 17:30

Chair: Yuri Kligerman, Technion, Haifa, Israel

**524 Nano-multilayered and Nanostructured Hard PVD Coatings for Tool/Dies at Medium/High Temperatures**

Gonzalo G. Fuentes, E. Almandoz, Asociación de la Industria Navarra, Galar-Pamplona, Spain

**1093 Wavelet Packet Decomposition for Failure Analysis Monitoring**

Davide Bianchi, Erwyn Mayhofer, AC<sup>2</sup>T Research GmbH, Wiener Neustadt, Austria, Martin Gröschl, András Vernes, Gerhard Betz, Technische Universität Wien, Wien, Austria

**565 Tribological Characteristics of Self-lubricating Spherical Plain Bearings Treated by the Rare Earth**

Ming Qiu, Yingchun Li, Long Chen, Chenhui Jia, Henan University of Science and Technology, Luoyang, China

**963 Scratch Behavior of Re-structured Carbon Coatings for Magnetic Disks by Oxygen Plasma Etching**

Meiling Guo, Dongfeng Diao, Liwei Yu, Xi'an Jiaotong University, Xi'an, China

**FW – Dry Friction and Wear**

**WE1-FW6 Theory of Friction and Wear, Numerical Simulation 5**

ROOM 5 NAPOLI • 08:30 – 10:30

Chair: Vincent Le Houérou, Université de Strasbourg, France

**1068 Modeling Pre-sliding Behaviour of a Multi Asperity Contact Including the Loading History**

Agnieszka Winogrodzka, Matthijn B. de Rooij, Dirk J. Schipper, University of Twente, Enschede, Netherlands

**1073 Influence of Tribological Parameters on Wear Behaviour**

Claudia Lenauer, Thomas Wopelka, Martin Jech, András Vernes, AC<sup>2</sup>T Research GmbH, Wiener Neustadt, Austria

**1091 Discrete Elements Models of Heterogeneous Friction Material: a Numerical Study of Wear**

Matthieu Champagne, INSA-Lyon, Villeurbanne, France, Mathieu Renouf, Université Montpellier 2, Montpellier, France, Yves Berthier, INSA-Lyon, Villeurbanne, France

**1156 Competition between 3rd Body Flows and Local Contact Dynamics**

Aurélien Saulot, INSA-Lyon, Villeurbanne, France, Francesco Massi, University of Rome "La Sapienza", Rome, Italy, Mathieu Renouf, Université Montpellier 2, Montpellier, France, Yves Berthier, INSA-Lyon, Villeurbanne, France

**1171 A Numerical Method to Predict Wear Evolution in Wheel-rail Contact under Partial Slip Conditions**

George Gavril, Spiridon Crețu, Technical University "Gheorghe Asachi", Iași, Romania

**1232 The Role of Micro-slip in Static and Kinetic Friction**

Jeffrey Streater, Georgia Institute of Technology, Atlanta, GA, United States

**WE2-FW7 Mechanisms of Wear 1**

ROOM 5 NAPOLI • 11:00 – 13:00

Chair: Marian Szczerek, National Research Institute, Radom, Poland

**1307 New Analytical Limiting Friction Laws and Universal Tribological Constants of Dry Static and Kinetic Friction**

Vladimir I. Pozhbelko, South-Ural State University, Chelyabinsk, Russian Federation

**30 Effects of Slip and Twinning Deformation Systems upon Friction and Wear at Single Crystal Faces of Calcite(CaCO<sub>3</sub>)**

Hitoshi Shindo, Mai Kobayashi, Chuo University, Tokyo, Japan, Kaori Niki, Chiba University, Chiba, Japan

**44 Is There a Third Abrasive Wear Mode?**

Ronaldo Câmara Cozza, Cláudio Geraldo Schön, Universidade de São Paulo – Escola Politécnica, São Paulo, SP, Brazil



- 62 Effect of Sliding Speed and Humidity on the Nanowear of Si/SiO<sub>2</sub> Pair**  
Linmao Qian, *Southwest Jiaotong University, Chengdu, China*, Seong H. Kim, *Pennsylvania State University, University Park, PA, United States*, Lei Chen, Xiaodong Wang, Binjun Yu, Zhongrong Zhou, *Southwest Jiaotong University, Chengdu, China*

- 65 Generation of Ammonia During Wear Processes in Adhesive Wear**  
Hiroshi Mishina, Kentaro Chiba, *Chiba University, Chiba, Japan*, Alan Hase, *Saitama Institute of Technology, Fukaya, Japan*

- 81 Evaluation and Prediction of the Effect of Load Frequency on the Wear Properties of pre-cracked Nylon 66**  
Ahmed Abdelbary, Mohamed N. Abouelwafa, Ibraheem M. El Ffahham, Alaa H. Hamdy, *Alexandria University, Alexandria, Egypt*

**WE3-FW8 Mechanisms of Wear 2**  
**ROOM 5 NAPOLI • 14:00 – 15:40**

Chair: Carla Martini, *Università di Bologna, Bologna, Italy*

- 266 Thermomechanical Wear of Slipper and Rail in Rocket Sled System**  
Chang-Dong Yeo, *Texas Tech University, Lubbock, TX, United States*, Anthony Palazotto, *Air Force Institute of Technology, WPAFB, OH, United States*, Rodolfo Buentello, *Air Force Institute of Technology, WPAFB, OH, United States*

- 730 Adhesive Transfer and Cutting Wear in Aero-Engine Abradable Lining Contacts**  
Nicola Fois, Jonathan Stringer, Matthew Marshall, *University of Sheffield, Sheffield, United Kingdom*

- 807 A Particle Shape Definition Related to Third-body Abrasive Wear**  
Martijn Woldman, Emile van der Heide, *University of Twente, Enschede, Netherlands*, Tiedo Tinga, *Netherlands Defence Academy, Den Helder, Netherlands*, Marc Masen, *University of Twente, Enschede, Netherlands*

- 897 Study of the Scratch Resistance of a Coated Material with Smoothed or Patterned Interface**  
Tristan Bourrel, *Institut Charles Sadron, Strasbourg, France*, Céline D'Orléans, *DELPHI France SAS, Illkirch Graffenstaden, France*, Vincent Le Houérou, Joël Krier, Christian Gauthier, *Institut Charles Sadron, Strasbourg, France*

- 966 Observation of Wear Track Generation During Single Asperity Abrasion of Metallic Coatings**  
Chang-Lae Kim, Dae-Eun Kim, *Yonsei University, Seoul, Republic of Korea*

**WE4-FW9 Mechanisms of Wear 3**  
**ROOM 5 NAPOLI • 16:10 – 17:30**

Chair: Giuseppe Palombarini, *Università di Bologna, Bologna, Italy*

- 1027 Magnetotribology of Sliding Ferromagnetic Steel / Ferromagnetic Steel Contact in Magnetic Field**  
Hamid Zaïdi, Adji C. Ba, *Université de Poitiers, Futuroscope Chasseneuil, France*, A. Fnidki, *Université de Rouen, Rouen, France*, Jean Frêne, *Université de Poitiers, Futuroscope Chasseneuil, France*

- 1051 Influences of Non-friction Time, Temperature and Humidity on Severe-mild Wear Transition of Iron**  
Takaaki Tsutsumi, Ken'ichi Hiratsuka, Yoshihiro Nagata, *Chiba Institute of Technology, Narashino, Japan*

- 1148 Effect of Varying Load on the Tribological Behaviour of a Steel/Al<sub>2</sub>O<sub>3</sub>-TiO<sub>2</sub> Ceramic Coating**  
Mattia Merlin, Chiara Soffritti, Reyna Vazquez, Gian Luca Garagnani, *University of Ferrara, Ferrara, Italy*

- 1260 Competition between Local Fatigue and Wear of 7075 Aluminum Alloy Induced by Rotational Fretting Wear**  
Ming-Xue Shen, Zhen-Bing Cai, Yan Zhou, Ji-Liang Mo, H.M. Shen, *Southwest Jiaotong University, Chengdu, China*, Xue-Dong Peng, *Zhejiang University of Technology, Hangzhou, China*, Min-Hao Zhu, *Southwest Jiaotong University, Chengdu, China*

**LA – Lubricants and Additives**

**WE1-LA6 Additives II**  
**ROOM 6 FIRENZE • 08:30 – 10:30**

Chair: Clotilde Minfray, *École Centrale de Lyon, Écully, France*

- 670 Keynote: Elementary Steps in The Formation of Boundary Films on Copper**  
Wilfred Tysoe, *University of Wisconsin Milwaukee, Milwaukee, WI, United States*

- 252 IF-MoS<sub>2</sub> Based Lubricants: Influence of Shape and Crystal Structure**  
Fabrice Dassenoy, Imène Lahouij, Béatrice Vacher, *École Centrale de Lyon, Écully, France*

- 650 Comparative Consideration of Microscopic Friction Characteristic of Tribofilms Produced from Different ZnDTPs**  
Saiko Aoki, Yoshihiro Nakada, Masabumi Masuko, Akihito Suzuki, *Tokyo Institute of Technology, Tokyo, Japan*

- 386 Study on the Behaviour of Polar Additives in EHD Contacts by Electrical Capacitance**  
Karolina Jablonka, Romeo Glovnea, *University of Sussex, Brighton, United Kingdom*, Jeroen Bongaerts, *SKF Engineering and Research Centre, Nieuwegein, Netherlands*

- 257 Biodegradable Ionic Liquids as Lubricants**  
Nicklas Hjalmarsson, Rubén Álvarez Asencio, *KTH Royal Institute of Technology, Stockholm, Sweden*, James Sweeney, *University of Newcastle, Newcastle, Australia*, Faiz U. Shah, *Luleå University of Technology, Luleå, Sweden*, Fredrik Schaufelberger, Olof Ramström, *KTH Royal Institute of Technology, Stockholm, Sweden*, Oleg N. Antzutkin, *Luleå University of Technology, Luleå, Sweden*, Rob Atkin, *University of Newcastle, Newcastle, Australia*, Sergei Glavatskikh, Mark W. Rutland, *KTH Royal Institute of Technology, Stockholm, Sweden*

- 247 Lubrication of Iron Oxide by Adsorbed C18 Fatty Acids in Vacuum: A Quantum Chemistry MD Simulation**  
Sophie Loehle, Clotilde Minfray, Christine Matta, Thierry Le Mogne, Jean-Michel Martin, *École Centrale de Lyon, Écully, France*, Raphaele Iovine, *TOTAL, Solaize Research Center, Solaize, France*, Yukiko Obara, Kenji Inaba, Ryuji Miura, Nozomu Hatakeyama, Akira Miyamoto, *Tohoku University, Aoba, Japan*

**WE2-LA7 Ionic Liquids I**  
**ROOM 6 FIRENZE • 11:00 – 13:00**

Chair: Rosa M. Espinosa-Marzal, *ETH Zürich, Switzerland*

- 189 Keynote: Influence of Ion Structure and Surface Potential on Ionic Liquid Lubrication**

- Rob Atkin, *University of Newcastle, Newcastle, Australia*
- 157 Surface-chemical Characterization of Boundary-layer Lubricant Films Formed in the Presence of Alkyl Sulfate Ionic Liquids**

Andrea Arcifa, *ETH, Zürich, Switzerland*, Antonella Rossi, *Università degli Studi di Cagliari, Cagliari, Italy*, Rosa M. Espinosa-Marzal, Nicholas D. Spencer, *ETH, Zürich, Switzerland*

- 1264 Tribological Comparison of Monocationic and Dicationic Pyridinium Ionic Liquids**  
 Francesco Pagano, *IK4-Tekniker, Eibar, Spain*, Maria Mahrova, *Universidad de Vigo, Vigo, Spain*, Raquel Bayon, *IK4-Tekniker, Eibar, Spain*, Angel Valea, *Universidad del País Vasco, Leioa, Spain*, Amaya Igartua, *IK4-Tekniker, Eibar, Spain*
- 443 The Effect of Surface Conformation of Imidazolium-based Ionic Liquids on Friction Property**  
 Seiya Watanabe, *Tokyo University of Science, Tokyo, Japan*, Miki Nakano, *Koji Miyake, National Institute of Advanced Industrial Science and Technology, Tsukuba, Japan*, Ryo Tsuboi, *Shinya Sasaki, Tokyo University of Science, Tokyo, Japan*
- 71 High Pressure Rheology of Ionic Liquids Based on Phase Diagram**  
 Nobuyoshi Ohno, *Toshifumi Mawatari, Bo Zhang, Akira Nakajima, Saga University, Saga, Japan*, Motohiro Kaneta, *Brno University of Technology, Brno, Czech Republic*
- 206 Film Thickness of Ionic Liquids Under High Contact Pressures**  
 Dan Guo, *Huaping Xiao, Guoshun Pan, Jianbin Luo, Tsinghua University, Beijing, China*

**WE3-LA8 Ionic Liquids II**

ROOM 6 FIRENZE • 14:00 – 15:40

Chair: Rob Atkin, *University of Newcastle, Australia*

- 633 Tribochemical Reaction of Ionic Liquids under Vacuum Condition**  
 Shouhei Kawada, *Seiya Watanabe, Yuriko Kondo, Ryo Tsuboi, Shinya Sasaki, Tokyo University of Science, Tokyo, Japan*
- 315 Lubrication Performance of Ionic Liquids as Lubricants for Space Mechanisms under High Vacuum and Low Temperature**  
 Kenji Kobayashi, *Akihito Suzuki, Masabumi Masuko, Tokyo Institute of Technology, Tokyo, Japan*, Yukitoshi Fujinami, *Idemitsu Kosan Co. Ltd., Ichihara, Japan*, Takashi Nogi, *Shingo Obara, Japan Aerospace Exploration Agency, Chofu, Japan*
- 605 Tribological Properties of Imidazolium-based Ionic Liquids and the Influence of Polarization**  
 Christian Dold, *Tobias Amann, Andreas Kailer, Fraunhofer Institute for Mechanics of Materials IWM, Freiburg, Germany*
- 635 Tribological Properties of Halogen-free Ionic Liquids against Hard Materials**  
 Yuriko Kondo, *Ryo Tsuboi, Shinya Sasaki, Tokyo University of Science, Tokyo, Japan*
- 209 Uncovering the Crucial Properties for IL-mediated Lubrication**  
 Rosa M. Espinosa-Marzal, *Kim Liu, Andrea Arcifa, ETH Zürich, Zürich, Switzerland*, Antonella Rossi, *Università degli Studi di Cagliari, Cagliari, Italy*, Nicholas D. Spencer, *ETH Zürich, Zürich, Switzerland*

**WE4-LA9 Greases**

ROOM 6 FIRENZE • 16:10 – 17:30

Chair: Jean Michel Martin, *École Centrale de Lyon, Écully, France*

- 490 Characterization of Nano Size Thickener Fiber in Grease by SAXS**  
 Yoshiyuki Suetsugu, *Yusuke Nakanishi, Yusuke Iseki, Hiroki Sekiguchi, Yukitoshi Fujinami, Idemitsu Kosan Co., Ltd., Sodegaura, Japan*
- 413 Grease-lubricated Reciprocated Sliding of a ZrO<sub>2</sub> - Al<sub>2</sub>O<sub>3</sub> Couple in High Vacuum**  
 Emile van der Heide, *Bert Dillingh, Norbert Koster, Edwin Stam, Esther Weltevreden, Edwin Gelinck, TNO, Eindhoven, Netherlands*

- 1089 A Fundamental Study on the Deterioration and the Service Life of Grease in Traction Motor of Railway**  
 Sumiko Hibino, *Tetsuya Hosoya, Railway Technical Research Institute, Kokubunji, Japan*
- 16 Development of Measuring Method of Grease Base Oil Film Thickness by Using High Melting Point Fluorescent Agent on Various Substance of Ground**  
 Yauyoshi Tozaki, *Keiji Nishiwaki, Kinki University, Higashiosaka, Japan*

**LF – STLE/ASME – Lubrication Fundamentals****WE1-LF6 Textured and Rough Surfaces I**

ROOM 7 BARI • 08:30 – 10:30

Chair: Wen-Zhong Wang, *Beijing Institute of Technology, China*

- 1132 Friction and Lubrication of Textured Surfaces in Elasto-Hydrodynamic Contacts**  
 Johan Guégan, *Amir Kadiric, Imperial College London, London, United Kingdom*, Tom Reddyhoff, *Guillermo Morales-Espejel, SKF Engineering and Research Centre, Nieuwegein, Netherlands*, Hugh Spikes, *Imperial College London, London, United Kingdom*
- 1082 Performance of Transient Surface Texture in Hydrodynamic Bearings**  
 Simon Medina, *Daniele Dini, Mark Fowell, Andrew V. Olver, Imperial College London, London, United Kingdom*
- 740 Effect of Dimples on the Line Contacts**  
 Lichun Hao, *Yonggang Meng, Tsinghua University, Beijing, China*, Cheng Chen, *Shell Global Solutions, Houston, TX, United States*
- 1050 Increase of Film Thickness by Nano-Texturing under Elastohydrodynamic Lubrication**  
 Tomoko Hirayama, *Mitsutaka Ikeda, Toshiteru Suzuki, Takashi Matsuoka, Doshisha University, Kyotanabe, Japan*, Hiroshi Sawada, *Kosuke Kawahara, Shunji Noguchi, Canon Machinery Inc., Kusatsu, Japan*
- 484 Investigating the Impact of Surface Roughness on the EHL Film Thickness Using a Homogenization Technique**  
 Francesco S. Guerrieri, *Paleotti, Bernhard Scheichl, AC<sup>2</sup>T Research GmbH, Wiener Neustadt, Austria*
- 1048 Numerical Investigation on the Effects of Surface Geometry in Transient Flow Conditions**  
 Andrei Gherca, *Aurelian Fatu, Mohamed Hajjam, Patrick Maspeyrot, Université de Poitiers, Angoulême, France*

**WE2-LF7 Textured and Rough Surfaces II**

ROOM 7 BARI • 11:00 – 13:00

Chair: Daniele Dini, *Imperial College London, United Kingdom*

- 128 Effect of Moving Body Mass on Impact EHL Contacts with Surface Ridges**  
 Motohiro Kaneta, *Brno University of Technology, Brno, Czech Republic*, Feng Guo, *Jing Wang, Qingdao Technological University, Qingdao, China*, Ivan Krupka, *Martin Hartl, Brno University of Technology, Brno, Czech Republic*
- 950 Effect of Surface Ridges on Oil Film Temperature in EHL Contacts**  
 Hiroshi Nishikawa, *Takahito Shimada, Satoshi Tsuda, Kyushu Institute of Technology, Kitakyushu, Japan*, Motohiro Kaneta, *Brno University of Technology, Brno, Czech Republic*
- 1208 Surface Roughness Effects in Thermal EHL Contacts**  
 Petr Sperka, *Ivan Krupka, Martin Hartl, Brno University of Technology, Brno, Czech Republic*



- 901 A Two-Scale Method for Incorporating the Effects of Three-Dimensional Surface Topography in an Elastohydrodynamic Line Contact**  
Greg N. de Boer, L. Gao, Rob W. Hewson, Harvey M. Thompson, *University of Leeds, Leeds, United Kingdom*
- 415 Lubricated Point-contacts Model with the Consideration of Inclusions**  
Wen-zhong Wang, Sheng-guang Zhang, JiBin Hu, *Beijing Institute of Technology, Beijing, China*, Yuan-zhong Hu, *Tsinghua University, Beijing, China*
- 749 Experimental Validation of a Mixed Lubrication Model for Contact Between Parallel Rough Surfaces**  
Salima Senhadji, *Université d'Oran, Oran, Algeria*, Francois Robbe-Valloire, *Laboratoire d'Ingenierie des Systèmes Mécaniques et des Matériaux, Saint-Ouen, France*, Farid Belarifi, *Université d'Oran, Oran, Algeria*

## VI – VIENNANO'13-Nanotechnology

### WE1-VI6 Measurement and Testing in the Nano-Range

ROOM 8 PALERMO • 08:30 – 10:30

Chair: Ille C. Gebeshuber, *Universiti Kebangsaan, Bangi, Malaysia*

- 1153 Scanning Probe Microscopy for Roughness Analysis of Complex Shape Samples**  
Francesco Tantussi, Daniele Vella, Francesco Fuso, Maria Allegrini, Luca Romoli, *University di Pisa, Pisa, Italy*, Marco Fiaschi, *Continental Automotive Italy S.p.A., Pisa, Italy*
- 1173 Atomic Force Microscope Circular Mode: A New Nanoscale Tribometer for Fast and Accurate Measurements of Friction and Adhesion at the Nanometer Scale**  
Pierre-Emmanuel Mazeran, *Université de Technologie de Compiègne, Compiègne, France*, Olivier Noël, Hussein Nasrallah, *Université du Maine, Le Mans, France*
- 977 Nanoscratching of Multi-layer Graphene by Molecular Dynamics Simulations**  
Qi Zhang, Dongfeng Diao, *Xi'an Jiaotong University, Xi'an, China*, Shandan Bai, Yuji Higuchi, *Tohoku University, Sendai, China*, Nobuki Ozawa, Momoji Kubo, *Shenzhen University, Shenzhen, China*
- 111 Express Test - A Novel Technique for Rapid Acquisition and Mapping of Accurate Mechanical Properties**  
Holger Pfaff, *Agilent Technologies, Frankfurt, Germany*
- 82 Highly Sensitive Normal Force Measurement with Accurate Sliding Gap Control for Evaluation of Boundary and Thin-film Lubrication Phenomena**  
Kenji Fukuzawa, Tomoya Takaba, Shintaro Itoh, Hedong Zhang, *Nagoya University, Nagoya, Japan*
- 466 Nano-scale Measurements of the Energy Dissipation Using a Quartz Crystal Resonator**  
Daisuke Inoue, Shingo Machida, Junko Taniguchi, Masaru Suzuki, *University of Electro-Communications, Chofu, Japan*, Makoto Ishikawa, Kouji Miura, *Aichi University of Education, Kariya, Japan*

### WE2-VI7 Special Nanotribological Systems

ROOM 8 PALERMO • 11:00 – 13:00

Chair: Friedrich Franek, *Vienna University of Technology, Austria*

- 159 Keynote: Nanotribology, Nanomechanics and Materials Characterization Studies and Applications to Bio/nanotechnology and Biomimetics**  
Bharat Bhushan, *Ohio State University, Columbus, United States*
- 1199 A Model of Friction between a CNT and a Surface**  
George Adams, Yu-Chiao Wu, Nick McGruer, *Northeastern University, Boston, MA, United States*

- 457 Super-Smooth Sliding Pins Processed with Gas Cluster Ion Beams for Pin-on-Disk Tests of Nanometer-Thick Liquid Lubricant Films**  
Renguo Lu, Hedong Zhang, *Nagoya University, Nagoya, Japan*, Yasunaga Mitsuya, *Nagoya Industrial Science Research Institute, Nagoya, Japan*, Kenji Fukuzawa, Shintaro Itoh, *Nagoya University, Nagoya, Japan*
- 862 Analysis of Elastic Contact Due to Meniscus Adhesion Force Acting on Sphere/Flat Geometry**  
Kyosuke Ono, *Tokyo Institute of Technology, Hachioji, Japan*
- 251 Understanding the Deformation of Soot Particle/Agglomerates in a Dynamic Contact: TEM in Situ Compression and Shear Experiments**  
Fabrice Dassenoy, Imène Lahouij, Béatrice Vacher, *École Centrale of Lyon, Écully, France*, Kaustav Sinha, David A. Brass, Maryann Devine, Jai Bansal, *INFINEUM US, Linden, NJ, United States*
- 170 Effect of Lubricant Materials on Light Contact between Dynamic Fly Height Control Sliders and Disk Surfaces in Hard Disk Drives**  
Norio Tagawa, Hiroshi Tani, Kazumi Iwasaki, *Kansai University, Suita, Japan*

### WE3-VI8 Nano-Tribology Lubrication Mechanisms

ROOM 8 PALERMO • 14:00 – 15:40

Chair: Qunji Xue, *Lanzhou Institute of Chemical Physics, China*

- 143 Lubrication Mechanisms of Hollow Core Inorganic Fullerene like WS<sub>2</sub> Nanoparticles: in Situ TEM Approach**  
Imène Lahouij, Béatrice Vacher, Fabrice Dassenoy, *École Centrale de Lyon, Écully, France*
- 711 A Molecular Dynamics Study for Momentum Transport Phenomena in Nanoscale Liquid Bridge**  
Takashi Tokumasu, *Tohoku University, Sendai, Japan*, Marie-Hélène Meurisse, Nicolas Fillot, Philippe Vergne, *Université de Lyon, Villeurbanne, France*
- 371 Synthesis of Nano Carbon Onion Thin Film by Plasma-Based Ion Implantation Method and Its Tribological Properties**  
Shu Sawai, Yuya Nakahara, Naohiro Matsumoto, Junho Choi, Takahisa Kato, *University of Tokyo, Bunkyo, Japan*
- 1043 Nanotribological "Zero-Wear" Effect**  
Alexander S. Kuzharov, Andrey A. Kuzharov, *Don State Technical University, Rostov-on-Don, Russian Federation*, Huynh Nguyen, Tuyen Nguyen, *Vietnam Academy of Science & Technology, Ha Noi, Viet Nam*
- 1213 Examining the Role of Load Dependent Bond Strain on Atomic Scale Defect Nucleation in Nanoscopic Contacts**  
James D. Batteas, *Texas A&M University, College Station, TX, United States*

### PS2-VI Posters

TRIUM • 09:00 – 16:30

- 267 Estimation of Triboreistance during Surface Nanoscanning**  
Victor Musalimov, Pavel Kovalenko, Svetlana Perepelkina, *National Research University of Information Technologies, Mechanics and Optics, Saint-Petersburg, Russian Federation*
- 322 Theoretical Study of the van der Waals Dispersion Forces Considering Material Distributions**  
Hiroshige Matsuoka, Niki Kitahama, Shigehisa Fukui, *Tottori University, Tottori, Japan*
- 680 Characterizing Material Transfer onto an Atomic Force Microscope Tip Resulting from Nanoscale Dry Sliding Using Atom Probe Tomography**  
Christopher J. Tourek, Sriram Sundararajan, *Iowa State University, Ames, IA, United States*

- 937 Drag Reduction over Superhydrophobic Surface in Microchannel**  
Yunle Chang, Huichen Zhang, *Dalian Maritime University, Dalian, China*
- 976 In Situ TEM Investigation of Nanoindentation Behavior of Carbon Coated Silicon Substrate**  
Pengyu Zhang, Lifeng Liu, Yongqiang Zhang, Dongfeng Diao, *Xi'an Jiaotong University, Xi'an, China*
- 1216 Effects of Annealing on AlTiN Coatings before Machining under Severe Cutting Conditions**  
Damien Joly, Caroline Richard, René Leroy, *University of Tours, Tours, France*
- 1291 Friction Properties of Artificial Turf Pitches: Macro and Nano Characterization**  
Elisabetta M. Zanetti, *University of Perugia, Perugia, Italy*, Cristina Bignardi, Alberto L. Audenino, *Politecnico di Torino, Torino, Italy*

## BE – Bearings

### WE1-BE6 Gas Bearings 1

ROOM 9 BOLOGNA • 08:30 – 10:30

Chair: Masayuki Ochiai, *Tokai University, Hiratsuka, Japan*

- 986 Dynamic Characteristics and Nonlinear Stability of Rotor-aerostatic Bearing System**  
Jianjun Du, Jie Shan, *Harbin Institute of Technology, Shenzhen, China*
- 1009 Experimental Verification of Slot Restrictor Shape Influence on Gas Bearing Characteristics**  
Tomohiko Ise, Akira Inoue, Toshihiko Asami, Fumiyoshi Kimura, Yoshiyuki Yamaguchi, *University of Hyogo, Himeji, Japan*
- 1115 Investigation on the Discharge Coefficient of Supply Micro Holes for Gas Bearings**  
Federico Colombo, Terenziano Raparelli, Andrea Trivella, Vladimir Viktorov, *Politecnico di Torino, Torino, Italy*
- 1117 Dynamic Characteristics of Air Foil Bearing Produced by Metal Injection Molding**  
Andy Tirta, Eungryul Baek, Pyung Hwang, *Yeungnam University, Gyeongsan, Republic of Korea*
- 1263 High Speed Rotors with Elliptic Gas Journal Bearings**  
Guido Belforte, Federico Colombo, Terenziano Raparelli, Andrea Trivella, Vladimir Viktorov, Rodrigo Villavicencio, *Politecnico di Torino, Torino, Italy*
- 1015 Numerical Analysis of Hydroinertia Gas Bearing with Inclined Supply Feed Holes for High Speed Rotary Machines**  
Tomohiko Ise, Sayuri Nakano, Toshihiko Asami, *University of Hyogo, Himeji, Japan*, Yuki Endo, *JEOL RESONANCE Inc., Akishima, Japan*, Fumiyoshi Kimura, Yoshiyuki Yamaguchi, Itsuro Honda, *University of Hyogo, Himeji, Japan*

### WE2-BE7 Rolling Bearings 4

ROOM 9 BOLOGNA • 11:00 – 13:00

Chair: Amir Kadiric, *Imperial College London, United Kingdom*

- 542 Grease Lubrication in super Precision Bearings Operating at High Speed**  
Feliciano Greco, *SKF Industrie S.p.A., Villar Perosa, Italy*, Jun Wang, Albert van den Kommer, *SKF Engineering & Research Centre, Nieuwegein, Netherlands*
- 79 Active Piezoelectric-sensor Based Condition Monitoring System for Rolling Element Bearings**  
Wenqu Chen, Robert Dwyer-Joyce, *University of Sheffield, Sheffield, United Kingdom*

- 90 Skidding Analysis of High Speed Rolling Bearing in a Whirling Squeeze Film Damper**  
Wei Chen, Junling Li, Libo Zhang, *Xi'an Jiaotong University, Xi'an, China*
- 169 Contact Analysis of Blade Bearing in Wind Turbine**  
Shiyuan Pei, Xiwei Zhou, Hua Xu, *Xi'an Jiaotong University, Xi'an, China*, FengCai Wang, *Wafangdian Bearing Group Corporation (ZWZ), Wafangdian, China*
- 178 Effect of Oil Film Parameter on Vibration Acceleration and Electrical Pitting in Small Ball Bearing**  
Shoji Noguchi, *Tokyo University of Science, Noda, Japan*, Tohru Kanada, Norifumi Miyana, *Kanto Gakuin University, Yokohama, Japan*
- 1076 Contact Mechanism of Four Row Cylindrical Roller Bearing on Mill Roller**  
H. Xi, *Xi'an Jiaotong University, Xi'an, China*, Z.Q. Wang, *Wuhan University of Science & Technology, Wuhan, China*, H.Y. Guo, *United Manufacturing Group, Yinchuan, China*, S.N. Xu, *National Research Centre of Bearing Technology, Dalian, China*, H. Xu, W. Chen, F.C. Wang, *Xi'an Jiaotong University, Xi'an, China*

### WE3-BE8 Condition Monitoring and Diagnostic

ROOM 9 BOLOGNA • 14:00 – 15:40

Chair: Robert Dwyer-Joyce, *University of Sheffield, United Kingdom*

- 367 Recognition of Wear State for Early Detection of Seizure in Slide Bearing Using Acoustic Emission Technique**  
Alan Hase, *Saitama Institute of Technology, Saitama, Japan*, Hiroshi Mishina, *Chiba University, Chiba, Japan*, Masaki Wada, *Polytechnic University, Kanagawa, Japan*
- 108 Damage detection in Rolling Element Bearings by Acoustic Emission Outlier Analysis**  
Jack R. Naumann, Robert Dwyer-Joyce, Matt B. Marshall, *University of Sheffield, Sheffield, United Kingdom*
- 481 Ferroglyph Image Segmentation Using Morphology Watershed and Ant Colony Algorithm**  
Jingqiu Wang, Long Zhang, Fengxia Lu, Xiaolei Wang, *Nanjing University of Aeronautics and Astronautics, Nanjing, China*
- 654 A Prediction Method of Mechanical Equipment Running Condition Based on Multi-information and Multi-kernel SVR**  
Yu Chen, Yongsheng Zhu, Youyun Zhang, Xiaoran Zhu, *Key Laboratory of Education Ministry for Modern Design and Rotor-Bearing System, Xi'an, China*
- 846 Wear Detection by Monitoring Hydraulic Oil Contamination – an Experimental Comparison between on-line and off-line Measurements**  
Per-Oskar Westin, *Institute of Applied Hydraulics, Örnködsvik, Sweden*, Pär Marklund, *Luleå University of technology, Luleå, Sweden*, Jon Sandström, *Institute of Applied Hydraulics, Örnködsvik, Sweden*

### WE4-BE9 Fluid-Film Bearings 3

ROOM 9 BOLOGNA • 16:10 – 17:30

Chair: Wang-Long Li, *National Cheng Kung University, Tainan, Taiwan*

- 461 Modeling of the Main Bearings of a Multi-Supporting Crankshaft of the Internal Combustion Engine**  
Yuriy Rozhdestvensky, Nadezhda Khozeniuk, Alexander Mylnikov, Igor Levanov, Vyacheslav Romanov, *South Ural State University, Chelyabinsk, Russian Federation*
- 597 On the Performance of Diamond Bearings Designed for Boundary, Mixed-mode and Hydrodynamic Lubrication Regimes**  
Brent A. Lingwall, Xiaobin Lu, Craig H. Cooley, Tim N. Sexton, *US Synthetic Corporation, Orem, UT, United States*, Michael M. Khonsari, *Louisiana State University, Baton Rouge, LA, United States*

- 533 Experimental Study of the Performance of Tilting-pad Journal Bearings**  
Chunyang Zang, *Shanghai University, Shanghai, China*, Qing Ge, *Shanghai Electric Power Generation Equipment Co, Shanghai, China*, Bing Wu, Jian Jin, Xiaojing Wang, Dengfeng Jiang, Gaoan Qi, *Shanghai University, Shanghai, China*
- 791 Thermo-molecular Gas-film Lubrication (t-MGL) Analysis for MEMS Elements (Application to HDD Flying Heads)**  
Shigehisa Fukui, Naoya Kitagawa, Ryo Wakabayashi, *Tottori University, Tottori, Japan*, Kiyomi Yamane, *Matsue National College of Technology, Matsue, Japan*, Hiroshige Matsuoka, *Tottori University, Tottori, Japan*

## EC – ECOTRIB 2013 Tribology of Machine Elements

### WE1-EC6 Automotive Tribology 3

ROOM 10 PERUGIA • 08:30 – 10:30

Chair: Masato Tanaka, *University of Tokio, Matsudo, Japan*

- 57 Using Fluorescence Technique for Lubrication Flow at Soft Contact in Oil Pipeline Pigging Application**  
Shuhai Liu, Guibin Tan, Deguo Wang, Si-wei Zhang, *China University of Petroleum-Beijing, Beijing, China*
- 746 Tribological Analysis of the Piston-Liner System for Cylinder Deactivation Engine**  
Xianghui Meng, Zhinan Zhang, Youbai Xie, *Shanghai Jiaotong University, Shanghai, China*
- 248 The Effects of Lubricants with Additives on the Friction Force of Smooth and Artificially Textured Piston Rings**  
Anastasios Zavos, Pantelis Nikolakopoulos, *University of Patras, Patras, Greece*
- 916 The Use of Giant Magneto Resistive (Magnetometer) Sensors for Measuring the Performance of Direct Acting Tappets and the Effect of Lubricant Rheology**  
Riaz A. Mufti, Jawad Aslam, Rehan Zahid, *National University of Sciences and Technology, Islamabad, Pakistan*, Farrukh Qureshi, *The Lubrizol Corporation, Wickliffe, OH, United States*
- 9 The Impact of Engine and Driveline Lubricants on Vehicle Fuel Consumption**  
Neal M. Morgan, Robert Ian Taylor, Robert Mainwaring, *Shell Global Solutions (United Kingdom), Chester, United Kingdom*
- 532 Determination of the Influence of Load Parameters on the Friction Behavior of Multidimensional nonstationary Tribological Contacts**  
Sandra Drechsler, Albert Albers, Benoit Lorentz, *Karlsruhe Institute of Technology (KIT), Karlsruhe, Germany*

### WE2-EC7 Automotive Tribology 4

ROOM 10 PERUGIA • 11:00 – 13:00

Chair: Jorge Seabra, *Universidade do Porto, Portugal*

- 1002 FGM Materials for Crucial Automotive Tribological Components: a Possible Future?**  
Flavia Gili, Davide Mangherini, *Centro Ricerche Fiat, Orbassano (To), Italy*, Ludwig Weiler, Irene Mieskes, *Technische Universität Darmstadt, Darmstadt, Germany*, Frantisek Simancik, Juraj Korab, *Slovak Academy of Sciences, Bratislava, Slovak Republic*, Katarzyna Pietrzak, Agata Strojny, *Institute of Electronic Materials Technology, Warsaw, Poland*, Stanislaw Stupkiewicz, *Institute of Fundamental Technological Research (IPPT PAN), Warsaw, Poland*
- 10 Friction, Oil Film Thickness, and Wear of Piston Rings: Impact of Lubricants**  
Robert Ian Taylor, Neal M. Morgan, *Shell Global Solutions (United Kingdom), Chester, United Kingdom*

- 73 Tribology of Cam and Follower for Direct-type Valve Train**  
Mitsuhiro Soejima, *Kyushu Sangyo University, Fukuoka, Japan*, Toshiro Hamatake, *Oita University, Oita, Japan*
- 97 Mixed Lubrication Analysis on the Piston Rings in Internal Combustion Engines**  
Toshiro Hamatake, *Oita University, Oita, Japan*, Mitsuhiro Soejima, *Kyushu Sangyo University, Fukuoka, Japan*
- 158 Toward Eco-tribological Design of Honed Surface Texture in Vehicle Engines**  
Sabeur Mezghani, Ibrahim Demirci, Mohamed El Mansori, *Arts et Métiers ParisTech, Châlons-en-Champagne, France*, Mohammed Yousfi, *Renault S.A.S., Paris, France*
- 213 Ultrasonic Mapping of Lubricant Film Thickness Along a Piston Skirt and its Use to Indicate Piston Secondary Motions**  
Robin Mills, Emin Yusuf Avan, Robert Dwyer-Joyce, *University of Sheffield, Sheffield, United Kingdom*

### WE3-EC8 2020 Interface: DLC with Low SAPS Additives

ROOM 10 PERUGIA • 14:00 – 15:40

Chair: Richard F. Salant, *Georgia Institute of Technology, Atlanta, GA, United States*

- 1297 Tribofilm Formation in Diamond-like-carbon Coatings with High-saps And Zero-saps Oils**  
Mitjan Kalin, Eva Oblak, *University of Ljubljana, Ljubljana, Slovenia*, Frederic Meunier, *Sulzer SOREVI SAS, Limoges, France*, Albano Cavaleiro, *Universidade de Coimbra, Coimbra, Portugal*, Tomas Polcar, *University of Southampton, Southampton, United Kingdom*, John Durham, *Lubrizol Limited, Derby, United Kingdom*
- 1298 The Effects of Low SAPS Oils on Camshaft / Tappet Tribocouples with Various DLC Coated Tappets in Motored and Fired Engines**  
John Durham, Adam Kidson, *Lubrizol Limited, Hazelwood, United Kingdom*
- 1299 Ab-initio Investigation of Chemical-bond Formation at the DLC Surface**  
Matej Komelj, Mitjan Kalin, *University of Ljubljana, Ljubljana, Slovenia*, John Durham, *Lubrizol Limited, Hazelwood, United Kingdom*
- 1300 Tribological Behaviour of W -alloyed Carbon-based Coatings in Dry Sliding and Lubricated Steel Contact**  
Manuel Evaristo, *University of Coimbra, Coimbra, Portugal*, Tomas Polcar, *University of Southampton, Southampton, United Kingdom*, Albano Cavaleiro, *University of Coimbra, Coimbra, Portugal*
- 1301 Effect of Organic Lubricant Additives on the Tribological Performance and Tribofilm Formation in Diamond-Like-Carbon Coatings**  
Hongyuan Zhao, Joe Lanigan, Ardian Morina, Anne Neville, *University of Leeds, Leeds, United Kingdom*, Tomas Polcar, *Albano Cavaleiro, Universidade de Coimbra, Coimbra, Portugal*, Frederic Meunier, *Sulzer SOREVI SAS, Limoges, France*

### WE4-EC9 Seals 1

ROOM 10 PERUGIA • 16:10 – 17:30

Chair: Martin Zimmermann, *Leibniz Universität Hannover, Germany*

- 693 Frictional Behaviour of Radial Lip Seals in Mixed Lubrication**  
Hirofumi Mizuta, *NOK Corporation, Fujisawa, Japan*, Joichi Sugimura, *Kyushu University, Fukuoka, Japan*
- 732 Numerical Model for Spiral Groove Mechanical Seal Operating with Compressible Lubricant in Inertial and Turbulent Regime**  
Jérôme Géhannin, *Centre National d'études Spatiales, Paris, France*, Noël Brunetière, *Université de Poitiers, Futuroscope Chasseneuil, France*



- 1090 A Comprehensive Model for the Simultaneous Analysis of Temperature, Friction and Wear in Radial Shaft Seal Rings**  
Daniel Frölich, Barbara Jennewein, Christian Kaiser, Bernd Sauer, *University of Kaiserslautern, Kaiserslautern, Germany*
- 354 Mechanical Face Seals Operating in Mixed and Hydrodynamic Regime: Theoretical and Experimental Comparison**  
Khoulood Ayadi, Noël Brunetière, Bernard Tournier, *CNRS- Université de Poitiers, Futuroscope Chassenuil, France*, Didier Fribourg, Abdelaghani Maoui, *CETIM Pôle Technologies de l'Étanchéité, Nantes, France*

## MF – Tribology in Manufacturing

### WE3-MF1 Surface and Contact Conditions

ROOM 7 BARI • 14:00 – 15:40

Chair: In-Ha Sung, *Hannam University, Daejeon, Rep. of Korea*

- 825 Analysis of Morphology Wear Model of Moulds from Alloys of Copper ISO CuZn39Pb3 in Injection Process**  
Alejandro Pereira, *University of Vigo, Vigo, Spain*, Primo Hernández, *Hergome Ltd., Nave, Spain*, Javier Martínez, José A. Pérez, *University of Vigo, Vigo, Spain*, M. Wieczorowski, *Poznań University of Technology, Poznań, Poland*, Thomas Mathia, *École Centrale de Lyon, Écully, France*
- 895 Influence of the Rake Surface Texture of the Twist Drill when Machining Aluminum Alloys**  
Janaina A. Pereira, Alisson Rocha Machado, *Federal University of Uberlândia, Uberlândia, Brazil*
- 942 Computational Study on Chemical Mechanical Polishing Properties of Perovskite Oxide Abrasive Grain**  
Nobuki Ozawa, Miho Nakamura, Kentaro Kawaguchi, Takeshi Ishikawa, Yuji Higuchi, Momoto Kubo, *Tohoku University, Sendai, Japan*
- 989 Modeling of Abrasive Tool Wear in Machining Using Statistical and Tribological Approaches**  
Faycel Halila, *École des Mines de Nancy, Nancy, France*, Christophe Czarnota, *Université de Lorraine, Metz, France*, Mohammed Nouari, *École des Mines de Nancy, Nancy, France*
- 1125 Cost Efficient Tribological Systems in Steel Production Based on Life Cycle Optimisation**  
Markus Varga, M. Buranich, *AC<sup>2</sup>T Research GmbH, Wiener Neustadt, Austria*, Karl Adam, Rudolf Wimberger, *Voestalpine Stahl GmbH, Linz, Austria*, Ewald Badisch, *AC<sup>2</sup>T Research GmbH, Wiener Neustadt, Austria*

### WE4-MF2 Wear

ROOM 7 BARI • 16:10 – 17:30

Chair: Janaina A. Pereira, *Universidade Federal de Uberlândia, Brazil*

- 1178 Influence of High Pressure Jet Coolant During Turning Process of Aisi 316 Stainless Steel on Chip-tool Contact Area of Coated Cemented Carbide Tools**  
Vitor T. Guimaraes Naves, *Federal University of Triangulo Mineiro, Uberaba, Brazil*, Márcio Bacci da Silva, *Federal University of Uberlândia, Uberlândia, Brazil*, Flavio J. Da Silva, *Federal University of Espirito Santo, Vitoria, Brazil*, Andre L. Beloni dos Santos, *Federal University of Triangulo Mineiro, Uberaba, Brazil*
- 295 Non-linear Finite Element Analysis of Failure in Cu/Low-k Interconnect Megasonic Cleaning**  
Yating Huang, Chunling Meng, Xiuping Dong, *Beijing Technology and Business University, Beijing, China*, Dan Guo, *Tsinghua University, Beijing, China*

- 467 Increased Wear Resistance of Ti6Al4V Components Through Laser Cladded Metal Matrix Composite Coatings**  
Filip Motmans, Marleen Rombouts, Gert Maes, Jo Verwimp, Raymond Kemps, Myriam Mertens, Willy Hendrix, Rosita Persoons, *Flemish Institute for Technological Research (VITO), Mol, Belgium*
- 662 Suggestion of a Contact Model for the Generation Mechanism of Micro-Scratches in Chemical Mechanical Planarization**  
In-Ha Sung, Soyoung Jung, *Hannam University, Daejeon, Republic of Korea*, Hong Jin Kim, *Samsung Electronics, Hwasung, Republic of Korea*, Hosung Kong, Hung-Gu Han, *Korea Institute of Science and Technology, Seoul, Republic of Korea*

### PS2-MF Posters

ATRIUM • 09:00 – 16:30

- 327 On the Role of Low Melting Point Insert Materials on Friction During Friction Stir Welding**  
Saurabh Dixit, Satish V. Kailas, Kamanio Chattopadhyay, *Indian Institute of Science, Bangalore, India*
- 379 On the Fundamental Mechanism of the Within-Wafer Non-Uniformity (WIWNU) in Chemical Mechanical Planarization**  
In-Ha Sung, Woo Yul Yang, Hong Jin Kim, *Samsung Electronics, Hwasung, Republic of Korea*
- 487 Effect of Micro Texturing at Cutting Tool Rake Face on Friction Force**  
Hiroki Kiyota, Fumihiro Itoigawa, Takashi Nakamura, *Nagoya Institute of Technology, Nagoya, Japan*
- 526 Effect of Built-up Edges and Transfer Layers on the Wear State During Dry Cutting of Steel With Cemented Carbide Tools**  
Johannes Kümmel, Jens Gibmeier, Erich Müller, Reinhard Schneider, Volker Schulze, Alexander Wanner, *Karlsruhe Institute of Technology (KIT), Karlsruhe, Germany*
- 589 Study on Tribological Behavior in Composite Injection Molding Processes of Microcellular Foam/ in Mold Decoration for Slap-up Plastic**  
Zhengying Lin, Youxi Lin, Wangli Hou, *Fuzhou University, Fuzhou, China*
- 622 Self-Sharpening of Cutting Tool Edges in CFRP Machining**  
Satoru Maegawa, Shinya Hayakawa, Fumihiro Itoigawa, Takashi Nakamura, *Nagoya Institute of Technology, Nagoya, Japan*
- 632 Dynamic Hydrophobicity of Silicone Resin/VGCF Composite Sheet with Ultrasonic Vibration**  
Kenji Yanagisawa, Manabu Okada, *Nagano National College of Technology, Nagano, Japan*
- 777 Influence of Feed Speed on Surface Quality of Several Building Stones**  
Mihai Botan, Catalin Pirvu, Constantin Georgescu, Lorena Deleanu, *"Dunarea de Jos" University of Galati, Galati, Romania*
- 1229 Controlling Temperature Variations on the Disc Surface in Ultra High Temperature and High Vacuum Tribometers**  
Amit Ganguli, Anshuman Dube, *Ducom Instruments, Bangalore, India*, Deepak H. Veeragowda, *Ducom Instruments Europe B.V., Groningen, Netherlands*, Rubina Akkoji, Narendra M. Dube, *Ducom Instruments, Bangalore, India*
- 1249 Finite Element Simulations of the Cryogenic Static Seal under Severe Environmental Conditions**  
Soo Yeon Jang, Yong Hwi Kim, In-Ha Sung, *Hannam University, Daejeon, Republic of Korea*
- 1309 Wear Behavior of ISO 1.2738 Steel for Plastic Molding**  
B. Rivolta, R. Gerosa, *Politecnico di Milano, Milano, Italy*, Donato Firrao, *Politecnico di Torino, Torino, Italy*, A. Ghidini, *Lucchini RS S.p.A., Lovere (Bs), Italy*



**MT – Tribology of Materials****WE1-MT2 Metals 2****ROOM 1 TORINO • 08:30 – 10:30***Chair: Daniele Ugues, Politecnico di Torino, Torino, Italy*

- 357 Experimental and Numerical Investigations of Interfacial Processes in Metallic Contacts**  
Pantcho Stoyanov, Pedro A. Romero, Tommi T. Järvi, Matthias Scherge, Michael Moseler, Martin Dienwiebel, *Fraunhofer Institute for Mechanics of Materials IWM, Freiburg, Germany*
- 812 Abrasion Wear Performance of Quenched Wear Resistant Steels**  
Niko Ojala, Kati Valtonen, *Tampere University of Technology, Tampere, Finland*, Marke Kallio, Joonas Aaltonen, Pekka Siitonen, *Metso Minerals, Inc., Tampere, Finland*, Veli-Tapani Kuokkala, *Tampere University of Technology, Tampere, Finland*
- 491 Wear-resistance Increase of High Speed Steel Surface Layer**  
Mazhyn Skakov, Bauyrzhan Rakhadilov, *D. Serikbaev East Kazakhstan State Technical University, Ust-Kamenogorsk, Kazakhstan*, Michael Sheffler, *Otto-von-Guericke Universität, Magdeburg, Germany*
- 619 Iron Based Self-lubricating Composites**  
José D. Biasoli de Mello, Cristiano Binder, Gisele Hammes, Renan Schroeder, Aloisio N. Klein, *Universidade Federal de Santa Catarina, Florianópolis, Brazil*
- 759 Austenite Transformation Induced by Abrasion in a Fe-Mn-Al-C Alloy, Investigated by Mössbauer Spectroscopy**  
Jorge Ramos, *Universidad Autónoma de Occidente, Cali, Colombia*, J.F. Piamba, H. Sánchez, Germán A. Perez, *Universidad Del Valle, Cali, Colombia*
- 283 Different Mechanisms of Acoustic Emission in Sliding Friction of Various Metal Pairs**  
Pengyi Tian, Yu Tian, *Tsinghua University, Beijing, China*

**WE2-MT3 Polymers 1****ROOM 1 TORINO • 11:00 – 13:00***Chair: Giulio Malucelli, Politecnico di Torino, Torino, Italy*

- 49 Design of Molecular Weight on Wear-resistant Materials of Modified UHMWPE with Cu (II) chelate of bisalicylaldehyde-ethylenediamine**  
Li Wu, *Wuhan Institute of Technology, Wuhan, China*, Xinlei Gao, *Wuhan Polytechnic University, Wuhan, China*, Wanzhen Gao, *Wuhan Research Institute of Materials Protection, Wuhan, China*, Xiuqing Bai, Chengqing Yuan, *Wuhan University of Technology, Wuhan, China*
- 156 Tribology of Thermoplastic Nanocomposites**  
Nikolai K. Myshkin, Stepan S. Pesetskii, Sergei P. Bogdanovich, *Belarus National Academy of Sciences, Gomel, Belarus*
- 366 Stick-slip Behaviour of Polymer Films in LHe**  
Géraldine Theiler, *BAM Federal Institute for Materials Research and Testing, Berlin, Germany*, Hannah Brice, *MR Magnet Technology, Witney, United Kingdom*, Thomas Gradt, *BAM Federal Institute for Materials Research and Testing, Berlin, Germany*
- 430 Characteristics of Micro-slip for Various Elastomers on Flat and Sphere Arrayed Surfaces**  
Takashi Fujimoto, *Yuge National College of Maritime Technology, Ochi, Japan*
- 521 Friction-Induced Vibrations of the Water-Absorbed Thermoplastic Ester Elastomers**  
Yoshitaka Uchiyama, *Kanazawa University, Kanazawa, Japan*
- 1302 An Examination of the Role of In-situ HDD Additives on Head-disk Interface Tribology**  
Vedantham Raman, Thomas Nguyen, Jorge Escobar, *Hitachi Global Storage Technologies, San Jose, CA, United States*

**WE3-MT4 Ceramics****ROOM 1 TORINO • 14:00 – 15:40***Chair: Giulio Malucelli, Politecnico di Torino, Torino, Italy*

- 27 Characterization of the Scratch Behavior of Architectural Glass**  
Sebastian Schula, Jens Schneider, *Technische Universität Darmstadt, Darmstadt, Germany*
- 228 Research on Green Automotive Brake Materials With High Performance**  
Chenghui Gao, Fushan He, *Fuzhou University, Fuzhou, China*
- 234 Tribological Behavior of a Silicon Carbide/Carbone Dry Contact**  
Stéphanie Lafon-Placette, Karl Delbé, Hélène Weleman, Jean Denape, *Université de Toulouse, Tarbes, France*, Marc Ferrato, Patrick Chéreau, *BOOSTEC, Bazet, France*
- 350 In-situ Investigation of Lateral Junction Growth by Nanoindentation**  
Yeau-Ren Jeng, *National Chung Cheng University, Chia-Yi, Taiwan*
- 970 Experimental Investigation of Wear Behaviors of Bronze and Carbon Reinforced PTFE Alloy Pivot Pin Bearings**  
Huseyin Imrek, Seyit M. Demet, *Selcuk University, Konya, Turkey*

**WE4-MT5 Involved Phenomena 1****ROOM 1 TORINO • 16:10 – 17:30***Chair: Francesco Pagano, IK4-Tekniker, Eibar, Spain*

- 848 Friction of Carbon Black and Silica Reinforced Elastomers**  
Milad Mokhtari, Dirk J. Schipper, *University of Twente, Enschede, Netherlands*, Tetyana V. Tolpekina, *Apollo Vredestein B.V.Ir., Enschede, Netherlands*
- 516 Fretting Wear Behaviour of Materials Used in Gas Turbine Combustor Components**  
Sathisha CH, *GE Global Research, Bangalore, India*, George Ghanime, *GE Global Research, Niskayuna, NY, United States*, Eugenio Del Puglia, *Francesco Mastromatteo, GE Oil & Gas, Florence, Italy*, Srinidhi Sampath, *GE Oil & Gas, Bangalore, India*, Michele Provenzale, *GE Oil & Gas, Florence, Italy*, Anand K., *GE Energy, Bangalore, India*, Marcin Trzcinski, *GE Oil & Gas, Warsaw, India*, Filippo Cappuccini, *GE Oil & Gas, Florence, Italy*
- 968 Erosion Wear Performance of Borax Filled Glass Fiber Reinforced Epoxy Composites by Using the Taguchi Experimental Design**  
Mehmet Bagci, *Selcuk University, Konya, Turkey*
- 660 The Effect of a Coating-substrate System on the Pitting of Lubricated PVD Coated Elements**  
Michał Michalak, Marek Kalbarczyk, Witold Piekoszewski, Marian Szczerek, *Institute for Sustainable Technologies – National Research Institute, Radom, Poland*

**PS2-MT Posters****ATRIUM • 09:00 – 16:30**

- 99 High velocity impact testing of thermal spray hard carbide coatings on steel substrates**  
Richard Waudby, Tommi Varis, Tomi Suhonen, Kenneth Holmberg, *VTT Technical Research Centre of Finland, Espoo, Finland*, Marian Apostol, Matti Lindroos, Veli-Tapani Kuokkala, *Tampere University of Technology, Tampere, Finland*
- 103 Estimation of Head Injury Criterion Score of Impact Attenuation Material Employed around Playground Equipment**  
Yuji Ohue, Keita Miyoshi, *Kagawa University, Takamatsu, Japan*

- 166 The Temperature Stability of the Subsurface Zone Induced by Friction in Bismuth Detected by Positron Lifetime**  
Jerzy Dryzek, *Opole University, Opole, Poland*
- 193 Wear Characteristics of Cermet Coating Film under High Temperature**  
Mafumi Kimiawada, Katsumi Iwamoto, *Tokyo University of Marine Science and Technology, Tokyo, Japan*, Kazuo Toyama, *Tokyo University of Marine Science and Technology, Tokyo, Japan*
- 241 Influence of Heat Treatment on Abrasion Resistance of High-speed Steels**  
Jan Suchánek, *Czech Technical University, Prague, Czech Republic*
- 269 Improvement of Tool Life of Aluminum Extrusion Die Tools**  
Andrés Morelos Zaragoza, Daniel A. Treviño Garza, Francisco J. Inzunza Zavala, Zygmunt Haduch, *University of Monterrey, San Pedro Garza García, NL, Mexico*
- 290 The Effect of Resin Foam/Rubber Thickness Ratio on Frictional Behavior of Shoe Sole Material**  
Kenta Moriyasu, Tsuyoshi Nishiwaki, *ASICS Corporation, Kobe, Japan*, Kei Shibata, Takeshi Yamaguchi, Kazuo Hokkirigawa, *Tohoku University, Sendai, Japan*
- 308 Wear Behavior and Self Tribofilm Formation of Infiltration-type TiC/FeCrWMoV Metal Ceramics Under Dry Sliding**  
YanJun Wang, Ying Han, Liying Yang, Shouren Wang, *University of Jinan, Jinan, China*, Zhenhong Yang, *Fans Company of Jinan, Jinan, China*
- 317 The Development of Adhesion Reduction Method for Thermoplastic CFRP and Mould**  
Motoyuki Murashima, Noritsugu Umehara, Hiroyuki Kousaka, Takayuki Tokoroyama, *Nagoya University, Nagoya, Japan*
- 346 Three-body Abrasive Wear of WC-Co Composites Manufactured by Reactive Sintering of Nanocrystalline Powders**  
Kristjan Juhani, Renee Joost, Jüri Priso, Sergei Letunovits, Mart Viljus, Marek Tarraste, *Tallinn University of Technology, Tallinn, Estonia*
- 358 Effect of the Surface Treatment of CaCO<sub>3</sub> on the Tribological Properties of PA6/PP/CaCO<sub>3</sub> Composites**  
Yosuke Nishitani, Masanori Shitsukawa, Kazuki Yamamoto, *Kogakuin University, Hachioji, Japan*, Takeshi Kitano, *Tomas Bata University in Zlin, Zlin, Czech Republic*
- 361 Influence of Hardness of Polyamide 12 Elastomer on the Tribological Properties of the Polymer Blends of Polyamide 12 Elastomer and Thermoplastic Polyurethane Elastomer**  
Noritada Naruse, Takashi Toba, Yosuke Nishitani, *Kogakuin University, Hachioji, Japan*, Takeshi Kitano, *Tomas Bata University in Zlin, Zlin, Czech Republic*
- 362 Wear Properties of Reactive Sintered WC-TiC-Co Cemented Carbides During Dry Cutting of Carbon Steel**  
Marek Tarraste, Kristjan Juhani, Jüri Pirso, Mart Viljus, Sergei Letunovits, *Tallinn University of Technology, Tallin, Estonia*
- 363 Influence of Type of PTFE on the Tribological Properties of PTFE Filled Semi-Aromatic Polyamide (PA6T) Composites**  
Yuki Takenaka, Takeshi Miyaji, Yosuke Nishitani, *Kogakuin University, Hachioji, Japan*, Takeshi Kitano, *Tomas Bata University in Zlin, Zlin, Czech Republic*
- 369 Lubrication Properties of Copper Molybdate Powders under High Temperature Conditions**  
Yoshinori Takeichi, Kentaro Minami, *Toyohashi University of Technology, Toyohashi, Japan*, Masahiro Kawamura, *Kawamura Research Laboratory Co. Ltd, Meguro, Japan*, Marian Dzimko, *University of Žilina, Žilina, Slovak Republic*
- 419 Friction and Wear Behavior of Rice Bran Ceramics under Vacuum Environment**  
Kei Shibata, Takeshi Yamaguchi, Kazuo Hokkirigawa, *Tohoku University, Sendai, Japan*
- 421 Friction and Wear Behavior of Polyamide 66 Composites Filled with Rice Bran Ceramics Slid against Stainless Steel**  
Kei Shibata, Takeshi Yamaguchi, Ryota Ifuku, Moeko Kishi, Kazuo Hokkirigawa, *Tohoku University, Sendai, Japan*
- 422 Tribological Properties of PEEK Resin Filled with RB Ceramics Particles under Water Lubrication**  
Takeshi Yamaguchi, Jingeul Kim, Yohei Fujii, Kazuo Hokkirigawa, *Tohoku University, Sendai, Japan*
- 454 Bearing and Axial Seal Performances for LH2 Turbopump of Rocket Engine**  
Satoshi Takada, Makoto Kojima, Masataka Kikuchi, Takayuki Sudo, Tomoyuki Takano, *Japanese AeroSpace Technology, Kakuda, Japan*
- 475 Tribological Properties of Nanostructured C/C-SiC Composites**  
Francisco M. Ramos, Mireia Blanes, Anna Amell, Francisco Albero S.A.U., *L'Hospitalet de Llobregat, Spain*, Joseba Esparza, Marta Martínez, José A. García, Rafael Rodríguez, *Centro de Ingeniería de Superficies, Cordovilla-Pamplona, Spain*, Luis A. Díaz, *Universidad de Oviedo, Llanera, Spain*
- 543 The Researches of Strain Hardening 30CrMnSiA Steel**  
Mazhyn Skakov, Gulzhaz Uazyrkhanova, *D. Serikbaev East Kazakhstan State Technical University, Ust-Kamenogorsk, Kazakhstan*, Natalya Popova, *Tomsk State Architecture and Building University, Tomsk, Russian Federation*, Michael Scheffler, *Otto von Guericke University, Magdeburg, Germany*
- 557 Tribological Properties of Multiphase Alloys before and after Laser Treatment**  
Viktor Novytskyi, Vladimir Havryliuk, Vladimir Lakhnenko, *National Academy of Sciences of Ukraine, Kyiv, Ukraine*
- 562 The Influence of Hardness of the Steel Sliding Surfaces on Their Tribological Characteristics**  
Tadeusz Leśniewski, *Wrocław University of Technology, Wrocław, Poland*
- 583 Compressor Airfoil Erosion Coating**  
Robert W. Bruce, Aaron Gastrich, John Hanify, *GE Aviation, Cincinnati, OH, United States*
- 642 Study of the Composite Layers Properties in the Abrasive Wear Resistance Conditions**  
Ingrid Kovaříková, Beáta Šimeková, Erika Hodúlová, Kristián Šalgó, Pavel Blaškovič, *Slovak University of Technology in Bratislava, Trnava, Slovak Republic*
- 721 Tribology of PTFE-based Polymeric Materials: Comparison between Pin-on-disc and Sliding Tests**  
Giulio Malucelli, Marco Actis Grande, *Politecnico di Torino, Alessandria, Italy*, Luigi Mazza, Roberto Grassi, Andrea Trivella, *Politecnico di Torino, Torino, Italy*
- 723 Effect of Al<sub>2</sub>O<sub>3</sub> Particle Size on Electrical Wear Performance of Al<sub>2</sub>O<sub>3</sub>/Cu Composites**  
Kexing Song, Xiuhua Guo, Xiaofeng Xu, Yongzhen Zhang, *Xi'an University of Technology, Xi'an, China*
- 734 Scratch and WWear Characteristics of Polyamide Nanocomposites**  
Luca Andena, Natalia Castro Fajardo, *Politecnico di Milano, Milano, Italy*, Francesco Manarini, Loredana Mercante, *LATI Industria Termoplastici S.p.A., Veduggio Olona, Italy*, Andrea Pavan, *Politecnico di Milano, Milano, Italy*
- 753 Tribological Performance of Forged Steel and Cast Iron Crankshafts on Model Scale**  
Florian Summer, Florian Grün, Jürgen Schiffer, István Gódor, *Montanuniversität Leoben, Leoben, Austria*, Ilias Papadimitriou, *Georg Fischer Automotive AG, Schaffhausen, Switzerland*

- 830 Nanomechanical Properties of C-Pd films**  
Joanna Rymarczyk, *Tele & Radio Research Institute, Warsaw, Poland*, Łukasz Kołodziejczyk, *Łódź University of Technology, Łódź, Poland*, Elżbieta Czerwosz, *Tele & Radio Research Institute, Warsaw, Poland*
- 860 Effects of Cr Content of Steels on Impact Fretting Wear in High Temperature Pure Water**  
Yoshiki Sato, Akira Iwabuchi, Michimasa Uchidate, Hitoshi Yashiro, *Iwate University, Morioka, Japan*
- 863 Influence of Friction Parameters on the Mechanical Properties of Surface Layer of Some Polymers**  
Wojciech Wieleba, Anna Dobrowolska, Piotr Kowalewski, Anita Ptak, *Wrocław University of Technology, Wrocław, Poland*
- 868 Friction and Wear Behaviour of Graphite Filled Polymer Composites in Hydrogen Environment**  
Géraldine Theiler, Thomas Gradt, *BAM - Federal Institute for Materials Research and Testing, Berlin, Germany*
- 902 Friction and Wear Characteristics of Advanced Ceramic Materials**  
Yeczain Perez Delgado, Mariana Staia, Sergei Glavatskikh, Koenraad Bonny, *Ghent University, Ghent, Belgium*, Oliver Malek, Bert Lauwers, Jozef Vleugels, *Catholic University of Leuven, Leuven, Belgium*, Patrick De Baets, *Ghent University, Ghent, Belgium*
- 922 Multi-pass Sub-critical Load Testing of Amorphous Polymeric Surfaces**  
Hervé Pelletier, Damien Favier, Leandro Jacomine, Christian Gauthier, *Institut Charles Sadron, Strasbourg, France*
- 955 Influence of Cobalt and Niobium to the Abrasive Wear Characteristics of Multi-component Cast Iron.**  
Hiroya Hara, Kazumichi Shimizu, Kenta Kusumoto, *Muroran Institute of Technology, Muroran, Japan*, Masahito Tanaka, *Sankyo Alloy Casting Co. Ltd, Osaka, Japan*, Jun Ito, *R&E Inc., Noboribetsu, Japan*, Vasily Iefremenko, *Pryazovskyi State Technical University, Mariupol, Ukraine*
- 993 Wear Modes of Resin Materials in Micro Scale Abrasion Test**  
Takumi Matsuda, *Tohoku University, Sendai, Japan*, Kenichi Sugiyama, Hiroshi Yakuwa, *Ebara corporation, Honfujisawa, Japan*, Koshi Adachi, *Tohoku University, Sendai, Japan*
- 1003 Measurement of Friction Behaviour of Modified NBR and CR Rubbers**  
Jens Klose, *Hochschule für Technik und Wirtschaft Dresden, Dresden, Germany*, Ringo Nepp, Matthias Kröger, *Technische Universität Bergakademie Freiberg, Freiberg, Germany*, Kathrin Harre, *Hochschule für Technik und Wirtschaft Dresden, Dresden, Germany*, Gert Heinrich, *Technische Universität Dresden, Dresden, Germany*
- 1046 High Temperature Friction Response of PECS TiB<sub>2</sub>-B<sub>4</sub>C Composite**  
Yeczain Perez Delgado, Mariana Staia, Sergei Glavatskikh, Koenraad Bonny, *Ghent University, Gent, Belgium*, Oliver Malek, Bert Lauwers, Jozef Vleugels, *Catholic University of Leuven, Leuven, Belgium*, Patrick De Baets, *Ghent University, Gent, Belgium*
- 1083 Contact Behavior of the Hard Thin Ceramic Coatings under Cyclic Loading**  
Fjodor Sergejev, Liina Lind, Maksim Antonov, Priidu Peetsalu, Eron Adoberg, *Tallinn University of Technology, Tallinn, Estonia*
- 1098 Mechanical Conditions and Influence of Oxidation on White Etching Layers Formation**  
Sarah Zitouni, Aurélien Saulot, Samuel Simon, Fabrice Ville, Jérôme Cavolet, *INSA-Lyon, Villeurbanne, France*, Xavier Quost, *Regie Autonome des Transports Parisiens, Fontenay-Sous-Bois, France*, Yves Berthier, *INSA-Lyon, Villeurbanne, France*

- 1104 Influence of Chemical Composition on Friction Behavior of Polymeric Films: Correlation with Adhesion and Deformability**  
Adeline Blaise, Céline Picard, Michel Grisel, *Université du Havre, Le Havre, France*
- 1128 Tribological Comparative Analysis of Abrasive Wear between New and Aged Internal HDPE Liners in Crude Oil Pipelines**  
Juliana R. de Souza, Nayane Carla M. C. de Sá Leitão, Jarbas S. Medeiros, João M. Sabino, João T. N. de Medeiros, *University of Rio Grande do Norte, Natal, Brazil*
- 1190 Influence of Deposition Parameters of TiO<sub>2</sub> Sprayed Films on the Abrasive Wear Resistance**  
Mara Kandeve, *Technical University-Sofia, Sofia, Bulgaria*, Vladimir Blaskov, Irina Stambolova, *Bulgarian Academy of Sciences, Sofia, Bulgaria*, Konstantin T. Balashev, *Sofia University, Sofia, Bulgaria*, Nina Kostova, *Bulgarian Academy of Sciences, Sofia, Bulgaria*
- 1224 Phase, Microstructure, Mechanical and Wear Characteristics of Sintered Rocks Powders**  
Jadna Catafesta, *Universidade de Caxias do Sul, Bom Princípio, Brazil*, Maria C. Moré Farias, Robinson C. Dudley Cruz, *Universidade de Caxias do Sul, Caxias do Sul, RS, Brazil*
- 1231 Effect of Yttria Addition on Mechanical and Tribological Properties of Plasma Nitrided Sintered AISI 316L**  
Michell F. Cano Ordoñez, Israel Krindges, César Aguzzoli, Israel J. Rabin Baumvol, Carlos A. Figueroa, Maria C. Moré Farias, *Universidade de Caxias do Sul, Caxias do Sul, RS, Brazil*
- 1269 Tribological Behavior of Spheroidal Graphite Cast Irons with Nanoadditives**  
Julieta Kaleicheva, Valentin Mishev, *Technical University of Sofia, Sofia, Bulgaria*, Georgi Avdeev, Zdravka Karagiuozova, *Bulgarian Academy of Sciences, Sofia, Bulgaria*, Mara Kandeve, *Technical University of Sofia, Sofia, Bulgaria*
- 1277 Friction of Thin Multi-component Oxide Films: Experiments and Modeling**  
Alexey Useinov, Konstantin Kravchuk, *Technological Institute for Superhard and Novel Carbon Materials, Troitsk, Russian Federation*, Elena Torskaya, Alexey Mezrin, *Russian Academy of Sciences, Moscow, Russian Federation*

## JM – Joint Mechanics

### WE4-JM1 Passive and Active Frictional Joints

ROOM 8 PALERMO • 16:10 – 17:30

Chair: Muzio Gola, *Politecnico di Torino, Torino, Italy*

- 1165 Contact Mechanics of Frictional Lap Joint**  
Anothai Thaitirarot, David Hills, *University of Oxford, Oxford, United Kingdom*, Daniele Dini, *Imperial College London, London, United Kingdom*
- 34 Measurement and Modelling of Interface Stiffness in Frictional Contacts**  
David Nowell, Daniel Mulvihill, *University of Oxford, Oxford, United Kingdom*, Henry Brunskill, *University of Sheffield, Sheffield, United Kingdom*, Mehmet Kartal, *University of Oxford, Oxford, United Kingdom*, Robert Dwyer-Joyce, *University of Sheffield, Sheffield, United Kingdom*
- 669 Assessment on Control Strategies of Friction Dampers**  
Marcelo Braga dos Santos, Francisco P. Lepore Neto, *Federal University of Uberlândia, Uberlândia, Brazil*
- 3 Semi-active Control of Structures Assembled by Bolted Joints**  
Lothar Gaul, *University of Stuttgart, Stuttgart, Germany*, Jens Becker, *Moog GmbH, Boblingen, Germany*



Thursday, September 12<sup>th</sup>

## BT – Biotribology

## TH1-BT9 Tactile Tribology I

ROOM 2 PISA • 08:30 – 10:30

Chair: Emile van der Heide, *University of Twente, Netherlands*

- 335 Non-uniform Contact Behaviour of Human Skin in Contact with Micro-Textured Pillar Surfaces**  
Sheng Zhang, Marc Masen, Emile Van der Heide, *University of Twente, Enschede, Netherlands*
- 1206 Preliminary Study of the Mechanical Properties and Frictional Response of Damaged Skin after Regeneration**  
Joanna Furgala, *Wrocław University of Technology, Wrocław, Poland*, Jolanta Baranowska, *West Pomeranian University of Technology, Szczecin, Poland*
- 519 Tactile Friction of Topical Formulations**  
Lisa Skedung, Lovisa Ringstad, *SP Technical Research Institute of Sweden AB, Stockholm, Sweden*, Izabela Buraczewska-Norin, *KTH Royal Institute of Technology, Stockholm, Sweden*, Mark Rutland, *ACO HUD Nordic AB, Upplands Väsby, Sweden*
- 1272 Haptic Tribology with Human Finger**  
Hassan Zahouani, Mehdi Djaghoul, Roberto Vargiolu, *ENISE - École Centrale de Lyon, Saint-Etienne, France*
- 692 Tactile Device for Textile Fabrics Simulation and Tactile Perception Study**  
Marie-Ange Bueno, *University of Haute Alsace, Mulhouse, France*, Frédéric Giraud, Michel Amberg, Betty Lemaire-Semail, *Université Lille 1, Villeneuve d'Ascq, France*
- 1187 Parameters Influencing the Friction of In Vivo Human Skin**  
Marc A. Masen, Noor K. Veijgen, T. Wolda, Emile van der Heide, *University of Twente, Enschede, Netherlands*

## TH2-BT10 Tactile Tribology II

ROOM 2 PISA • 11:00 – 13:00

Chair: Yu Yan, *University of Science and Technology Beijing, China*

- 410 On the Probability of Skin Damage due to Frictional Heating in Real Asperity Contacts**  
Emile van der Heide, Marc Masen, Sheng Zhang, Julien van Kuilenburg, *University of Twente, Enschede, Netherlands*, Edwin Gelinck, *TNO, Netherlands*
- 826 Friction of Various Polymer Textures against Skin-like Materials**  
Matthew A. Darden, Christian J. Schwartz, *Iowa State University, Ames, IA, United States*
- 1167 Dynamic Modelling of Finger-surface Contacts**  
Ramona Fagiani, *Università degli studi di Parma, Parma, Italy*, Marco Barbieri, *Università di Modena e Reggio Emilia, Modena, Italy*
- 582 Tribology, Texture and Touch**  
Lisa Skedung, Mark W. Rutland, *SP Technical Research Institute of Sweden, Stockholm, Sweden*, Martin Arvidsson, Birgitta Berglund, *Stockholm University, Stockholm, Sweden*, Jun Chung Young, Christopher M. Stafford, *National Institute of Standards and Technology, Gaithersburg, MD, United States*
- 1238 Tribological Approach of the Contact Human Skin Synthetic Fabric**  
Jérôme Cavoret, Benyebka Bou-Saïd, Fabrice Ville, *INSA-Lyon, Villeurbanne, France*

## TH3-BT11 Hydrogels

ROOM 2 PISA • 14:00 – 16:00

Chair: Nicholas D. Spencer, *ETH Zürich, Switzerland*

- 908 Keynote: Squishy Physics and Slippery Hydrogels**  
Alison C. Dunn, Juan M. Urueña, Thomas E. Angelini, W. Gregory Sawyer, *University of Florida, Gainesville, FL, United States*
- 313 Effect of Synovial Fluid Constituents on Tribological Performance of Artificial Hydrogel Cartilage Material**  
Seido Yarimitsu, Kazuhiro Nakashima, Yoshinori Sawae, Teruo Murakami, *Kyushu University, Fukuoka, Japan*
- 428 Elution and Wear of PVA Hydrogels by Reciprocating Friction**  
Atsushi Suzuki, Saori Sasaki, Syouhei Sasaki, Taegu Noh, *Yokohama National University, Yokohama, Japan*, Kazuhiro Nakashima, Seido Yarimitsu, Teruo Murakami, *Kyushu University, Fukuoka, Japan*
- 596 Effects of Bulk Transport on Surface Friction of Hydrogels**  
Tetsuo Yamaguchi, Teruo Murakami, *Kyushu University, Fukuoka, Japan*
- 1273 Mechanical and Frictional properties of Laminated Alpha-TCP filled Polyvinyl Alcohol Hydrogel**  
Tomoaki Iwai, Kanae Yamamoto, Keisuke Asahara, Yutaka Shoukaku, *Kanazawa University, Kanazawa, Japan*
- 66 Effects of Irradiation Dose on Mechanical Properties of PVA/PVP Hydrogels as Articular Cartilage**  
Dangsheng Xiong, Yan Shi, Jinfeng Zhang, *Nanjing University of Science and Technology, Nanjing, China*

## TH4-BT12 Hydrogels, Scaffolds and Soft Contacts

ROOM 2 PISA • 16:30 – 18:50

Chair: Atsushi Suzuki, *Yokohama National University, Japan*

- 585 The Effect of Material, Structure and Cell Culture on the Tribological Performance of 3D Porous Scaffold for Functional Tissue Regeneration**  
Xiangqiong Zeng, Wim Hendrikson, Jincan Yan, Jeroen Rouwkema, Clemens van Blitterswijk, Lorenzo Moroni, Emile van der Heide, *University of Twente, Enschede, Netherlands*
- 1075 Traction Loading on Tissue Surface Stimulate Cartilage Tissue Development by Cultured Chondrocytes**  
Yoshinori Sawae, Keisuke Fukuda, Seiji Omata, *Kyushu University, Fukuoka, Japan*
- 1112 Adsorption of Synovial Fluid Proteins on Biomaterials for Permanent Meniscus Replacement and their Bio-lubrication**  
Sara Ehsani Majd, Roel Kuijter, *University of Groningen, Groningen, Netherlands*, Tannin Schmidt, *University of Calgary, Calgary, Canada*, Prashant K. Sharma, *University of Groningen, Groningen, Netherlands*
- 1255 Friction of Medical Materials on PVA Hydrogel in Physiological Lubrication**  
Hiroyuki Kosukegawa, Vincent Fridrici, Emmanuelle Laurenceau, *École Centrale de Lyon, Écully, France*, Makoto Ohta, *Tohoku University, Sendai, Japan*, Philippe Kapsa, *École Centrale de Lyon, Écully, France*
- 286 Superior Lubricity in Articular Cartilage and Artificial Hydrogel Cartilage**  
Teruo Murakami, Seido Yarimitsu, Kazuhiro Nakashima, Tetsuo Yamaguchi, Yoshinori Sawae, Nobuo Sakai, Atsushi Suzuki, *Kyushu University, Fukuoka, Japan*
- 150 Nanomechanical Characterization of Biological Surfaces Using Combination of Nanotribology and Instrumented Indentation**  
Jiri Nohava, Fanny Ecarla, *CSM Instruments, Peseux, Switzerland*, Gilles Weder, *CSEM, Neuchâtel, Switzerland*
- 1323 Ultralow Friction of Soft Matters and Antibiofouling Application**  
Feng Zhou, *Chinese Academy of Science, Lanzhou, China*



## ST – Surface Tribology

## TH1-ST18 Contact Mechanics 5

ROOM 3 MILANO • 08:30 – 10:30

Chair: Leon Keer, *Northwestern University, Evanston, IL, United States*

- 390 Multi-Body Contact Problem for a Nonhomogeneous Elastic Coated Foundation with Wear**  
Alexander V. Manzhirov, *Russian Academy of Sciences, Moscow, Russian Federation*
- 684 Mechanothermodynamic Analysis of Volumetric Damage in Complex Systems with Contact Interaction**  
Leonid A. Sosnovskiy, *Interdepartmental Laboratory "TRIBO-FATIGUE", Gomel, Belarus*, Michael M. Khonsari, *Louisiana State University, Baton Rouge, LA, United States*, Sergei S. Sherbakov, *Belarusian State University, Minsk, Belarus*
- 757 Predictions of the Average Surface Separation and Stiffness between Contacting Elastic and Elastic-Plastic Sinusoidal Surfaces**  
Amir Rostami, Robert L. Jackson, *Auburn University, Auburn, United States*
- 881 Microstructure and Linear Scratch Test of Low Temperature Plasma Nitrided Stainless Steels**  
Luis Espitia, Luis Varela, Gabriela Tieppo, *University of São Paulo, São Paulo, SP, Brazil*, Carlos Pinedo, *Heat Tech Technology for Heat Treatment and Surface Engineering Ltd, Mogi das Cruzes, SP, Brazil*, Mario Bocalini, *São Paulo Technological Research Institute, São Paulo, SP, Brazil*, André P. Tschiptschin, *University of São Paulo, São Paulo, SP, Brazil*
- 1066 Smoothed Particle Applied Mechanics (SPAM) in Tribology: Simulating a Scratch Test**  
Severin Nugent, Armin Fischer, Sotirak Ilo, Georg Vorlauffer, *AC<sup>2</sup>T Research GmbH, Wiener Neustadt, Austria*
- 1162 Sliding Contact Problems Involving Multi-layered Elastic Materials**  
Stewart Chidlow, *Oxford Brookes University, Oxford, United Kingdom*, Nick Cramer, Mircea Teodorescu, *University of California - Santa Cruz, Santa Cruz, CA, United States*

## TH1-ST19 Texturing 1

ROOM 4 VENEZIA • 08:30 – 10:30

Chair: Carsten Gachot, *Saarland University, Saarbrücken, Germany*

- 13 Static and Dynamic Wettability of Multiscaled Surfaces Processed with Femtosecond Laser**  
Stéphane Valette, Pavel Bizi-Bandoki, *École Centrale de Lyon, Écully, France*, C. Maclair, *Université Jean Monnet, Saint-Etienne, France*, Stéphane Benayoun, *École Centrale de Lyon, Écully, France*
- 84 Macro-surface Modification through Exploitation of Rivets and Dimples - Numerical and Experimental**  
Mohd Danial Ibrahim, Mohd Shahril Osman, *Universiti Malaysia Sarawak, Kota Samarahan, Malaysia*, Norifumi Miyana, *Waseda University, Shinjuku-ku, Japan*, Amir Azam Khan, *Universiti Malaysia Sarawak, Kota Samarahan, Malaysia*
- 883 Optical Characterisation of Polished Steel Surfaces**  
M. L. Miranda-Medina, Peter Somkuti, Bern Steiger, *AC<sup>2</sup>T Research GmbH, Wiener Neustadt, Austria*, D. Bader, *Berndorf Band GmbH, Berndorf, Austria*, Martin Jech, András Vernes, *AC<sup>2</sup>T Research GmbH, Wiener Neustadt, Austria*, Kurt Hingerl, *Johannes Kepler University Linz, Linz, Austria*
- 793 Laser Surface Texturing: the Effect of Dimple Diameter and Oil Viscosity**  
Daniel Braun, Christian Greiner, Johannes Schneider, *Karlsruhe Institute of Technology, Karlsruhe, Germany*

- 836 A Combination Effect of Laser Surface Texturing and Solid Lubricant Film on Tribological Properties by Multi-Dimple Pattern**

Dawit Z. Segu, *Kyungpook National University, Daegu, Republic of Korea*, Jong-Hyoung Kim, *Korea Institute of Industrial Technology, Daegu, Republic of Korea*, Si Geun Choi, Yong-Sub Jung, Seock-Sam Kim, *Kyungpook National University, Daegu, Republic of Korea*

- 1146 Surface Modification of Hard PVD Coatings by Laser Texturing to Increase the Sliding Wear Resistance**  
Daniele Ugues, *Politecnico di Torino, Torino, Italy*, Nora Lecis, Ali G. Demir, Barbara Previtali, *Politecnico di Milano, Milano, Italy*

## TH2-ST20 Coatings 7

ROOM 3 MILANO • 11:00 – 13:00

Chair: Josef Brenner, *AC<sup>2</sup>T Research GmbH, Wiener Neustadt, Austria*

- 165 Mechanical and Tribological Behaviour of Thin Ceramic Coatings Deposited on PET and PEN Substrates**  
Abdul Shah, Nathalie M. Renevier, Ian Sherrington, *University of Central Lancashire, Preston, United Kingdom*, David Wickens, *Manchester Metropolitan University, Manchester, United Kingdom*, Peter Kelly, *Manchester Metropolitan University, Manchester, United Kingdom*
- 1295 Comparative Analysis of the Tribological Behaviour of HVOF- and HVAF-sprayed Cermet Coatings**  
Lutz-Michael Berger, *Fraunhofer-Institut für Werkstoff- und Strahltechnik (IWS), Dresden, Germany*, Giovanni Bolelli, Tim Börner, *Università degli Studi di Modena e Reggio Emilia, Modena, Italy*, Heli Koivuluoto, *Tampere University of Technology, Tampere, Finland*, Luca Lusvarghi, *Università degli Studi di Modena e Reggio Emilia, Modena, Italy*, Christophe Lyphout, Nicolaie Markocsan, Per Nylén, *University West, Trollhättan, Sweden*, Petri Vuoristo, *Tampere University of Technology, Tampere, Finland*, S. Zimmermann, *H.C. Starck GmbH, Laufenburg, Germany*
- 547 Tribology Behavior under Different Working Conditions and Friction Heat Effect on Abradability of Abradable Seal Coating**  
Shu Li, Deli Duan, Siyang Gao, *Chinese Academy of Sciences, Shenyang, China*
- 981 Effectiveness of Hard Coatings for Vacuum Lubrication by Space Liquid Lubricants**  
Masanori Iwaki, *Japan Aerospace Exploration Agency, Tsukuba, Japan*, Takanori Takeno, Hiroyuki Miki, Toshiyuki Takagi, *Tohoku University, Sendai, Japan*
- 1207 Tribological Behaviour of Ferrous-based APS Coatings under Dry Sliding Conditions**  
Aleksandar Vencel, *University of Belgrade, Belgrade, Serbia*
- 499 Study on the Residual Stress of Si Doped CNx Films**  
Tianmin Shao, Shiyu Hu, Xiao Huang, Hui Wang, *Tsinghua University, Beijing, China*

## TH2-ST21 Texturing 2

ROOM 4 VENEZIA • 11:00 – 13:00

Chair: Stéphane Valette, *École Centrale de Lyon, Écully, France*

- 35 Measurement of Lubricant Film Thickness in a Gearbox Journal Bearing with Ultrasonic Reflection**  
Hiroyuki Suzuki, Matt Marshall, Robert Dwyer-Joyce, *University of Sheffield, Sheffield, United Kingdom*
- 37 Starved Lubrication of Textured Surfaces**  
Henara L. Costa, *Universidade Federal de Uberlândia, Uberlândia, MG, Brazil*
- 118 A Homogenization Method of Modeling Surface Texturing Effect in Full Film Lubrication**  
Shiyuan Pei, Lin Wang, Hua Xu, *Xi'an Jiaotong University, Xi'an, China*

- 423 Improvement of Friction Characteristics on Reciprocating Machinery by Surface Texturing**  
Masaki Oda, Katsumi Iwamoto, Kentaro Tanaka, *Tokyo University of Marine Science and Technology, Tokyo, Japan*, Toshikazu Fujino, *Nagaoka University of Technology, Nagaoka, Japan*
- 530 Effect of Brush Structure on Friction under Water Lubrication**  
Shingo Kawara, Noritsugu Umehara, Takayuki Tokoroyama, *Nagoya University, Nagoya, Japan*, Masahiro Suzuki, *Toshiyuki Saito, JTEKT Corporation, Kashiwara, Japan*
- 420 Friction and Wear Behavior of Textured Cu alloy under Dry and Oil-lubricated Conditions**  
Auezhan Amanov, *Tokyo University of Science, Tokyo, Japan*, Jun Hyong Kim, Young Sik Pyun, *Sun Moon University, Asan, Republic of Korea*, Shinya Sasaki, *Tokyo University of Science, Tokyo, Japan*

**TH3-ST22 Coatings 8**

ROOM 3 MILANO • 14:00 – 16:00

Chair: Filippo Mangolini, *University of Pennsylvania, Philadelphia, PA, United States*

- 56 On the Weakening Effect in a Spherical Contact with Thin Hard Coatings**  
R. Goltsberg, I. Etsion, *Technion, Haifa, Israel*
- 666 Effect of Substrate Surface Finish/Coating Architecture on the Sliding Wear of Multi-layered/Gradient NCrAlSi Coatings**  
Silviu Victor, Carlos A.S. de Oliveira, *Universidade Federal de Santa Catarina, Florianópolis, Brazil*, Mario M. de Oliveira, José D. Biasoli de Mello, *Universidade Federal de Uberlândia, Uberlândia, Brazil*
- 885 Smart Coatings and Green Tribology**  
Emilia Assenova, *Society of Bulgarian Tribologists, Sofia, Bulgaria*, Gottlieb Polzer, *Tribology Unit, Schönfels, Germany*, Dr. Tsermaa, *University of Ulan Bator, Ulan Bator, Mongolia*, Mara Kandeve, *Technical University - Sofia, Sofia, Bulgaria*
- 1029 Study on Anti-Micropitting Protective Mechanisms of Black Oxide Coating**  
Victor Brizmer, Andriy Rychahivskyy, Bo Han, *SKF Engineering & Research Centre, Nieuwegein, Netherlands*
- 1080 PVD Refractory Metal Based Coatings for Tribological Applications**  
Silvia M. Deambrosis, Enrico Miorin, Francesco Montagner, Valentina Zin, *CNR-Institute for Energetics and Interphases, Padova, Italy*, Marco Sebastiani, *University "Roma Tre", Roma, Italy*, D. Dellasega, M. Passoni, *Politecnico di Milano, Milano, Italy*, Edoardo Bemporad, *University "Roma Tre", Roma, Italy*, Monica Fabrizio, *CNR-Institute for Energetics and Interphases, Padova, Italy*
- 1200 The Effect of Applied Load on Tribological Behaviour of PVD-CrN Coatings**  
Candida Petrogalli, Lorenzo Montesano, Marcello Gelfi, Giovina M. La Vecchia, *University of Brescia, Brescia, Italy*, Paolo Colombi, *CSMT Gestione S.c.a.r.l., Brescia, Italy*

**TH3-ST23 Texturing 3**

ROOM 4 VENEZIA • 14:00 – 16:00

Chair: Noël Brunetière, *Université de Poitiers, Futuroscope Chasseneuil, France*

- 191 Investigation on the Load Carrying Capacity of Textured Surface Based on Interferometry Measurements**  
Enyang Zhang, Bo Zhang, Wei Huang, Xiaolei Wang, *Nanjing University of Aeronautics & Astronautics, Nanjing, China*

- 258 Numerical Analysis of Global and Local Effects of Textures on the Hydrodynamic Performance of a Mechanical Seal**  
Mohand Adjemout, Noël Brunetière, Jean Bouyer, *CNRS-Université de Poitiers, Chasseneuil, France*
- 638 CFD Investigation of Influence of Surface Texturing on the Wedge Effect**  
Yasutsugu Oshima, Akira Nakano, Ryo Tsuboi, Shinya Sasaki, *Tokyo University of Science, Tokyo, Japan*
- 810 Improving Piston-liner Performance thru Surface Texturation: Coupling Measurement and Theoretical Study to Optimize Friction and Oil Consumption**  
Pierre Charles, Gabriel Cavallaro, *PSA Peugeot Citroën, La Garenne-Colombes, France*
- 873 Investigation of Tribological Properties and Vortex Structures in the Texture by using Computational Fluid Dynamics**  
Ryo Tsuboi, Yasutsugu Oshima, Akira Nakano, Shinya Sasaki, *Tokyo University of Science, Tokyo, Japan*
- 1159 A Numerical and Experimental Approach in Understanding the Performance of Textured Surfaces in Sliding Contacts**  
Nicholas J. Morris, Miguel De La Cruz, Ramin Rahmani, Michael Leighton, Homer Rahnejat, Paul King, *Loughborough University, Loughborough, United Kingdom*

**TH4-ST24 Surface Analysis**

ROOM 3 MILANO • 16:30 – 18:50

Chair: Hagen Lind, *Leibniz Universität Hannover, Germany*

- 14 Micro-Tribological Characterization of Coated Paper, Influence of Nano Sized Particles**  
Hermann Schmid, *PTS Munich, Munich, Germany*, Wolfgang P. Weinhold, *Innowep GmbH, Würzburg, Germany*
- 444 Directional Fractal Signature and Optimization of Surface Textures**  
Pawel Podsiadlo, Gwidon Stachowiak, *Curtin University, Perth, Australia*
- 445 Numerical Characterization of AFM Images of Self-structured Surface Textures**  
Marcin Wolski, Pawel Podsiadlo, Gwidon W. Stachowiak, *Curtin University, Perth, Australia*
- 953 Reduced Description of Three-dimensional Measured Surface Texture**  
Hagen Lind, Hendrik Kues, Tim Linke, *Leibniz Universität Hannover, Hannover, Germany*, Frank Schmerwitz, Burkhard Wies, *Continental Reifen Deutschland GmbH, Hannover, Germany*
- 1271 Relaxation of Surface Tension of Aqueous Solutions by Humidification of the Gas Phase**  
Marco A. Álvarez-Valenzuela, Sergio Jiménez-López, Juan Sanchez Garcia Casarrubios, Efrén Díez-Jiménez, Ignacio Valiente-Blanco, Cristian Cristache, José L. Pérez Díaz, *Universidad Carlos III de Madrid, Leganes, Spain*

**TH4-ST25 Surface Treatments 2**

ROOM 4 VENEZIA • 16:30 – 18:50

Chair: Rowena Crockett, *EMPA, Dübendorf, Switzerland*

- 43 Combined Modeling and Experimental Studies of Interacting Polymer Brushes under Shear**  
Manjesh Kumar Singh, Patrick Ilg, Rosa M. Espinosa-Marzal, Martin Kröger, Nicholas D. Spencer, *ETH, Zürich, Switzerland*
- 211 Evaluation of Strategies in Finishing Cylinder Running Surfaces**  
Bernhard Karpuschewski, Florian Welzel, Konstantin Risse, *University of Magdeburg, Magdeburg, Germany*, Andrea Mura, *Politecnico di Torino, Torino, Italy*

- 334 Tribological Behaviour of Plasma-treated PPS Composites with Water Lubrication**  
Masaaki Yamane, Kumiko Yoshihisa, *IHI Corporation, Yokohama, Japan*
- 446 Effects of Bamboo Fiber Modifications on the Tribological Performance of their Reinforced Brake Composites**  
Fushan He, Chenghui Gao, Kaikui Zheng, Youxi Lin, *Fuzhou University, Fuzhou, China*
- 780 Optimizing Roughness and Stress Through Isotropic Finishing and Controlled Shot Peening of Surfaces**  
Alessandro Zanini, *Metal Improvement Company, Piacenza, Italy*

## PS3-ST Posters

ATRIUM • 09:00 – 16:30

- 75 Nitriding of AISI 4140 Steel by EDM**  
Rogério F. Santos, Ernane R. Silva, Henara L. Costa, André R. F. Oliveira, Alberto A. Raslan, *Universidade Federal de Uberlândia, Uberlândia, MG, Brazil*
- 167 Choice of Fractal Surface Synthesis Algorithm**  
Chao Zhou, Chenghui Gao, *Fuzhou University, Fuzhou, China*
- 218 Tribological Behavior of AISI H13 Steel Subjected to Boriding Thermochemical Treatment**  
Anael Preman Krelling, Julio César Giubilei Milan, César Edil da Costa, *State University of Santa Catarina, Joinville, SC, Brazil*
- 232 Function-based Geometrical 3D Surface Characterization**  
Saskia Schiefer, Marco Gerlach, Sophie Gröger, *Technische Universität Chemnitz, Chemnitz, Germany*
- 275 Experimental Simulation of Grid-to-Rod Fretting in a Single Nuclear Fuel Rod**  
Young-Ho Lee, Hyung-Kyu Kim, Kang-Hee Lee, Heung-Seok Kang, *Korea Atomic Energy Research Institute, Daejeon, Republic of Korea*
- 287 Effect of Slurry Conditions on Performance and Abrasive Erosion of Non-clogging Centrifugal Pump Impeller**  
Jeong-Eui Yun, Joo-Ho Kim, *Kangwon National University, Samcheok, Republic Of Korea*
- 311 Soft-chemo Mechanical Surface Tribology**  
Wolfgang P. Weinhold, *Innowep GmbH, Würzburg, Germany*, Ralph Stengler, *University of Applied Sciences, Darmstadt, Germany*, Helen Wang, *AMT Advanced Material Technology Inc., Beijing, China*, M. Nuss, *University of Würzburg, Würzburg, Germany*
- 316 Micromechanical and Microtribological Surface Analysis of Wind Turbine Blades coated with Nanoparticles**  
Wolfgang P. Weinhold, *Innowep GmbH, Würzburg, Germany*, Ralph Stengler, *University of Applied Sciences, Darmstadt, Germany*, Helen Wang, *AMT Advanced Material Technology Inc., Beijing, China*, M. Nuss, *University of Würzburg, Würzburg, Germany*
- 319 The Impact of Slider Surface Roughness on the Touchdown-Takeoff Hysteresis Phenomenon**  
Ramida Vithoonsaritsilp, George L. Best, *Western Digital (Thailand) Co., Bangpa-in, Thailand*, Joydeep Dutta, *Asian Institue of Technology, Klong Luang, Thailand*
- 402 The Effect of the TiN and CrN Interlayers on the Tribological Behavior of DLC Coatings**  
Monika Madej, *Kielce University of Technology, Kielce, Poland*
- 404 Stress-Strain State and Damage of the Mutielement System with Complex Contact Interactions between its Elements**  
Sergei Sherbakov, *Belarusian State University, Minsk, Belarus*, Leonid Sosnovskiy, *Interdepartmental Laboratory "Tribo-Fatigue", Gomel, Belarus*

- 462 Synergistic Roles of Benzotriazole and Sodium Dodecyl Sulfonate in CMP of Copper at a Reduced Down Pressure**  
Guoshun Pan, Hua Gong, Zhonghua Gu, *Tsinghua University, Beijing, China*
- 486 Friction and Wear Properties by Laser-textured Piston-ring Surfaces**  
Yali Zhang, Xiaogang Zhang, Jiaoyi Wu, Tonghai Wu, You-Bai Xie, *Xi'an Jiaotong University, Xi'an, China*
- 535 Comparative Tribological Behavior between Stainless Steels AISI 316L**  
Mamoun Fellah, Mohammed Labaiz, Omar Assala, *Badji Mokhtar University, Annaba, Algeria*, Alain Iost, *Laboratory of metallurgy and materials science ENSAM, Lille, France*
- 615 Surface Texturing by Making Use of Microploughing**  
Jun Shimizu, Takeyuki Yamamoto, Libo Zhou, Teppei Onuki, Hirotaka Ojima, *Ibaraki University, Hitachi, Japan*
- 617 Chemical Mechanical Polishing (CMP) of SiC Wafer Utilizing Catalyst in Slurry**  
Yan Zhou, Guoshun Pan, Guihai Luo, Xiaolei Shi, Chunli Zou, *Tsinghua University in Shenzhen, Shenzhen, China*, Yuhong Liu, *Tsinghua University, Beijing, China*
- 653 Effect of post Oxidation Treatment on Wear Resistance of Nitrided Plain Carbon Steels**  
Davide Mombelli, Nora Lecis, *Politecnico di Milano, Milano, Italy*, Gianluca Mancuso, *Colmegna S.p.A, Siziano (Pv), Italy*
- 656 Fracture of Minerals under Controlled Environment for a Better Understanding of Dry Grinding**  
Clotilde Minfray, Sandrine Bec, Anton Rusanov, Matthieu Guibert, Thierry Le Mogne, *École Centrale de Lyon, Écully, France*
- 712 Microtopographic Features of Worn Surfaces**  
Árpád Czifra, Béla Palásti Kovács, *Óbuda University, Budapest, Hungary*
- 856 Working and Application of the Combined, non-polluting Methods of a Covering-greasing**  
Sulkhan Iashvili, Slava Mebonia, Maia Iadze, A. Suladze, Ts. Iashvili, *Institute of Machine Mechanic, Tbilisi, Georgia*
- 870 Investigation of the Effects of a Micro Texturing on the Hydrodynamic Lubrication**  
Bora Lee, Suk Man Moon, Yong Joo Cho, *Pusan National University, Busan, Republic of Korea*
- 914 Correlation between the State of the Metal-polymer Surface and the Friction Parameters in (-50 ÷ 0) °C Temperature Range**  
Anita Ptak, Wojciech Wieleba, *Wrocław University of Technology, Wrocław, Poland*
- 920 Influence of Weather Factors on Seasonal Frictional Possibilities of Coupling of Wheels with Rails and Economic Estimations of Railway Transport Work**  
Yury Luzhnov, *Al Russia Railway Research Institute, Moscow, Russian Federation*, Alina Romanova, *State University of Railway Transport, Moscow, Russian Federation*
- 921 Abrasive Wear Resistance of Multi-layered/Gradient NCrAlSi PVD Coatings**  
W.M. da Silva, V. C. Teles, *Universidade Federal de Uberlândia, Uberlândia, Brazil*, S. Victor, C.A.S. de Oliveira, *Universidade Federal de Santa Catarina, Florianópolis, Brazil*, J.D. Biasoli de Mello, *Universidade Federal de Uberlândia, Uberlândia, Brazil*
- 964 Contact Stress Induced Micromagnetic Behavior in Magnetic Recording Disk**  
Lei Yang, Dongfeng Diao, Meiling Guo, *Xi'an Jiaotong University, Xi'an, China*
- 978 Study on Rough Surface Contact Using a Direct Simulation with Computer Generated Surfaces**  
Michimasa Uchidate, Akira Iwabuchi, Tomoharu Shimui, *Iwate University, Morioka, Japan*



- 990 Scale Effect on Adhesion of Textured Elastomeric Surfaces**  
Valentin Hisler, *Université de Strasbourg, Strasbourg, France*, Marie Palmieri, *Université de Haute Alsace, Mulhouse, France*, Vincent Le Houérou, Christian Gauthier, *Université de Strasbourg, Strasbourg, France*, Michel Nardin, Marie-France Vallat, Laurent Vonna, *Université de Haute Alsace, Mulhouse, France*
- 1085 Complex Wear Measurement on Thin PVD Coatings Using a Novel Tribometer**  
Cesare Di Cesare, Luca Bosio, Marco Bacchereti, Massimiliano Cecconi, *Scienza Macchinale Srl, Navacchio di Cascina (Pi), Italy*, Vincenzo Mangione, Edoardo Bemporad, *University of Rome "Roma 3", Roma, Italy*
- 1094 Lubrication Condition Prediction of Laser Surface Textured Rotary Seal Rings**  
Yimin Zhao, Chao Wei, Jibin Hu, Shihua Yuan, *Beijing Institute of Technology, Beijing, China*
- 1122 Friction on Ice: Influence of Surface Topography**  
Alberto Spagni, Enrico Gualtieri, Antonio Ballestrazzi, Alberto Rota, Sergio Valeri, *Università di Modena e Reggio Emilia, Modena, Italy*
- 1170 Cavitation Erosion Behavior of CrN and AlCrN Coatings Deposited on 34 CrAlNi 7 Plasma Nitrided Steel**  
Flávio J. da Silva, *Federal University of Espírito Santo, Vitória, Brazil*, Sinésio D. Franco, *Federal University of Uberlândia, Uberlândia, Brazil*
- 1177 Experimental Topological Analysis Simulating a Wall of the Internal Surface of Pipelines by Mechanical Profilometry**  
Christiano J. Menezes da Costa, Jarbas Santos de Medeiros, Alysson A. Santos da Silva, João T. Nóbrega de Medeiros, João M. Sabino, *Federal University of Rio Grande do Norte, Natal, Brazil*, Claudio S. Camerini, *Centro de Pesquisa da Petrobrás - Petróleo Brasileiro S.A., Brazil*
- 1185 Corrosive-Cavitative-Erosive Wear of a Carbon Steel in Aqueous Medium with Salt (NaCl), CO<sub>2</sub> and Solid Particulates (SiO<sub>2</sub>) Fractions**  
Fernando Nunes da Silva, Jardel Dantas da Cunha, Fabiana Fernandes de Lima, Djalma Ribeiro da Silva, João T. Nóbrega de Medeiros, *Federal University of Rio Grande do Norte, Natal, Brazil*
- 1241 Friction and Wear of Ni Coatings with Nanosize Particles of SiC**  
Mara Kandeve, *Technical University - Sofia, Sofia, Bulgaria*, Dimitar Karastoyanov, *Bulgarian Academy of Sciences, Sofia, Bulgaria*, B. Ivanova, Anna Dimitrova, Yavor Sofronov, Nikolay Nikolov, *Technical University - Sofia, Sofia, Bulgaria*
- 1262 Tribological Properties of Textured Copper Alloy Surface Containing Micro Sized Sulfide Phase**  
Tomohiro Sato, Yoshimasa Hirai, Takehisa Fukui, *Kurimoto Ltd., Osaka, Japan*, Yuma Horiba, Kazuki Tanizawa, Hatsuhiko Usami, *Meijo University, Nagoya, Japan*
- 1304 Effect of Surface Functionalization of Friction Materials Fillers on Physical and Tribological Properties**  
Diego A. Santamaria Razo, Diego Pellerej, Pietro Buonficio, *ITT Motion Technologies Italia srl, Barge (Cn), Italy*, Barbara Onida, *Politecnico di Torino, Torino, Italy*
- 1310 Improving Operational Performances of Wearing Parts in the Charging Mechanisms of the HK 33E Infantry Rifles**  
Ayhan Aytaç, *Turkish Military Academy, Ankara, Turkey*, Uğur Malayoğlu, *Dokuz Eylül University, İzmir, Turkey*
- 1319 An Integrated Hard- and Soft- ware Triboelectrochemical Test Rig for Tribocorrosion Experiments**  
Marc Bellantonio, *TRIBOtechnic, Clichy, France*

## FW – Dry Friction and Wear

TH1-FW10 Experiment, Equipment, Test Methods 1  
ROOM 5 NAPOLI • 08:30 – 10:30Chair: Michael Varenberg, *Technion, Haifa, Israel*

- 54 Keynote: Ranking of Particulate Abrasivity**  
Kenneth G. Budinski, *Bud Labs, Rochester, NY, United States*
- 1261 Impact-sliding Wear Characteristics of Nitrided Stainless Steel at 400°C**  
Junichi Yoshihisa, *IHI corporation, Yokohama, Japan*, Jean-Christophe Abry, Gaeton Bouvard, Philippe Kapsa, *Ecole Central de Lyon, Écully, France*
- 1308 Wear Mechanisms in Polyoxymethylene (POM) Spur Gears**  
Mike Evans, Sam Akehurst, Patrick Keogh, *University of Bath, Bath, United Kingdom*
- 95 Dynamic Friction Measurement and Modelling - A Review**  
Shuwen Wang, Zhenning Yang, Kang Chen, Rutao Zhao, Houqi Liu, *Harbin Institute of Technology at Weihai, Weihai, China*
- 117 Experimental Measurement of Friction for Elevator Sliding Guide System**  
Xi Shi, Huibo Fang, Lei Qian, *Shanghai Jiao Tong University, Shanghai, China*, Simo Makimattila, *KONE Elevator Co., Kunshan, China*, Changming Zhu, *Shanghai Jiao Tong University, Shanghai, China*
- 216 Experimental Device to Identify Friction Levels for Airport Applications**  
Enrico Galvagno, Mauro Velardocchia, Alessandro Vigliani, *Politecnico di Torino, Torino, Italy*

TH2-FW11 Experiment, Equipment, Test Methods 2  
ROOM 5 NAPOLI • 11:00 – 13:00Chair: Lorella Ceschini, *Università di Bologna, Bologna, Italy*

- 230 Influence Study of Wear Parameters in three-body Abrasion**  
Yen The Doan, Kristin M. de Payrebrune, Matthias Kröger, *Technische Universität Bergakademie Freiberg, Freiberg, Germany*
- 337 Study on Car Brake Noise Generation by Friction with Loading Control Tribometer**  
Yan-Ming Chen, David Caze, Jan Brzezinski, Pierre Chalandon, *Cetim - Technical Centre of Mechanical Industry, Senlis, France*, Moussa Diaby, Arnaud Lucas, Joël Zami, *PSA, Peugeot-Citroën Automobile, France*
- 393 Friction and Adhesion of Rubber Contacts at High Temperatures**  
Christian Berndt, Ringo Nepp, Matthias Kröger, *TU Bergakademie Freiberg, Freiberg, Germany*
- 401 Limiting States of Metal/Polymer System under Sliding Friction**  
Leonid Sosnovskiy, *Interdepartmental Laboratory "Tribofatigue", Gomel, Belarus*, Aleksandr Bogdanovich, Yanka Kupala State University of Grodno, *Grodno, Belarus*, Sergei Sherbakov, *Belarusian State University, Minsk, Belarus*
- 629 Contact Fatigue Life Investigations and Wear Mechanisms of Gears with Different Steels and Hardening Process**  
Andreas Trausmuth, Ewald Badisch, *AC<sup>2</sup>T Research GmbH, Wiener Neustadt, Austria*, Istvan Godor, Michael Stoschka, Florian Grun, *Montanuniversität Leoben, Leoben, Austria*, Alexander Dietrich, *MAGNA Powertrain, Lannach, Austria*
- 1145 Abrasive Wear Mechanisms of Rubber Conveyor Belts in Lab-scale Tests**  
Wolfgang Molnar, Markus Varga, J. Brenner, *AC<sup>2</sup>T Research GmbH, Wiener Neustadt, Austria*, Markus Keller, *Semperit Technische Produkte GmbH, Wimpasing im S., Austria*, Ewald Badisch, *AC<sup>2</sup>T Research GmbH, Wiener Neustadt, Austria*



**TH3-FW12 Experiment, Equipment, Test Methods 3**

ROOM 5 NAPOLI • 14:00 – 16:00

Chair: Kenneth G. Budinski, *Bud Labs, Rochester, NY, United States*

- 427 Generation and Verification of Wear Load Spectrum**  
Yuping Yan, Yongsheng Zhu, Youyun Zhang, Sisi Qian, Zhao Chen, *Key Laboratory of Education Ministry for Modern Design and Rotor-Bearing System, Xi'an, China*
- 559 Friction and Wear Characteristics of the PTFE Braided Composites**  
Jian Liu, *Northwestern Polytechnical University, Xi'an, China*, Yongzhen Zhang, Sanming Du, *Henan University of Science and Technology, Luoyang, China*
- 677 Study of Adhesion and Evaluation of the Friction Forces Using a Scaled Roller-Rig**  
Nicola Bosso, Antonio Gugliotta, Nicolò Zampieri, *Politecnico di Torino, Torino, Italy*
- 678 A Method to Define the Rail Quality Condition due to Wear**  
Nicola Bosso, Antonio Gugliotta, Nicolò Zampieri, *Politecnico di Torino, Torino, Italy*
- 728 Research on Tribological Properties of Cast Iron at High-Speed Dry Sliding Condition**  
Yue Chen, Ying-yu Huang, Chang-ling Zhu, *Henan University of Science & Technology, Luoyang, China*
- 900 Numerical Study of the Friction on Soft Matter: Role of Nature and Size of Surface Patterning**  
Vincent Le Houérou, Tristan Bourrel, Joël Krier, Christian Gauthier, *Institut Charles Sadron, Strasbourg, France*

**TH4-FW13 Experiment, Equipment, Test Methods 4**

ROOM 5 NAPOLI • 16:30 – 18:50

Chair: Daniele Ugues, *Politecnico di Torino, Torino, Italy*

- 784 Optimization of Test Parameters Influencing the Dry Friction of W-DLC Coated Elements**  
Marek Kalbarczyk, Remigiusz Michalczewski, Marian Szczerek, Magdalena Trzos, Jan Wulczyński, *Institute for Sustainable Technologies – National Research Institute (ITeE-PIB), Radom, Poland*
- 960 Analysis of Temperature Effect on the Wear Mechanism of TPU-steel Contact Pair**  
F. Javier Martínez, Margarita Canales, Noelia Alcalá, Miguel A. Jiménez, *Instituto Tecnológico de Aragón, Zaragoza, Spain*
- 988 A New Jaw Crusher Design for Testing of High Stress Abrasion**  
Juuso Terva, Veli-Tapani Kuokkala, Kati Valtonen, *Tampere University of Technology, Tampere, Finland*, Pekka Siitonen, *Metso Minerals Inc., Tampere, Finland*
- 1131 Detailed Characterization of Microcrystalline Diamond Coatings, Thanks to the Relaxation Tribometer Technique**  
Michel Belin, *École Centrale de Lyon, Écully, France*, Hiroyuki Miki, *Tohoku University, Sendai, Japan*, Fida Majdoub, *École Centrale de Lyon, Écully, France*
- 1194 Studies Friction Behaviour and Wear Rate of Poly(methylmethacrylate) by New Design Reciprocating Test Machine**  
Pratip Vongbandit, Benjawan Saengwichien, Panomrat Somwung, *Thailand Institute of Scientific and Technological Research, Klongluang, Thailand*
- 679 Influence of Steel Grade and Contact Conditions on Initiation of Rail Squat Defects**  
Samuel Simon, Aurélien Saulot, *Université de Lyon, Lyon, France*, Xavier Quost, *Régie Autonome des Transports Parisiens (RATP), Fontenay-Sous-Bois, France*, Yves Berthier, *Université de Lyon, Lyon, France*

- 61 Experience in Application of the Friction Pendulum Bearings for Seismic Isolation**  
Yuri Drozdov, *Academy of Sciences, Moscow, Russian Federation*, Vladimir Nadein, *OGS Energodiagnostika, Moscow, Russian Federation*, Vladimir Puchkov, *Academy of Sciences, Moscow, Russian Federation*

**PS3-FW Posters**

ATRIUM • 09:00 – 16:30

- 31 Effects of Slip Systems upon Friction and Wear at (001) Faces of Rock Salt-type Single Crystals**  
Erika Kasahara, *Chuo University, Tokyo, Japan*, Kaori Niki, *Chiba University, Chiba, Japan*, Hitoshi Shindo, *Chuo University, Tokyo, Japan*
- 132 Influence of Test Equipment and Working Conditions on the Coefficient of Friction Values**  
Demófilo Maldonado Cortés, *University of Monterrey (UDEM), San Pedro Garza García, Mexico*
- 187 Complex of Tribological Researches «ITRIB-System»**  
Viacheslav Khovanskiy, *Moscow Automobile and Road Construction State Technical University, Moscow, Russian Federation*
- 210 The Global Wear Parameter for Rail-wheel Metro System**  
Andrei Tudor, *Polytechnic University of Bucharest, Bucharest, Romania*, Ilias Tountas, *Attiko Metro S.A., Athens, Greece*, Mircea Sebesan, *Metrorex S.A., Bucharest, Romania*, Nicolae Sandu, *Romanian Authority of Rail Way, Bucharest, Romania*
- 219 Role of Surface Mesoscale Deformations on Multi-degradation Mechanisms of Stainless Steel Exposed to Tribocorrosive Environment**  
Amin H. Zavieh, Nuria Espallargas, *Norwegian University of Science and Technology, Trondheim, Norway*
- 243 Energetic Aspects of Scuffing Resistance Forming of 42CrMo4 Steel**  
Łukasz Wojciechowski, *Poznań University of Technology, Poznań, Poland*
- 249 Tribological Behavior of Ultramid Reinforced with Cloisite**  
Olga Konovalova, *Czech Technical University, Prague, Czech Republic*, Jan Suchánek, *Czech Technical University, Prague, Czech Republic*
- 697 Fluorescence Recovery after Patterned Photobleaching Measurements of Sheared Confined Polymer: a New Experimental Approach.**  
Li Fu, Anne Rubin, Damien Favier, Thierry Charitat, Christian Gauthier, *Strasbourg University, Strasbourg, France*
- 961 Effect of Vibration on Friction Reduction in Dry and Lubricated Sliding Conditions**  
Shin-Sung Yoo, Dae-Eun Kim, *Yonsei University, Seoul, Republic of Korea*
- 992 The Friction and Wear Mechanism in Multi-component Polyoxymethylene-based Composites when Mating with Steel**  
Dymitry Capanidis, *Wrocław University of Technology, Wrocław, Poland*
- 1012 A Study on Friction Characteristics of Magnetorheological Elastomer**  
Kwang-Hee Lee, Chenglong Lian, Chul-Hee Lee, *Inha University, Incheon, Republic of Korea*, Cheolhyun Kim, Won-Oh Cho, *CALS Corporation, Asan, Republic of Korea*
- 1022 Wear Properties of Glass-Ceramic Coatings With Plasma Spray Technique Via by Melted Basalt Glass Powders**  
Ediz Ercenk, Gunhan Bayrak, Akin Akinci, Ugur Sen, Senol Yilmaz, *Sakarya University, Sakarya, Turkey*

- 1055 Sliding Wear Behavior of Cr-Al-N Coated AISI D2 Steel**  
Bulent Kilinc, *Sakarya University, Sakarya, Turkey*, Ozkan Cegil, *Körfez Technical and Industrial Vocational High School, Körfez, Turkey*, Saduman Sen, Ugur Sen, *Sakarya University, Sakarya, Turkey*
- 1067 Boundary-controlled Barostats for Slab Geometries in Molecular Dynamics Simulations**  
Szymon Maćkowiak, *University of Technology, Poznań, Poland*, Chiara Gattinoni, David M. Heyes, *Imperial College London, London, United Kingdom*, Arkadiusz Brańka, *Polish Academy of Sciences, Poznań, Poland*, Daniele Dini, *Imperial College London, London, United Kingdom*
- 1102 Transition of Surface Morphology in Rolling/Sliding of Polymer-metal Contacts**  
Jacob Sukumaran, Seyfollah Soleimani, Vanessa Rodriguez, *Ghent University, Gent, Belgium*, Matyas Ando, *Szent Istvan University, Godollo, Hungary*, Wilfred Philips, *Patrick De Baets, Ghent University, Gent, Belgium*
- 1106 Effect of Shaft Corrosion Resistance on Fretting Wear with Composite Bearings**  
Michael Kim, *GGB Bearing Technologies, Thorofare, NJ, United States*
- 1133 High Temperature Wear Phenomena in Steel Production Plants on the Example of a Coke Quenching Car**  
Markus Varga, Ewald Badisch, Horst Winkelmann, *AC<sup>2</sup>T Research GmbH, Wiener Neustadt, Austria*, Karl Adam, *Voestalpine Stahl GmbH, Linz, Austria*
- 1248 The Influences of a Hydrogen Environment on the Tribological Properties of Pure Metals**  
Kanao Fukuda, *Universiti Teknologi Malaysia, Kuala Lumpur, Malaysia*, Joichi Sugimura, *Kyushu University, Fukuoka, Japan*
- 1251 Composite Coatings to Improve Durability of the Working Body of the Drill**  
Mara Kandeve, Boryana Ivanova, *Technical University-Sofia, Sofia, Bulgaria*, Vyara Pozhidaeva, *University of Mining and Geology "St. Ivan Rilski", Sofia, Bulgaria*, Dimitar Karastoyanov, *Bulgarian Academy of Sciences, Sofia, Bulgaria*, Juliana Javorova, *University of Chemical Technology and Metallurgy, Sofia, Bulgaria*

## LA – Lubricants and Additives

### TH1-LA10 Tribochemistry III

ROOM 6 FIRENZE • 08:30 – 10:30

Chair: Antonella Rossi, *Università di Cagliari, Cagliari, Italy*

- 372 Keynote: Friction-reducing Polymeric Coatings "for Everyone"**  
Nicholas D. Spencer, Robert Bielecki, *ETH, Zürich, Switzerland*
- 1195 Friction and Wear Performance Mapping of Engine Oils**  
Ksenija Topolovec Miklozic, *Powertrib Limited, Oxford, United Kingdom*
- 155 Prediction of Micropitting Performance of Oil/Additive Solutions in Rolling and Sliding Contacts**  
Victor Brizmer, Rihard Pasaribu, Guillermo Morales-Espejel, *SKF Engineering & Research Centre, Nieuwegein, Netherlands*
- 282 Effects of Slide-Roll Ratio on the Behaviors of Grease Fingers, Reservoir and EHL Film Thickness**  
Lu Huang, Dan Guo, Shizhu Wen, *Tsinghua University, Beijing, China*
- 288 A Study of the Grease with Water Resistance and Low Friction Torque**  
Noriyuki Inami, Michita Hokao, Kazuhiro Soga, Atsushi Yokouchi, *NSK Ltd., Fujisawa, Japan*

- 1186 Q-factor Amplification and Parasitic Effect Compensation Using a Self-actuated Piezoelectric AlN MEMS Resonator for Viscosity Measurements**  
Martin Kucera, *Vienna University of Technology, Vienna, Austria*, Tomás Manzanique, José L. Sánchez-Rojas, *Universidad de Castilla-La Mancha, Ciudad Real, Spain*, Nicole Dörr, *AC<sup>2</sup>T Research GmbH, Wiener Neustadt, Austria*, Achim Bittner, Ulrich Schmid, *Vienna University of Technology, Vienna, Austria*

### TH2-LA11 LUBMAT I

ROOM 6 FIRENZE • 11:00 – 13:00

Chair: Ian Sherrington, *University of Central Lancashire, Preston, United Kingdom*

- 164 Keynote: Polyglycol-based Engine Oils—Has the Industry to Adapt to this Lubricant Class?**  
Stephen Merryweather, Daniel Zweifel, *DOW Europe GmbH, Horgen, Switzerland*, Mathias Woydt, *BAM Federal Institute for Materials Research and Testing, Berlin, Germany*
- 1239 Understanding of Failure in Lubricated Systems by Use of Mass Spectrometry**  
Nicole Dörr, Andjelka Ristic, Alexander Kassler, *AC<sup>2</sup>T Research GmbH, Wiener Neustadt, Austria*
- 688 The Study about Ultra Low Ash and No Phosphorus Engine Oil**  
Hiroshi Fujita, *Idemitsu Kosan Co., Ltd., Tokyo, Japan*, Yasunori Shimizu, Junya Iwasaki, *Idemitsu Kosan Co., Ltd., Ichihara, Japan*
- 416 Surface Influence on Soot Aggregation and Friction in a Lubricated Contact**  
André Ernesto, Denis Mazuyer, Juliette Cayer-Barrioz, *École Centrale de Lyon, Écully, France*
- 1321 Synthetic Lubricants: from Molecular Design to Engineering Applications**  
Weimin Liu, Feng Zhou, *Chinese Academy of Science, Lanzhou, China*
- 4 Effect of Water in Engine Oil on Steel Wear under Boundary Lubrication and the Wear Mechanism**  
Takashi Izumi, Hiroshi Moritani, Mamoru Tohyama, Toshihide Ohmori, *Toyota Central R&D Labs., Inc., Nagakute, Japan*, Kosuke Fujimoto, Hiroyuki Murase, *Toyota Motor Corporation, Toyota, Japan*

### TH3-LA12 LUBMAT II

ROOM 6 FIRENZE • 14:00 – 16:00

Chair: Amaya Igartua, *IK-4 Tekniker, Eibar, Spain*

- 119 Study on Tribology Performance of Diesel Engine Oil Using SRV4 Tribometer**  
Xiaohong Xu, *PetroChina Lanzhou Lubricating Oil R&D Institute, Lanzhou, China*, Shuren Sun, *DongFeng Commercial Vehicle Technical Center, Wuhan, China*, Ailian Lei, Peng Wang, *PetroChina Lanzhou Lubricating Oil R&D Institute, Lanzhou, China*, Guanghua Peng, *DongFeng Commercial Vehicle Technical Center, Wuhan, China*
- 262 Friction and Wear Performance of MoDTC- and Ester-containing Lubricants over Steel Surfaces under Reciprocating Conditions**  
Eduardo D. Trindade, *Petrobras S.A., Rio de Janeiro, RJ, Brazil*, Alexander Zuleta Durango, Amilton Sinatora, *Universidade de São Paulo, São Paulo, SP, Brazil*
- 594 Functionalized Graphene: Fabrication and Tribological Behavior in Ester Oil**  
Bernadette Schlüter, Andreas Kailer, *Fraunhofer Institute for Mechanics of Materials IWM, Freiburg, Germany*, Rolf Mülhaupt, *Albert-Ludwigs University, Freiburg, Germany*

- 540 Tribological Performance of DLC/Cast Iron and Steel/Cast Iron System when Lubricated in Fully Formulated Oils with Different Concentration of MoDTC-type Friction Modifier**  
Shahriar Kosarieh, Ardian Morina, *University of Leeds, Leeds, United Kingdom*, Jonathan Flemming, Emmanuel Lainé, *Infineum UK Limited, Abingdon, United Kingdom*, Anne Neville, *University of Leeds, Leeds, United Kingdom*
- 512 Evaluation of Tribological Property for Hydraulic Fluid by Roller on Disk Test**  
Yukiko Naka, *Japan Lubricating Oil Society, Fuabashi, Japan*, Masakazu Otsuka, *Japan Lubricating Oil Society, Fuabashi, Japan*
- 946 Effect of Additive on the Tribological Properties of Nano-stripe Surface**  
Miki Nakano, Koji Miyake, Atsushi Korenaga, *National Institute of Advanced Science and Technology, Tsukuba, Japan*, Yasuhisa Ando, *Tokyo University of Agriculture and Technology, Tokyo, Japan*

**TH4-LA13 LUBMAT III**

ROOM 6 FIRENZE • 16:30 – 18:50

Chair: Francesco Pagano, *IK4-Tekniker, Eibar, Spain*

- 1024 Analysis of the Additive Layer Formation and Evaluation of Wear Mechanisms of Phosphorous-free and Conventional Engine Lubricants on the Surface of Cylinder Liner and Piston Rings**  
Hakan Kaleli, *Yildiz Technical University, Istanbul, Turkey*, Yves Berthier, *Institut National des Sciences Appliquées de Lyon, Lyon, France*, Dogus Özkan, Levent Yükses, *Yildiz Technical University, Istanbul, Turkey*
- 124 Energetic Investigations of the Structural Degradation of Lubricating Greases Caused by Friction**  
Erik Kuhn, *Hamburg University of Appl.Sc., Hamburg, Germany*
- 534 A New Biocompatible Ionic Liquid as an Antiwear Additive for Biodegradable Lubricants**  
Bhawna Khemchandani, *Indian Oil Corporation Ltd., Faridabad, India*, Anthony Somers, Patrick Howlett, *Deakin University, Burwood, Australia*, A.K. Jaiswal, *Indian Oil Corporation Ltd., Faridabad, India*, E. Sayanna, *Indian Oil R&D centre, Faridabad, India*, Maria Forsyth, *Deakin University, Burwood, Australia*
- 1305 Engine Oil Advanced Technologies For Fuel Economy Targets Achievement In HD Engines**  
Flavia Gili, Davide Mangherini, *Centro Ricerche Fiat, Orbassano (To), Italy*, Andrea Dolfi, Gianni Cecconello, Andrew Ogley, *Petronas Lubricants Italy, Villastellone (To), Italy*, Peter Beyer, *FPT Motorenforschung AG, Arbon, Switzerland*
- 25 Deposition on Bearing Pads by Insoluble Particulates in Turbine Oils**  
Fumihiko Yokoyama, Yuka Iwama, Masahiro Maruyama, Mitsuo Sano, *IHI Corporation, Yokohama, Japan*
- 130 Experimental Analysis of Anti-wear Performance of Marine Engine Lubricants**  
Mayank Anand, Mark Hadfield, Ben Thomas, *Bournemouth University, Poole, United Kingdom*, Steve Austen, Rob Cantrill, *Royal National Lifeboat Institution, Poole, United Kingdom*, J. L. Viesca, *University of Oviedo, Oviedo, Spain*, N. Garland, *Bournemouth University, Poole, United Kingdom*
- 1317 Meeting the Tribological Challenges of Wind Turbine Gearboxes with a New Formulation Approach**  
Rene Koschabek, Christoph Wincierz, *Evonik Oil Additives, Darmstadt, Germany*

**LF – STLE/ASME – Lubrication Fundamentals****TH1-LF8 EHL Measurement**

ROOM 7 BARI • 08:30 – 10:30

Chair: Tom Reddyhoff, *Imperial College London, United Kingdom*

- 506 Dynamic Measurement of EHL Film Thickness**  
Yingjun Chen, Yazhen Wang, Ping Huang, *South China University of Technology, Guangzhou, China*
- 510 Localized Boundary Effect on EHL Film Shape**  
Z. Fu, P.L. Wong, *City University of Hong Kong, Hong Kong*, F. Guo, *Qingdao Technological University, Qingdao, China*
- 88 A High-precision, High-speed System for Measuring Instantaneous Lubricant Film Thickness Profiles**  
Gonzalo Garcia-Atance Fatjo, Edward H. Smith, Ian Sherrington, *University of Central Lancashire, Preston, United Kingdom*
- 50 How Rheology Influences the Interfacial Friction Law of a Circular EHL Oscillating Sliding Contact**  
Emmanuel Rigaud, Denis Mazuyer, Juliette Cayer-Barrioz, *École Centrale de Lyon, Écully, France*
- 15 Determination of the Stick-slip Behavior of Slideway Oils by Using the SRV Ttribometer Test Rig**  
Wilhelm Rehbein, *Rhein Chemie Rheinau GmbH, Mannheim, Germany*, Juergen Rigo, *University of Mannheim, Mannheim, Germany*, Isabell Lange, *Rhein Chemie Rheinau GmbH, Mannheim, Germany*
- 769 Flow-Profile Mapping in Elastohydrodynamic Lubrication Region**  
Janet Wong, Aleks Ponjavic, *Imperial College London, London, United Kingdom*

**TH4-LF9 Lubricants and Additives**

ROOM 7 BARI • 16:30 – 18:50

Chair: Jeffrey Streator, *Georgia Institute of Technology, Atlanta, GA, United States*

- 307 A Model to Relate Siloxane Chemical Structure to Tribological Performance**  
Thomas J. Zolper, *Northwestern University, Evanston, IL, United States*, Manfred Jungk, *Dow Corning GmbH, Wiesbaden, Germany*, Tobin J. Marks, Yip-Wah Chung, Qian Wang, *Northwestern University, Evanston, IL, United States*
- 456 Friction and Wear Studies of Si and Ti Surfaces Lubricated by Aqueous Copolymer**  
Bingjing Lin, A Kiet Tieu, Hongtao Zhu, Buyung Kosasih, *University of Wollongong, Wollongong, Australia*
- 651 Potential-Controlled Boundary Lubrication at Metal Surfaces in Propylene Carbonate Solutions**  
Xiaoyong Yang, Yonggang Meng, Yu Tian, *Tsinghua University, Beijing, China*
- 567 On the Effect of DLC Coating on Full Film EHL Friction**  
Marcus Björling, Pär Marklund, Roland Larsson, *Luleå University of Technology, Luleå, Sweden*
- 1143 Evaluation of Polymer Wear Assessment Methods**  
Sophie Froeland, Ion M. Sivebaek, *Technical University of Denmark, Lyngby, Denmark*
- 823 Ashless Friction Modifier and Lubrication Surface: Stribeck Curve Approach**  
Mohamadou B. Diew, Jean Michel Martin, *École Centrale de Lyon, Écully, France*, Mehdi El Fassi, *Research and Advanced Engineering at Peugeot Sport, Vélizy Villacoublay, France*, Denis Mazuyer, *École Centrale de Lyon, Écully, France*
- 782 Self-Controlled Viscosity Using Interaction between Liquid Crystals and Boundary Films**  
Chiharu Tadokoro, Ken Nakano, *Yokohama National University, Yokohama, Japan*



## BE – Bearings

### TH1-BE10 Rolling Bearings 5

ROOM 9 BOLOGNA • 08:30 – 10:30

Chair: Oliver Koch, *Schaeffler Technologies AG, Herzogenaurach, Germany*

- 620 Accelerated Life Test for Roller-Ball Type Coaxial Bearing Loaded on Outer Raceway**  
Jong-Won Park, Dong-Cheon Baek, Byung-Oh Choi, *Korea Institute of Machinery & Materials, Daejeon, Republic of Korea*,  
Byoung-Young Song, *GMB Korea Corp., Changwon, Republic of Korea*,  
Gun-Tae Jung, *GMB Korea Corp., Changwon, Republic of Korea*
- 603 Formation of Anti-Wear Films in Rolling Bearings due to Run-in Procedures**  
Andreas Stratmann, Christoph Hentschke, Georg Jacobs, *RWTH Aachen University, Aachen, Germany*
- 797 A Novel Skid Damage Test Rig for Rolling Bearing and Its Experimental Study**  
Junning Li, Wei Chen, Youbai Xie, *Xi'an Jiaotong University, Xi'an, China*
- 847 Study of the Short Term Effect of Fe<sub>3</sub>O<sub>4</sub> Particles in Rolling Element Bearings**  
Stephan Schnabel, Pär Marklund, Roland Larsson, *Luleå University of technology, Luleå, Sweden*
- 877 Multi-body Vibration Modeling of Rolling Bearing System**  
Xing Yuan, Yongsheng Zhu, Youyun Zhang, *Xi'an Jiaotong University, Xi'an, China*
- 64 Observation of Spherical Surfaces using a Laser Microscope with Wide Field of View**  
Isami Nitta, Yosuke Tsukiyama, Takuya Watanabe, Naoyuki Fukushima, *Niigata University, Niigata, Japan*

### TH2-BE11 Gas Bearings 2

ROOM 9 BOLOGNA • 11:00 – 13:00

Chair: Jianjun Du, *Harbin Institute of Technology, Shenzhen, China*

- 931 Impact Characteristics of Optimized Hydrodynamic Thrust Air Bearing**  
Masayuki Ochiai, Yuta Sunami, Hayato Sasaki, Hiromu Hashimoto, *Tokai University, Hiratsuka, Japan*
- 1016 Theoretical and Experimental Analysis of the Pneumatic Hammer Instability in an Aerostatic Bearing**  
Mihai Arghir, Franck Balducchi, Amine Hassini, *Université de Poitiers, Futuroscope Chasseneuil, France*, Sébastien Guingo, *SNECMA - Division Moteurs Spatiaux, Vernon, France*,  
Emelyne Renard, *CNES, Paris, France*
- 1110 Static Study of the Arc Effect on Annular-Thrust Aerostatic Porous Bearings**  
Pyung Hwang, *Yeungnam University, Gyeongsan, Republic of Korea*,  
Polina Khan, *Kamchatka State Technical University, Petropavlovsk-Kamchatski, Russian Federation*
- 523 Modeling Method of Aeroengine Bearing Chamber Oil/Air Two-phase Flow**  
Hengchao Sun, Guoding Chen, Tao Wang, *Northwestern Polytechnical University, Xi'an, China*

### TH3-BE12 Magnetic Levitation

ROOM 9 BOLOGNA • 14:00 – 16:00

Chair: Lars-Erik Stacke, *SKF Engineering & Research Centre, Göteborg, Sweden*

- 985 Rotational Power Loss on a Rotor Radially Supported by Electrodynamic Passive Magnetic Bearings**  
Joaquim Girardello Detoni, Fabrizio Impinna, Nicola Amati, Andrea Tonoli, *Politecnico di Torino, Torino, Italy*

- 1095 Characterization and Improvement of Axial and Radial Stiffness of Contactless Thrust Superconducting Magnetic Bearings**

Ignacio Valiente-Blanco, Efrén Díez-Jiménez, Cristian Cristache, Marco A. Álvarez-Valenzuela, Juan Sánchez-García-Casarrubios, José L. Pérez-Díaz, *Universidad Carlos III de Madrid, Madrid, Spain*

- 1103 Non-hysteretic Passive Magnetic Linear Bearing for Cryogenic Environments**

Victor Castro-Fernández, Efrén Díez-Jiménez, Ignacio Valiente-Blanco, José L. Pérez-Díaz, *Universidad Carlos III de Madrid, Leganés, Spain*

- 1164 Stability Analysis of an Automated Maglev People Mover System**

Roberto Bassani, Massimo Losa, Antonino Musolino, Rocco Rizzo, *University of Pisa, Pisa, Italy*

- 1166 Permanent Magnet Bearings**

Antonino Musolino, Rocco Rizzo, Ernesto Tripodi, *University of Pisa, Pisa, Italy*

- 277 Friction and Wear Behaviors of Polymer/Steel Laminated Composites at Elevated Temperatures**

Dongya Zhang, Pengbo Zhang, Guangneng Dong, *Xi'an Jiaotong University, Xi'an, China*

### TH4-BE13 Fluid-Film Bearings 4

ROOM 9 BOLOGNA • 16:30 – 18:50

Chair: Jean Bouyer, *Université de Poitiers, Futuroscope Chasseneuil, France*

- 661 Influence of Bush Wear in Water Lubricated Marine Stern Tube Bearings with Shaft Misalignment**

Wojciech Litwin, *Gdansk University of Technology, Gdańsk, Poland*

- 673 Creep Characteristics of White Metal Lined Bearings**

Tomoaki Yamashita, Saburo Usami, *Hitachi Research Laboratory, Hitachi, Japan*

- 700 Sensitivity Analysis of Non-Linear Forces in Oil-Film Journal Bearings**

Andrea Vania, Paolo Pennacchi, Steven Chatterton, Ezio Tanzi, *Politecnico di Milano, Milano, Italy*

- 722 Influences of Journal Rotating Direction on Cryogenic Hybrid Journal Bearings**

Mamoru Oike, *Ishinomaki Senshu University, Ishinomaki, Japan*,  
Masataka Kikuchi, Satoshi Takada, Takayuki Sudo, Tomoyuki Takano, *Japan Aerospace Technology, Kakuda, Japan*

- 302 Low Friction, Low Noise, High Normal Projected Pressure Water-lubricated Bearing Elastomer**

Xin-cong Zhou, Zhi-min Yan, Hong-ling Qin, Kai Liu, *Wuhan University of Technology, Wuhan, China*

- 385 Analysis of an Hydrostatic Worm Rack Drive for Large Machine Tools**

Alberto Cassinari, Giacomo Bianchi, Mario Poli, *CNR-Institute for Industrial Technologies and Automation, Milano, Italy*

- 724 Lubrication Analysis of a Stern Tube Bearing Considering Misalignment**

Tao He, Xiqun Lu, Dequan Zou, Yibin Guo, Wanyou Li, *Harbin Engineering University, Harbin, China*

### PS3-BE Posters

ATRIUM • 09:00 – 16:30

- 570 Dynamic Behavior Analysis of a Rotor-Ball Bearing System with Nonlinear Bearing Stiffness Characteristics**

Pyung Hwang, Van Trang Nguyen, *Yeungnam University, Gyeongsan, Republic of Korea*



- 747 Influences of Raceway Texture on the Torque of Needle Roller Thrust Bearing**  
Tetsuzo Hatazawa, Takahisa Kawaguchi, *Utsunomiya University, Utsunomiya, Japan*
- 779 Condition Trend Prediction of Machine Tool Spindle Based on the Multiple-input Multiple-output Support Vector Regression**  
Xiaoran Zhu, Yongsheng Zhu, Youyun Zhang, *Xi'an Jiaotong University, Xi'an, China*
- 872 Stability Analysis of Journal Bearings Lubricated by Viscoelastic Fluids**  
Jun Tomioka, Hirotsugu Hayashi, Norifumi Miyanaga, *Waseda University, Tokyo, Japan*
- 875 Linear and Nonlinear Stability Analysis of Herringbone-Grooved Aerodynamic Journal Bearings with Viscoelastic Support Elements**  
Norifumi Miyanaga, Jun Tomioka, *Waseda University, Tokyo, Japan*
- 969 Effect of Nanoparticle on Load Capacity in Gas Film Lubrication**  
Zhiru Yang, Dongfeng Diao, Hongyan Fan, *Xi'an Jiaotong University, Xi'an, China*

## EC – ECOTRIB 2013 Tribology of Machine Elements

### TH1-EC10 Tribodesign and Maintenance

ROOM 10 PERUGIA • 08:30 – 10:30

Chair: Andrea Vania, *Politecnico di Milano, Milano, Italy*

- 152 Tribology Problems in Space**  
Marat A. Bronovets, *Russian Academy of Sciences, Moscow, Russian Federation*
- 179 Trouble-free Tribo-Design Implementation from Learning Case Studies**  
Masato Tanaka, *University of Tokyo, Matsudo, Japan*, Shojiro Sugimura, *Sugimura Planning Corporation, Okayama, Japan*, Minoru Hanahashi, *Daido Metal Co., Inuyama, Japan*
- 1236 Multi-phase Bit Cutter-on-rock Tribometry: Understanding the Drilling Process for Renewable Energy Resources**  
Patrick S.M. Dougherty, Jeremiah N. Mpagazehe, John Shelton, C. Fred Higgs, *Carnegie Mellon University, Pittsburgh, PA, United States*
- 1137 Application of Shaft Orbits for Rotordynamic Crack Diagnostics**  
Philip Varney, Itzhak Green, *Georgia Institute of Technology, Atlanta, GA, United States*
- 107 Technical Specifications and PM Procedures Merging, for a More Robust Reliability Approach.**  
Giuseppe Adriani, Matteo Campatelli, *Mecol Diagnosi Meccaniche srl, Florence, Italy*, Edoardo Bassanini, *Vipetrol S.p.a., Vigevano (Pv), Italy*, Alessandro Paccagnini, *Mecol Diagnosi Meccaniche srl, Florence, Italy*
- 637 Automated System for On-line Oil Analysis**  
Jože Vižintin, José Salgueiro, Gabrijel Peršin, Boris Kržan, *University of Ljubljana, Ljubljana, Slovenia*

### TH2-EC11 Friction in Machine Components

ROOM 10 PERUGIA • 11:00 – 13:00

Chair: Paolo Pennacchi, *Politecnico di Milano, Milano, Italy*

- 703 Influences of Friction of Vane Sliding Surface on Lubricating Condition between Rolling Piston and Vane Top in Rotary Compressors**  
Yasutaka Ito, Hitoshi Hattori, *Corporate Research & Development Center, Toshiba Corporation, Kawasaki, Japan*, Kazuhiko Miura, *Toshiba Carrier Corporation, Fuji, Japan*

- 808 High Speed Friction and Wear Measurements on Innovative Polymeric Materials for Sliding Elements in Reciprocating Compressors**  
Luigi Mazza, Roberto Grassi, Andrea Trivella, Giulio Malucelli, *Politecnico di Torino, Torino, Italy*
- 60 Oil Film Formation in the Sliding Parts of Vane of Multiple Vane Type Compressors**  
Eita Kureha, *Yanmar Co. Ltd., Maibara, Japan*, Masayoshi Muraki, *Shonan Institute of Technology, Fujisawa, Japan*
- 492 Static Friction Experiments of Lubricated Sliding Systems on a SRV**  
Stefan Klien, Anke Ristow, Florian Ausserer, Alexander Diem, *V-Research GmbH, Dornbirn, Austria*
- 1025 Lab-scale Modeling of Rail Damage Phenomena**  
Thomas Lebersorger, Ewald Badisch, Andreas Trausmuth, *AC<sup>2</sup>T Research GmbH, Wiener Neustadt, Austria*, Stephan Scheriau, Hans P. Brantner, *Voestalpine Schienen GmbH, Leoben, Austria*, Friedrich Franek, *AC<sup>2</sup>T Research GmbH, Wiener Neustadt, Austria*
- 813 The Effect of Gaseous Environments on Friction and Wear of Steel-steel Contacts**  
Florian Ausserer, Igor Velkavrh, Stefan Klien, *V-Research GmbH, Dornbirn, Austria*, Josef Brenner, *AC<sup>2</sup>T Research GmbH, Wiener Neustadt, Austria*, Pierre Forêt, *Linde AG, Unterschleißheim, Germany*, Alexander Diem, *V-Research GmbH, Dornbirn, Austria*

### TH3-EC12 Rolling-based Applications

ROOM 10 PERUGIA • 14:00 – 16:00

Chair: Rowena Crockett, *EMPA, Dübendorf, Switzerland*

- 215 Genetic Algorithm and Artificial Bee Colony Algorithm for Journal Bearing Optimization**  
Luca Gorasso, Liqin Wang, *Harbin Institute of Technology, Harbin, China*
- 576 Modeling Oil Film Flows in an Aeroengine Bearing Chamber**  
Bo Chen, Guoding Chen, Hengchao Sun, *Northwestern Polytechnical University, Xi'an, China*
- 1057 3D Numerical Modeling of Wheel-rail Contact Dynamics: Application to Straight Track Corrugation**  
Fangfang Duan, Aurélien Saulot, Yves Berthier, *INSA-Lyon, Villeurbanne, France*
- 1108 Study of Effects of Wheel Flange/Rail Gauge Contact Lubrication**  
Milan Omasta, Josef Frýza, Martin Hartl, Ivan Krupka, *Brno University of Technology, Brno, Czech Republic*
- 373 Investigation of Thermoelastic Instabilities in the Wet Clutch System with an Equivalent Friction Coefficient**  
Jiaxin Zhao, Heyan Li, Biao Ma, *Beijing Institute of Technology, Beijing, China*, Yunbo Yi, *University of Denver, Denver, CO, United States*
- 704 The Performances Test Results of Finger Seal**  
Yanchao Zhang, *Xi'an University of Technology, Xi'an, China*, Guoding Chen, *Northwestern Polytechnical University, Xi'an, China*, Kai Liu, *Xi'an University of Technology, Xi'an, China*, Lianjie Zhou, *Chengdu, China*, Haitao Hu, *China Gas Turbine Establishment, Chengdu, China*

### TH4-EC13 Seals 2

ROOM 10 PERUGIA • 16:30 – 18:50

Chair: Joichi Sugimura, *Kyushu University, Fukuoka, Japan*

- 102 New High Performance Test Rig for Sealing Systems Characterization**  
Bihotz Pinedo, Marcello Conte, Ion Perez, Manex San Martin, Eneko Gomez-Acedo, Amaya Igartua, *IK4-Tekniker, Eibar, Spain*
- 233 Effect of Shaft Roughness on Axial and Radial Seals at Varying Pressure and Velocity**  
Alessandro Tasora, Edzeario Prati, *Università di Parma, Parma, Italy*

- 460 Experimental Study on Grooved Faces in a 2-phase Mechanical Seal**  
Tao Wang, Weifeng Huang, Xiangfeng Liu, Yongjian Li, Yuming Wang, *Tsinghua University, Beijing, China*
- 494 Modeling Radial Lip Seal Friction – A FEM-based Multi-Scale Soft Micro-Elastohydrodynamic Lubrication Approach**  
Bengt Wennehorst, Gerhard Poll, *Leibniz Universität Hannover, Hannover, Germany*
- 949 Evaluation of Lip-Seal Properties against Pressurized Ethanol Flow for Turbopump in Rocket Engine**  
Manabu Jinno, Hayato Morishita, Tomoko Hirayama, Takashi Matsuoka, *Doshisha University, Kyotanabe, Japan*, Makoto Yoshida, Satoshi Takada, Tomoyuki Takano, *Japan Aerospace Exploration Agency, Kakuda, Japan*
- 675 The T-Ring Principle: A Sophisticated Approach of Sealing Dynamically**  
Gonzalo Barillas, Matthias Wangenheim, Patrick Kinsch, Jürgen Jäckel, *Freudenberg Sealing Technologies, Schwalmstadt, Germany*
- 28 Simulation of Hydraulic Rod Seals with a Plunge-Ground Rod**  
Yuli Huang, Richard F. Salant, *Georgia Institute of Technology, Atlanta, United States*

## MF – Tribology in Manufacturing

### TH2-MF3 Metal Forming

ROOM 7 BARI • 11:00 – 13:00

Chair: José Daniel Biasoli de Mello, *Universidade Federal de Uberlândia, MG, Brazil*

- 29 A Study of Shear Friction Factor in FSP/FSW for Developing a Finite Element Model and Its Importance in the Context of Formation of Defect Free and Defective Weld**  
Malik Vinayak, K.M. Midhun, Satish V. Kailas, *Indian Institute of Science, Bangalore, Bangalore, India*
- 39 A Novel Sensor for Lubrication and Contact Measurement in Metal Rolling**  
Robert Dwyer-Joyce, Andy K. Hunter, *University of Sheffield, Sheffield, United Kingdom*
- 509 Friction Modeling for Sheet Metal Forming Processes under Loading and Reloading Contact Conditions**  
Dinesh K. Karupannasamy, *Materials innovation institute (M2i), Delft, Netherlands*, Matthijn B. de Rooij, Dirk J. Schipper, *University of Twente, Enschede, Netherlands*
- 694 Friction Characteristic of Palm Olein as Lubricant in Plane Strain Extrusion Process**  
Samion Syahrullail, *Universiti Teknologi Malaysia, Skudai, Malaysia*, Shunpei Kamitani, Kenji Nakanishi, *Kagoshima University, Kagoshima, Japan*
- 727 New Approaches for Lubrication in Steel Cold Rolling**  
Tilo Reichardt, *VDEh-Betriebsforschungsinstitut GmbH, Düsseldorf, Germany*, Martin Raulf, *ThyssenKrupp Steel AG, Duisburg, Germany*, Michael Herrmann, *Chemische Werke Kluthe GmbH, Heidelberg, Germany*, Cornelia Mömming, *Hydro Aluminium Rolled products GmbH, Bonn, Germany*, Rolf Luther, *Fuchs Europe Schmierstoffe GmbH, Mannheim, Germany*
- 1210 Wear Debris Generation During Cold Rolling Process**  
Willian Labiapari, Cláudio M. de Alcântara, *Aperam South America, Timóteo, MG, Brazil*, Henara L. Costa, José Daniel Biasoli de Mello, *Universidade Federal de Uberlândia, Uberlândia, MG, Brazil*

### TH3-MF4 Machining and Cutting Systems

ROOM 7 BARI • 14:00 – 16:00

Chair: Robert Dwyer-Joyce, *University of Sheffield, United Kingdom*

- 175 Nanoindentation Numerical Simulations and Comparison with Experimental Results for TiN Film**  
José D. Bressan, *Santa Catarina State University - UDESC, Joinville, SC, Brazil*, Carlos M. Lepienski, *Federal University of Paraná – UFPR, Curitiba, PR, Brazil*
- 383 Particle-based Simulations of Abrasive Flow Machining**  
Christian Nutto, *Fraunhofer Institute for Mechanics of Materials IWM, Freiburg, Germany*, Claas Bierwisch, Hanna Lagger, Michael Moseler, *Fraunhofer Institute for Mechanics of Materials IWM, Freiburg, Germany*
- 497 Quantum Chemical Molecular Dynamics Simulations of Mechano-Chemical Reactions during Chemical Mechanical Polishing Processes for Semiconductor Devices**  
Kentaro Kawaguchi, Takeshi Ishikawa, Yuji Higuchi, Nobuki Ozawa, Momiji Kubo, *Tohoku University, Sendai, Japan*
- 608 The Study of the Tribological Performance of Ti Based Nitride Coating**  
Jiesong Tu, Jianhua Xu, Jian Li, *Wuhan Research Institute of Materials Protection, Wuhan, China*
- 645 Application of MoS<sub>2</sub> and (PTFE+graphite) Coating on End Mill Cutters for Arresting BUE During Machining of Pure Aluminium**  
Suresh Kannan I, Amitava Ghosh, *Indian Institute of Technology Madras, Chennai, India*
- 817 Investigation of the Reaming Operation of Holes Machined in Sintered Carbon-Iron Pistons**  
Vanessa A. Oliveira Rosa, Márcio Bacci da Silva, Luciano J. Arantes, *Federal University of Uberlândia, Uberlândia, Brazil*

## MT – Tribology of Materials

### TH1-MT6 Involved Phenomena 2

ROOM 1 TORINO • 08:30 – 10:30

Chair: Marcello Conte, *IK4-Tekniker, Eibar, Spain*

- 707 Tribological Conditions Leading to Ignition Phenomena of Energetic Materials**  
Rudy Charlery, Aurélien Saulot, *LaMCoS - INSA-Lyon, Villeurbanne, France*, Nicolas Daly, *Herakles-Safran Group, Vert-le-Petit, France*, Yves Berthier, *LaMCoS - INSA-Lyon, Villeurbanne, France*
- 794 Effect of Spherical Inclusions on Contact Pressure Distribution and Friction Coefficient**  
Koffi E. Koumi, Julien Leroux, Thibaut Chaise, Daniel Nélías, *INSA-Lyon, Villeurbanne, France*
- 842 Tribological Characteristics between Snow and Mechanical Materials and in Snow**  
Toshikazu Fujino, Masajiro Abe, Daiju Okano, Taruho Sen, *Nagaoka University of Technology, Nagaoka, Japan*, Isao Kamiishi, *National Research Institute for Earth Science and Disaster Prevention, Nagaoka, Japan*, Katsumi Iwamoto, *Tokyo University of Marine Science and Technology, Tokyo, Japan*
- 1031 Tribological Behaviour of Carbon Thin Films against Bearing Steel under Continuous Sliding in Hydrogen Environment**  
Antti Vaajoki, *VTT Technical Research Centre of Finland, Espoo, Finland*, Hiro Yoshi Tanaka, *Kyushu University, Fukuoka, Japan*, Simo Varjus, Helena Ronkainen, *VTT Technical Research Centre of Finland, Espoo, Finland*, Joichi Sugimura, *Kyushu University, Fukuoka, Japan*

- 1063 Evaluation of the Brake Pads Wear Debris as a Possible Source of Contamination in the Analysis of GSR**  
 Federica Bartoli, *Gabinetto Polizia Scientifica Arezzo, Arezzo, Italy*, Diego Pellerej, Diego Santamaria, Elena Alba, Pietro Buonficio, *ITT Motion Technology Italia srl, Barge (Cn), Italy*, Gabriel Ingo, Giuseppina Padeletti, *ISMN-CNR, Montelibretti (Rm), Italy*

#### TH2-MT7 Nano-fluids and Composites

ROOM 1 TORINO • 11:00 – 13:00

Chair: Sergei Glavatskikh, *KTH Royal Institute of Technology, Stockholm, Sweden*

- 708 Keynote: Nanotribology: Tribotronics, Ionic Liquids and Control of Surface Interactions**  
 Rubén Á. Asencio, Emily D. Cranston, Deb Wakeham, Petru Niga, *KTH Royal Institute of Technology, Stockholm, Sweden*, Oliver Werzer, James Sweeney, *University of Newcastle, Callaghan, Australia*, Florian Hausen, *INM–Leibniz-Institute for New Materials, Saarbrücken, Germany*, Robert Hayes, Grant B. Webber, *University of Newcastle, Callaghan, Australia*, Frank Endres, *Clausthal University of Technology, Clausthal-Zellerfeld, Germany*, Roland Bennewitz, *INM–Leibniz-Institute for New Materials, Saarbrücken, Germany*, Nicklas Hjalmarsson, Sergei Glavatskikh, *KTH Royal Institute of Technology, Stockholm, Sweden*, Rob Atkin, *University of Newcastle, Callaghan, Australia*, Mark W. Rutland, *KTH Royal Institute of Technology, Stockholm, Sweden*
- 804 Tribological Behavior of Carbon Fibers and Multi-wall Carbon Nanotubes Reinforced UHMWPE.**  
 Vanesa Martínez Nogués, *University of Southampton, Southampton, United Kingdom*, Maria J. Martínez-Morlanes, Francisco J. Pascual, *Universidad de Zaragoza, Zaragoza, Spain*, Steven Kurtz, *Drexel University, Philadelphia, PA, United States*, José A. Puértolas, *Universidad de Zaragoza, Zaragoza, Spain*
- 602 Electro-potential Dependent Frictional Characteristic on Self-organized Metallic Nanopore Structures**  
 Sunghan Kim, Hong Liang, *Texas A&M University, College Station, TX, United States*
- 657 Tribology of Self-lubricating SU-8 Composites for MEMS Applications**  
 Prabakaran Saravanan, Nalam Satyanarayana, Hai Minh Duong, *National University of Singapore, Singapore*, Sujee K. Sinha, *Indian Institute of Technology, Kanpur, India*
- 483 Friction Coefficient Mapping (FCM) and Contact Adhesion Mapping (CAM): Surface Microstructure and Function**  
 Rubén Álvarez Asencio, Eleonora Bettini, Jinshan Pan, Esben Thormann, Mark W. Rutland, *KTH Royal Institute of Technology, Stockholm, Sweden*
- 451 Mixed and Boundary Lubrication Characteristics of Resin Overlay for Plain Bearing Materials**  
 Hiromitsu Katsuki, Hiroki Kobayakawa, Colin McAleese, Naohisa Kawakami, Yoshiaki Sato, *Daido Metal CO. Ltd., Inuyama, Japan*

#### TH3-MT8 General Issues

ROOM 1 TORINO • 14:00 – 16:00

Chair: Flavia Gili, *Centro Ricerche Fiat, Orbassano (To), Italy*

- 967 Characteristics of Erosive Wear with Multi Component Cast Iron**  
 Kenta Kusumoto, Kazumichi Shimizu, Hiroya Hara, *Muroran Institute of Technology, Muroran, Japan*, Masahito Tanaka, *Sankyo Alloy Casting Co. Ltd, Osaka, Japan*, Olecsandr Cheikiakah, Vasily Iefremenko, Yuliia Chabak, *Pryazovskyi State Technical University, Mariupol, Ukraine*

- 857 Advanced Cermets as Tribomaterials**  
 Irina Hussainova, Maksim Antonov, Jakob Kübarsepp, *Tallinn University of Technology, Tallin, Estonia*
- 840 Modeling of Wear in Silicon Nitride in Rolling-sliding Contact**  
 Iyas Khader, *German Jordanian University, Amman, Jordan*, Dominik Kürten, *Fraunhofer Institute for Mechanics of Materials IWM, Freiburg, Germany*, Andreas Kailer, *Fraunhofer Institute for Mechanics of Materials IWM, Freiburg, Germany*
- 893 Why is there Nonlinearity of Deformation Energy during Mechanism Transitions of PTFE Scratching?**  
 Juliana R. de Souza, Nayane C. M. C. Sá Leitão, Mariana S. P. de Azevedo, Ludimila S.P. de Azevedo, Plínio M. Oliveira, Efrain P. Matamoros, João T.N. de Medeiros, *Federal University of Rio Grande do Norte, Natal, Brazil*
- 1007 Surface Characterization of Mold Steel in Injection Molding of Glass Fiber-reinforced Polymers**  
 Isidoro Martínez-Mateo, Francisco-José Carrión-Vilches, María-Dolores Bermúdez, *Universidad Politécnica de Cartagena, Cartagena, Spain*
- 1219 Effect of Ethanol on Lubricated Sliding Wear of Al and Mg Alloys and Composites**  
 Anindya Banerji, Afsaneh Edrisy, Ahmet T. Alpas, *University of Windsor, Windsor, ON, Canada*

#### TH4-MT9 Polymers 2

ROOM 1 TORINO • 16:30 – 18:50

Chair: Amaya Igartua, *IK4-Tekniker, Eibar, Spain*

- 5 Experimental Study on the Tribological Behavior of Bamboo Fiber Reinforced Brake Composites under Water Lubrication**  
 Youxi Lin, Wei Xie, Fushan He, Chenghui Gao, *Fuzhou University, Fuzhou, China*
- 6 The Importance of Wall Friction between Particulate Solids and Elastomeric Belt**  
 Stanislaw F. Scieszka, Daniel Adamecki, *Silesian University of Technology, Gliwice, Poland*
- 923 Effect of Shaft Roughness and Pressure on Friction of Polymer Bearings in Water**  
 Arash Golchin, *Luleå University of Technology, Luleå, Sweden*, Tan Dat Nguyen, Patrick De Baets, *Ghent University, Gent, Belgium*, Braham Prakash, *Luleå University of Technology, Luleå, Sweden*, Sergei Glavatskikh, *Royal Institute of Technology, Stockholm, Sweden*
- 100 Role of Crystallinity on Wear Behavior of PTFE Composites**  
 Marcello Conte, Beatriz Fernandez, Amaya Igartua, *IK4-Tekniker, Eibar, Spain*
- 861 Role of Amount Aramid Fibers on the Tribo-Performance Properties of NAO Friction Materials**  
 Neelamegam Aranganathan, Bijwe Jayashree, *Indian Institute of Technology, New Delhi, India*
- 735 The Tribological Properties of the Polyaryletherketone (PAEK) Family at High Speed and High Temperature**  
 Christopher J. Dyson, Malcolm F. Fox, *University of Leeds, Leeds, United Kingdom*, Bill Hopkins, *ROCOI Lubricants, Leeds, United Kingdom*, Martin Priest, *University of Leeds, Leeds, United Kingdom*



**JM – Joint Mechanics****TH4-JM2 Tribology and Wear within Frictional Joints**

ROOM 8 PALERMO • 16:30 – 18:50

Chair: Lothar Gaul, *University of Stuttgart, Germany*

- 911 Research on the Tribological Reliability of the Piezoelectric Contact**  
Juozas Padgurskas, Raimundas Rukuiža, Aleksandras Stulginskis  
*University, Kaunas, Lithuania*, Ramutis Bansevicius, *Kaunas University of Technology, Kaunas, Lithuania*, Audrius Žunda, *Aleksandras Stulginskis University, Kaunas, Lithuania*, Valentin Mihailov, *Institute of Applied Physics, Chisinau, Moldova*
- 436 High Temperature Comparative Tribological Study of CoCrTaAlY Coatings Reinforced with Different Percentages of Alumina**  
Daniele Botto, Mario Lavella, Muzio Gola, Paolo Zanon,  
*Politecnico di Torino, Torino, Italy*
- 433 Utilization of Abbott-Firestone Curves to Characterize the Wear Behavior of Low Wear Rate Coating Layers**  
Daniele Botto, Mario Lavella, Muzio Gola, *Politecnico di Torino, Torino, Italy*
- 598 Characterization of Contact Parameters and Fretting Wear Behavior of T-800 Coating on Inconel 718**  
Mario Lavella, Daniele Botto, Muzio M. Gola, *Politecnico di Torino, Torino, Italy*
- 1327 Impact of Synergic Interactions between Sliding Frequency and a Cyclic Variation of Normal Force on Ti-6Al-4V/ Ti-6Al-4V Gross Slip Fretting Wear Response**  
Siegfried Fouvry, Benjamin Van-Peteghem, Mariana Mendes, Patricia Neubauer, *École Centrale de Lyon, Écully, France*
- 999 Simulation of Starved Lubrication in Spherical Joints**  
Holger Fuchs, Henning Haensel, *Ruhr-University Bochum, Bochum, Germany*, Oliver Habel, *Daimler AG, Sindelfingen, Germany*, Jan Scholten, *Ruhr-University Bochum, Bochum, Germany*
- 253 Development of a Coupling Metric to Assess the Shakedown Limits for a Contact Interface**  
Matthew R. Brake, *Sandia National Laboratories, Albuquerque, NM, United States*, Robert R. Flicek, David A. Hills, Anothai Thaitirarat, *University of Oxford, Oxford, United Kingdom*

**PS3-JM Posters**

ATRIUM • 09:00 – 16:30

- 148 Tribological Aspects of Shaft Hoist Ropes Wear and Durability**  
Michał Styp-Rekowski, *University of Technology and Life Sciences, Bydgoszcz, Poland*, Maciej Matuszewski, *University of Technology and Life Sciences, Bydgoszcz, Poland*, Eugeniusz Mańka, *Research and Supervisory Centre of Underground Mining Co.Ltd., Łędziny, Poland*, Monika Madej, Dariusz Ozimina, *Technical University Kielce, Kielce, Poland*

**NT – Novel Aspects in Tribology****TH1-NT1 Novel Tribosystems and Lubrication**

ROOM 8 PALERMO • 08:30 – 10:30

Chair: Joichi Sugimura, *Kyushu University, Fukuoka, Japan*

- 91 Tribotronics – The Advent of a New Paradigm for Tribological Systems?**  
Ian Sherrington, *University of Central Lancashire, Preston, United Kingdom*, Sergei Glavatskiy, *KTH Royal Institute of Technology, Stockholm, Sweden*

- 572 Evaluation of Novel Liquid Crystal Lubricants with Minimum Friction Coefficients in the Context of Micromechanical Sliding Bearings**

Susanne Beyer-Faiss, Werner Stehr, *Dr. Tillwisch GmbH Werner Stehr, Horb, Germany*

- 1113 Effects of Interfacial Free Energy on Adhesive Friction Behavior of Elastomer Surfaces under Wet Condition**  
Satoshi Momozono, Yoji Iguchi, Kazuya Oshikiri, Kenya Nakamura, Keiji Kyogoku, *Tokyo Institute of Technology, Tokyo, Japan*
- 424 pH Value Effect on Friction between Silica Surfaces and Shear Thickening of Silica Suspensions**  
Lei Shan, Yu Tian, Jun Zhang, Yonggang Meng, *Tsinghua University, Beijing, China*
- 906 Lubrication Issues in Granular Suspension Rheology**  
Nicolas Fernandez, Lucio Isa, *ETH Zürich, Zürich, Switzerland*, Juliette Cayer-Barrioz, *CNRS, Écully, France*, Nicholas D. Spencer, *ETH Zürich, Zürich, Switzerland*
- 395 Numerical Study of Grain Shape in Granular Lubrication**  
Claas Bierwisch, Michael Moseler, *Fraunhofer Institute for Mechanics of Materials IWM, Freiburg, Germany*

**TH2-NT2 Novel Techniques**

ROOM 8 PALERMO • 11:00 – 13:00

Chair: Chenhui Zhang, *Tsinghua University, Beijing China*

- 380 Analysing Contact Interfaces with the Use of Ultrasonic Rayleigh Waves**  
Eng Seng Ooi, Robert Dwyer-Joyce, *Sheffield University, Sheffield, United Kingdom*
- 904 The Real-Time Measurement of Wear using Ultrasonic Reflectometry**  
Henry Brunskill, Phil Harper, *Tribosonics Ltd, Sheffield, United Kingdom*, Roger Lewis, *University of Sheffield, Sheffield, United Kingdom*
- 399 High Velocity Particle Impactor – Modeling and Experimental Verification of Impact Wear Tests**  
Marian Apostol, Veli-Tapani Kuokkala, *Tampere University of Technology, Tampere, Finland*, Anssi Laukkanen, Kenneth Holmberg, Richard Waudby, *VTT Technical Research Centre of Finland, Espoo, Finland*, Matti Lindroos, *Tampere University of Technology, Tampere, Finland*
- 647 Tribological Tests in H2O2 Environment for Components in Packaging Machines**  
Roberta Valle, *Centro Sviluppo Materiali S.p.A., Roma, Italy*, Manuela Franchi, *Tetra Pak Packaging Solutions, Modena, Italy*
- 556 Clarification of the Wear Property of DLC under Pressurized Hot Water at 30 MPa and 300°C**  
Yuji Yagi, Haci A. Tasdemir, Takayuki Tokoroyama, Noritsugu Umehara, *Nagoya University, Nagoya, Japan*, N. Inayoshi, K. Sasaki, *DENSO Corporation, Kariya, Japan*
- 212 A New Test Rig for Spline Couplings**  
Vincenzo Cuffaro, Francesca Curà, *Politecnico di Torino, Torino, Italy*, Marco Facchini, *Avio S.p.A., Rivalta (To), Italy*

**TH3-NT3 Novel Materials and Phenomena**

ROOM 8 PALERMO • 14:00 – 16:00

Chair: Fabrice Dassenoy, *École Centrale de Lyon, Écully, France*

- 1268 Effect of Friction of Catalyst on the Oxidation of Ethylene**  
Ken'ichi Hiratsuka, Takaaki Tsutsumi, *Chiba Institute of Technology, Narashino, Japan*
- 555 Hydrocarbon Decomposition and Hydrogen Generation by Reaction of Greases with Nascent Clean Steel Surface**  
Toshiaki Wakabayashi, *Kagawa University, Takamatsu, Japan*, Yasuoka Tokumo, Kentaro Yamaguchi, Kiyomi Sakamoto, Yuji Shitara, *JX Nippon Oil & Energy Corporation, Yokohama, Japan*



**93 Wear Characterization of a Masonry Brick towards the Study of its Particle Emission Tendency**

Neeraj Shandilya, Olivier Le Bihan, Christophe Bressot, *Institut National de l'Environnement Industriel et des Risques (INERIS), Verneuil-en-Halatte, France*, Martin Morgeneyer, *Université de Technologie Compiègne, Compiègne, France*

**96 Tribological Behaviour of Metallic Glass: the Underlying Mechanism**

Mohammad L. Rahaman, Liangchi Zhang, Haihui Ruan, *The University of New South Wales, Sydney, Australia*

**388 Superlubricity - Friction and Wear Phenomena of Hydrogen-Free Tetrahedral Amorphous Carbon (ta-C) Coatings**

Stefan Makowski, *Fraunhofer Institute for Material and Beam Technology, Dresden, Germany*, Lisa Krell, *BMW AG, München, Germany*, Jürgen Rausch, *Fuchs Europe Schmierstoffe, Mannheim, Germany*, Frank Schaller, Volker Weihnacht, *Fraunhofer Institute for Material and Beam Technology, Dresden, Germany*, Johann Schnagl, *BMW AG, München, Germany*, Rolf Luther, *Fuchs Europe Schmierstoffe, Mannheim, Germany*

**PS3-NT Posters**

ATRIUM • 09:00 – 16:30

**590 Actuality and Perspectives of Triboinformatics**

Lev Evelson, *Bryansk State Academy of Engineering and Technologies, Bryansk, Russian Federation*, Mayya Rafalovskaya, *Bryansk State Technical University, Bryansk, Russian Federation*

**764 Photoelastic Observations of Fast Transient Behaviors of Contact Area between an Elastic Belt and a Pulley**

Ken Nakano, Chiharu Tadokoro, Naohiro Kado, *Yokohama National University, Yokohama, Japan*

Friday, September 13<sup>th</sup>**BM – Biomimetics****FR1-BM2 Superhydrophobic, Self-cleaning, Low Friction Surfaces**  
ROOM 4 VENEZIA • 08:30 – 10:30Chair: Giuseppe Carbone, *Politecnico di Bari, Bari, Italy*

- 77 Keynote: Lotus Effect: Surfaces with Roughness-Induced Superhydrophobicity, Self Cleaning and Low Adhesion**  
Bharat Bhushan, *Ohio State University, Columbus, OH, United States*
- 314 Simulation Analysis on Drag Reduction Performance of Shell Surfaces with Antifouling Ability**  
Xiuqin Bai, Xuan Zhang, Chengqing Yuan, Chengwang Lei, Xinping Yan, *Wuhan University of Technology, Wuhan, China*
- 889 Tuning Roughness to Design Robust Superhydrophobic Surfaces**  
Francesco Bottiglione, Luciano Afferrante, *Politecnico di Bari, Bari, Italy*, Elena Pierro, *Università degli Studi della Basilicata, Potenza, Italy*, Giuseppe Carbone, *Politecnico di Bari, Bari, Italy*
- 705 Controllable Partial Wetting on Microwrinkle Surfaces**  
Takuya Ohzono, *Nanosystem Research Institute, AIST, Tsukuba, Japan*
- 325 Aqueous Lubrication of Sliding Contacts of Polymeric Surfaces by means of Polymer Brushes**  
Troels Røn, Irakli Javakhishvili, Søren Hvilsted, Seunghwan Lee, *Technical University of Denmark, Kgs. Lyngby, Denmark*
- 623 Bioinspired Solutions for Lubrication**  
Tiina Ahlroos, *VTT Technical Research Centre of Finland, Espoo, Finland*, Vesa Saikko, *Aalto University, Aalto, Finland*, Timo Hakala, Päivi Laaksonen, Robert Roozeman, Riitta Mahlberg, Markus Linder, Aino Helle, *VTT Technical Research Centre of Finland, Espoo, Finland*, Petri Kuosmanen, *Aalto University, Aalto, Finland*, Kenneth Holmberg, *VTT Technical Research Centre of Finland, Espoo, Finland*

**FR2-BM3 Microstructured Surfaces with Superior Adhesive Performance**

ROOM 6 FIRENZE • 11:00 – 13:00

Chair: Bharat Bhushan, *Ohio State University, Columbus, OH, United States*

- 1234 Keynote: Nanotribology of the Fantastic 4: Spider-silk Anchorages, Gecko Feet, Lotus Leaves and Graphene**  
Nicola M. Pugno, *University of Trento, Trento, Italy*
- 714 Adhesive Performance of Mushroom-shaped Micro-pillars with Interfacial Micro-bubbles of Air**  
Elena Pierro, *Università degli Studi della Basilicata, Potenza, Italy*, Giuseppe Carbone, Luciano Afferrante, Francesco Bottiglione, *Politecnico di Bari, Bari, Italy*
- 198 Coupling of Adhesion and Friction of Gecko Setal Array During Sliding**  
Yu Tian, Jin Wan, Yonggang Meng, Xiangjun Zhang, *Tsinghua University, Beijing, China*, Noshir Pesika, *Tulane University, New Orleans, LA, United States*
- 800 A Bio-inspired Micro-structured Surface with Anisotropic Adhesion**  
Luciano Afferrante, Francesco Bottiglione, Elena Pierro, Giuseppe Carbone, *Politecnico di Bari, Bari, Italy*
- 874 Dynamic Analysis of an Adhesive Fibrillar Contact**  
Turgay Eray, *Istanbul Technical University, Istanbul, Turkey*, Bilsay Sümer, *Hacettepe University, Ankara, Turkey*, İlker M. Koç, *Istanbul Technical University, Istanbul, Turkey*
- 802 Detachment of Adhering Membranes: Double Peeling vs Conical Peeling**  
Luciano Afferrante, Giuseppe Carbone, *Politecnico di Bari, Bari, Italy*, Nicola M. Pugno, *University of Trento, Trento, Italy*

**ST – Surface Tribology****FR1-ST26 Texturing 4**

ROOM 3 MILANO • 08:30 – 10:30

Chair: Giuseppe Carbone, *Politecnico di Bari, Bari, Italy*

- 458 Wear Resistant Property of Stainless Steel Modified by Friction Reforming**  
Han Chen, Masayuki Shima, Takashi Sugawara, Tatsuhiro Jibiki, *Tokyo University of Marine Science and Technology, Tokyo, Japan*
- 1013 Study of the Film Forming Technology to the Cylindrical Materials Using Friction**  
Hideki Akita, *Hitachi Construction Machinery Co., Ltd, Tsuchiura, Japan*, Masayuki Shima, Takashi Sugawara, Tatsuhiro Jibiki, Yasuhiro Konda, *Tokyo University of Marine Science and Technology, Tokyo, Japan*
- 713 Effects of Surface Texture on the Tribological Properties of Ti-6Al-4V Sliding against Si3N4 Balls in Water Lubrication**  
Fei Zhou, Yuejun Peng, Zhenfu Zhang, Xianliang Wang, Jianning Cheng, Naizhang Yun, *Nanjing University of Aeronautics and Astronautics, Nanjing, China*
- 254 Dry Friction between Laser-patterned Surfaces**  
Andreas Rosenkranz, Carsten Gachot, *Saarland University, Saarbrücken, Germany*, Nikolay Prodanov, Martin H. Müser, *Jülich Supercomputing Centre, Jülich, Germany*, Frank Mücklich, *Saarland University, Saarbrücken, Germany*
- 1097 Effects of Periodic Structure on EHL Film Formation under Pure Sliding Condition**  
Hiroshi Shiomi, Kazuaki Maniwa, Takashi Nogi, Shingo Obara, *Japan Aerospace Exploration Agency, Tsukuba, Japan*
- 1087 Study of Run-in Behaviour of Laser-patterned Surfaces under Dry Sliding Conditions**  
Björn Lechthaler, Carsten Gachot, Frank Mücklich, *Saarland University, Saarbrücken, Germany*

**FR2-ST27 Texturing 5**

ROOM 3 MILANO • 11:00 – 13:00

Chair: Daniel Braun, *Karlsruhe Institute of Technology, Germany*

- 172 Fabrication and Tribological Properties of Patterned Nickel Film with Artificial Micro/Nano Cylinders**  
Ying Wang, Jing Yang, Xia Li, Jianning Ding, Ningyi Yuan, *Changzhou University, Changzhou, China*
- 320 The Adhesive and Fictional Properties of Pillar Patterned Surface**  
Wei Huang, Jingqiu Wang, Xiaolei Wang, *Nanjing University of Aeronautics & Astronautics, Nanjing, China*
- 698 Tribology of Patterned Si Surface from the Nano- to the Micro-scale**  
Alberto Rota, Manoj Tripathi, *Università di Modena e Reggio Emilia, Modena, Italy*, Gian Carlo Gazzadi, *CNR - Istituto di Nanoscienze, Modena, Italy*, Sergio Valeri, *Università di Modena e Reggio Emilia, Modena, Italy*
- 940 Submillimeter Microparts Feeding along with Asymmetric Surfaces Fabricated by Anisotropic Etching Process of Single-Crystal Silicon**  
Atsushi Mitani, *Sapporo City University, Sapporo, Japan*, Yasutaka Matsuo, *Hokkaido University, Sapporo, Japan*
- 1053 How to Prevent Surfaces from Interlocking-Penrose Inspired Surface Patterns by Laser Interference**  
Carsten Gachot, Frank Mücklich, *Saarland University, Saarbrücken, Germany*
- 957 Effect of Textured Interface Layer on Tribological Properties of Electro-deposited Silver Coatings at Room Temperature**  
Jianliang Li, Dangsheng Xiong, Yongkun Qin, Heguo Zhu, *Nanjing University of Science and Technology, Nanjing, China*

## FR2-ST28 Coatings 9

ROOM 4 VENEZIA • 11:00 – 13:00

Chair: Junyan Zhang, *Chinese Academy of Sciences, Lanzhou, China***147 Wear and Scratch Resistance of Magnesium Alloys Covered by Surface Coatings Formed by Reaction with Imidazolium Phosphonate Ionic Liquids**Ana-Eva Jimenez, Tulia Espinosa, Jose Sanes, Maria-Dolores Bermúdez, *Universidad Politécnica de Cartagena, Cartagena, Spain*, Antonella Rossi, *Università degli Studi di Cagliari, Monserrato (Ca), Italy*, Nicholas D. Spencer, *ETH Zürich, Zürich, Switzerland***185 Tribological Properties and Lifetime of Electrical Contacts**  
Jian Song, Eduard Plett, Liangliang Wang, *Ostwestfalen-Lippe University of Applied Sciences, Lemgo, Germany***658 Effect of Cr3C2 Reinforcement on the Tribological Performance of Inconel 625 Laser Cladding Coatings**Davide Verdi, Miguel Á. Garrido-Maneiro, Claudio J. Múñez, Pedro Poza, *Universidad Rey Juan Carlos, Móstoles, Spain***898 Multi-probe Scratching Technique as an Interfacial Adhesion Measurement in Coated Systems**Vincent Le Houérou, Leandro Jacomine, Christian Gauthier, *Institut Charles Sadron, Strasbourg, France***987 Tribological Investigation of Laser Cladded Ceramic Al2O3 Coatings on Aluminium**Florian Pape, Christian Nölke, Stefan Kaieler, *Laser Zentrum Hannover e.V., Hannover, Germany*, Ude D. Hangen, *Hysitron, Inc., Aachen, Germany*, Rolf Reiter, Volker Wesling, *Technische Universität Clausthal, Clausthal-Zellerfeld, Germany***1099 Tribological Characterization of Thermally Sprayed Silicon Carbide Coatings**Fahmi Mubarak, *Norwegian University of Science and Technology, Trondheim, Norway*, Sergio Armada, *SINTEF Material and Chemistry, Trondheim, Norway*, Nuria Espallargas, *Norwegian University of Science and Technology, Trondheim, Norway*

## FW – Dry Friction and Wear

## FR1-FW14 Friction at the Nano, Micro and Macro Scales

ROOM 2 PISA • 08:30 – 10:30

Chair: Jan Suchánek, *Czech Technical University, Prague, Czech Republic***52 Influence of Thermal Excitation in Atomic-Scale Friction**Yazhen Wang, Yingjun Chen, Xinpeng Zhang, Ping Huang, *South China University of Technology, Guangzhou, China***168 Nanoscale Sliding Contacts between Multi-Asperity Tips and Textured Surfaces**Ruiting Tong, Geng Liu, Tianxiang Liu, *Northwestern Polytechnical University, Xi'an, China***281 Computational Chemistry Study on Tribo-chemical Reaction Mechanism of Polytetrafluoroethylene in Various Environments**Tasuku Onodera, Kenji Kawasaki, Takayuki Nakakawaji, *Hitachi Research Laboratory, Hitachi, Japan*, Yuji Higuchi, Nobuki Ozawa, Kazue Kurihara, Momoto Kubo, *Tohoku University, Sendai, Japan***365 Stick-slip and Wear Behavior of Ceramic and Polymer Materials under Reciprocating Sliding Conditions**Christian Scholz, Rolf Wäsche, *BAM Federal Institute for Materials Research and Testing, Berlin, Germany***528 How Nano-roughness Reduces the Interfacial Scission of Glassy Polymer in the Viscoelastic Contact Pressure Range**Anne Rubin, *Strasbourg University, Strasbourg, France*, Christian Gauthier, *Strasbourg University, Strasbourg, France***760 Study of Mechanisms Occurring During Friction of Textile Surfaces**Michel Tournalias, Romain Bocquet, Marie-Ange Bueno, *Université de Haute-Alsace, Mulhouse, France*, Siegfried Derler, René Rossi, *EMPA - Swiss Federal Laboratories for Materials Science and Technology, St. Gallen, Switzerland*

## FR1-FW15 Control and Modification of Frictional Properties

ROOM 5 NAPOLI • 08:30 – 10:30

Chair: Dariusz M. Bieliński, *Institute for Engineering of Polymer Materials & Dyes, Piastów, Poland***425 Frictional Behavior of Particulate Anti-Slip Agents for Hands and Fingers**Takeshi Yamaguchi, Toshihiro Shimakura, Takahiro Kawasaki, Kazuo Hokkirigawa, *Tohoku University, Sendai, Japan***574 Effects of Photoageing on the Tribological Properties of Engineering Plastics**Haitao Duan, Ding Wang, Kali Gu, *Wuhan Research Institute of Materials Protection, Wuhan, China***771 Influence of Environmental Factors on Slip of Rubber Vulcanizates**Dariusz M. Bieliński, *Institute for Engineering of Polymer Materials & Dyes, Piastów, Poland*, Mariusz Siciński, Joanna Kleczewska, *Łódź University of Technology, Łódź, Poland*, Jan Mężyński, *Institute for Engineering of Polymer Materials & Dyes, Piastów, Poland***789 Effects of Dynamic Behaviors of Asperities on Friction Coefficients**Naohiro Kado, Chiharu Tadokoro, *Yokohama National University, Yokohama, Japan*, Takatoshi Shinyoshi, Atsushi Suzuki, *Toyota Motor Corporation, Toyota, Japan*, Ken Nakano, *Yokohama National University, Yokohama, Japan***778 Relating Acoustic Emission to Wear of PBT Composites against Steel**Constantin Georgescu, Iulian G. Birsan, Lorena Deleanu, *"Dunarea de Jos" University of Galati, Galati, Romania*

## FR2-FW16 Surface Tribology – Coatings

ROOM 2 PISA • 11:00 – 13:00

Chair: Marian Szczerek, *National Research Institute, Radom, Poland***974 Tribological Properties of CVD Graphene Sheets on Polymer Substrates**Kwang-Seop Kim, Kyungmin Jo, Bongkyun Jang, Jae-Hyun Kim, Hak-Joo Lee, *Korea Institute of Machinery & Materials, Daejeon, Republic of Korea***818 The Wear Behaviors of Basalt Base Glass-ceramic Coatings by Plasma Spray Coating Technique**Gunhan Bayrak, Senol Yilmaz, Ugur Sen, Ediz Ercenk, *Sakarya University, Sakarya, Turkey***880 Sliding Wear Behavior of Chromium Boride Coated AISI 52100 Steel**Ugur Sen, Fatih Aydın, Smail H. Kara, Saduman Sen, *Sakarya University, Sakarya, Turkey***204 Tribological Behavior of Cr-doped and Non-doped DLC Films Deposited on Ti-6Al-4V Alloy by Unbalanced Magnetron Sputtering**Auezhan Amanov, Tsukasa Watabe, Ryo Tsuboi, Shinya Sasaki, *Tokyo University of Science, Tokyo, Japan*

## FR2-FW17 Tribology of Materials

ROOM 5 NAPOLI • 11:00 – 13:00

Chair: Magdalena Trzos, *Institute for Sustainable Technologies (ITe-PIB), Radom, Poland***1294 Tribosystems for Dry Running, High Performance Rolling Sliding Contacts**Michael Widmann, *Wittenstein Bastian GmbH, Fellbach, Germany*

- 1062 The Effect of Pre-sliding in Air on the Tribological Properties of DLC/Cr-DLC Bi-gradient Coating against Stainless Steel in Vacuum**  
Kosuke Ito, *Nihon University, Koriyama, Japan*, Koji Matsumoto, *Japan Aerospace Exploration Agency, Chofu, Japan*, Takanori Takeno, *Tohoku University, Sendai, Japan*, Junichi Takaku, *Nihon University, Koriyama, Japan*, Koshi Adachi, *Tohoku University, Sendai, Japan*
- 489 Validation of a Numerical Model by Means of Pin-on-disk Tests for Low Loaded Dry Contacts (Al<sub>2</sub>O<sub>3</sub>-Titan Alloy)**  
Benoit Lorentz, *Karlsruhe Institute of Technology (KIT), Karlsruhe, Germany*, Andreas Rosenkranz, *Saarland University, Saarbrücken, Germany*
- 1121 Multi-scale Modeling of Indentation and Contact Fatigue: A Coupled CPFE/DD Approach**  
Yilun Xu, Daniel S. Balint, Daniele Dini, *Imperial College London, London, United Kingdom*
- 324 Tribological Behaviour of MoS<sub>2</sub> in Hydrogen Environment**  
Thomas Schneider, Thomas Gradt, *BAM Bundesanstalt für Materialforschung, Berlin, Germany*, Bernd Vierendeel, Stephan Tremmel, Sandro Wartzack, *Friedrich-Alexander-University Erlangen-Nuremberg, Erlangen, Germany*
- 224 Comparison of the EHL Characteristics for Different Roller Axial Profiles**  
Tae-Jo Park, *Gyeongsang National University, Jinju, Republic of Korea*
- 192 Radial Stiffness of an Angular Contact Ball Bearing under Cryogenic Temperature**  
Tomoya Nakamura, Satoshi Takada, Masataka Kikuchi, Takayuki Sudou, *Japan Aerospace Exploration Agency, Kakuda, Japan*, Tomoyuki Takano, *Japan Aerospace Technology Foundation, Kakuda, Japan*
- 296 Cage Instability of High Speed Ball Bearing in Starting Process**  
Zhenhuan Ye, Liqin Wang, *Harbin Institute of technology, Harbin, China*
- 984 Refrigerant-Lubricated Gas Foil Bearings - A Thermo-Hydrodynamic Study**  
Mathieu Garcia, *Liebherr Aerospace Toulouse SAS, Toulouse, France*, Benyebka Bou-Saïd, *INSA-Lyon, Lyon, France*, Jérôme Rocchi, Gregory Grau, *Liebherr Aerospace Toulouse SAS, Toulouse, France*
- 448 Analysis of Sliding Friction Moment in Ball-Cage Contact of Instrument Mini-ball Bearing Undergoing Oscillatory Motion**  
Shaona Jiang, Xiaoyang Chen, *Shanghai University, Shanghai, China*, Jiaming Gu, *Shanghai Tian An Bearing Co. Ltd, Shanghai, China*

## LA – Lubricants and Additives

### FR1-LA14 Lubricants

ROOM 6 FIRENZE • 08:30 – 10:30

Chair: Fabrice Dassenoy, *École Centrale de Lyon, Écully, France*

- 1021 In situ Analysis of Viscosity Modifiers at EHL Contact Using a FT-IR Spectroscopy**  
Yasushi Hoshi, Hidetaka Nanao, Shigeyuki Mori, *Iwate University, Morioka, Japan*
- 736 Microencapsulation for Next Generation Lubricants**  
Karen Mitchell, Olivier J. Cayre, Ardian Morina, Anne Neville, *University of Leeds, Leeds, United Kingdom*, Gary Walker, Mike Sutton, *Lubrizol Limited, Derby, United Kingdom*
- 785 Oiliness Additive Adsorption onto Metal Surface Analyzed by Infrared Reflection Absorption Spectroscopy**  
Ryota Kawamura, Masato Nakashima, Takashi Matsuoka, Tomoko Hirayama, *Doshisha University, Kyotanabe, Japan*
- 1056 The Development of In Situ Chemical Sensors for Engine Oil Acidity Monitoring**  
Mostafa Soleimani, Ling Wang, John K. Atkinson, *University of Southampton, Southampton, United Kingdom*, Robert I. Taylor, *Shell Research Ltd, Chester, United Kingdom*, Robert J K Wood, *University of Southampton, Southampton, United Kingdom*
- 775 Flammability of Emulsions on Hot Surfaces**  
Lorena Deleanu, Constantin Georgescu, Sorin Ciortan, Liviu Şolea, *"Dunarea de Jos" University of Galati, Galati, Romania*
- 474 Bis-ammonium Based Halogen Free Ionic liquids as Lubricant Additive for Steel-Steel Contact**  
Rashi Gusain, Om P. Khatri, *CSIR - Indian Institute of Petroleum, Dehradun, India*

## BE – Bearings

### FR1-BE14 Rolling Bearings 6

ROOM 7 BARI • 08:30 – 10:30

Chair: Paolo Pennacchi, *Politecnico di Milano, Milano, Italy*

- 336 False Brinelling - Influence of the Pivoting Angle on the Contact Mechanics and the Wear Mechanisms in the Contact between Roller and Raceway**  
Markus Grebe, Paul Feinle, *Mannheim University of Applied Sciences, Mannheim, Germany*, Pavol Blaškovič, *Slovak University of Technology in Bratislava, Trnava, Slovak Republic*

### FR1-BE15 Fluid-Film Bearings 5

ROOM 9 BOLOGNA • 08:30 – 10:30

Chair: Stanislaw Strzelecki, *Institute of Textile Machinery "Polmatex-Cenaro", Łódź, Poland*

- 926 Experimental Study on a Hydrodynamic Centered Pivot Tilting-pad Thrust Bearing**  
Jean Bouyer, *Université de Poitiers, Futuroscope Chasseneuil, France*, Yuuta Nakano, Mari Nagata, *Daido Metal Co. Ltd, Inuyama, Japan*, Michel Fillon, *Université de Poitiers, Futuroscope Chasseneuil, France*
- 928 Experimental Identification of a Squeeze Film Damper Rotordynamic Coefficients**  
Ezequiel Trejo, Gustavo Rodríguez, Sergio Diaz, *Universidad Simón Bolívar, Caracas, Venezuela*
- 1047 Development and Validation of Low Friction Guide Shoe Bearing for Large Two-stroke Marine Diesel Engines**  
Anders Vølund, *MAN Diesel & Turbo SE, Copenhagen, Denmark*
- 1313 Experimental Investigation of Innovative Low Viscosity Synthetic Oils for Journal Bearings in Turbomachinery Applications**  
Luigi Barbato, Francesca Tognini, *GE Oil & Gas, Firenze, Italy*, Claudio Barzaghi, Manuela Toscanini, *Eni S.p.A., San Donato Milanese (Mi), Italy*
- 525 Experimental Test of Dynamic Characteristics of Tilting Pad Thrust Bearing**  
Qing Ge, *Shanghai Electric Power Generation Equipment Co., Shanghai, China*, Bing Wu, Chunyang Zang, Jian Jin, Xiaojing Wang, *Shanghai University, Shanghai, China*
- 761 Comparative Performance Study of Hybrid Bearings with Different Structures**  
Lin Wang, Shiyuan Pei, Hua Xu, *Xi'an Jiaotong University, Xi'an, China*



**FR2-BE16 Fluid-Film and Rolling Bearings**

ROOM 7 BARI • 11:00 – 13:00

Chair: Christos I. Papadopoulos, *National Technical University of Athens, Greece*

- 375 Performance Test and Development of the Test Rig for the Water Lubricated Ball Bearing**  
Choong Hyun Kim, Jun Hyeon Jo, *Korea Institute of Science and Technology, Seoul, Republic of Korea*
- 652 Experimental Study on the Power Consumption of High-speed Tilting-Pad Journal Bearing**  
Yongsheng Zhu, *Key Laboratory of Education Ministry for Modern Design and Rotor-Bearing System, Xi'an, China*, Jun Hong, *State Key Laboratory for Manufacturing Systems Engineering, Xi'an, China*, Pengju Li, Youyun Zhang, *Key Laboratory of Education Ministry for Modern Design and Rotor-Bearing System, Xi'an, China*
- 601 Analysis of Diamond Segmented Pads on both Rotating and Stationary Bearings in Contact Sliding**  
Brent A. Lingwall, *US Synthetic Corporation, Orem, UT, United States*, Joonyoung Jang, Michael M. Khonsari, *Louisiana State University, Baton Rouge, LA, United States*, Tim N. Sexton, *US Synthetic Corporation, Orem, UT, United States*
- 1325 A Complementarity Formulation for the EHL Analysis of a Connecting Rod Big End Bearing**  
Matteo Giacomini, Luca Bertocchi, Andrea Baldini, *University of Modena and Reggio Emilia, Modena, Italy*, Daniele Dini, *Imperial College London, London, United Kingdom*
- 1326 A Complementarity Formulation of the Tangential Velocity Slip Problem in Lubricant Films**  
Antonio Strozzi, Matteo Giacomini, Enrico Bertocchi, *University of Modena and Reggio Emilia, Modena, Italy*, Daniele Dini, *Imperial College London, London, United Kingdom*
- 1202 New Methodologies for Rolling Contact Fatigue Performance Evaluation of Gear Oils**  
Ksenija Topolovec Miklozic, *Powertrib Limited, Oxford, United Kingdom*

**FR2-BE17 Fluid-Film Bearings 6**

ROOM 9 BOLOGNA • 11:00 – 13:00

Chair: Azzedine Dadouche, *National Research Council – Canada, Ottawa, Canada*

- 845 Friction Model for Water Lubricated Sliding Thrust Bearing Including Deformation and Wear**  
Helge Grann, John Frigaard Nielsen, *Grundfos Holding A/S, Bjerringbro, Denmark*
- 1155 Tilting Pad Thrust Bearing with Novel Material Selection - Experimental Comparison of Low and Medium Speed Operation**  
Michał Wasilczuk, Michał Wodtke, *Gdańsk University of Technology, Gdańsk, Poland*, Wolfgang Braun, *Schaeffler Technologies AG & Co KG, Germany*
- 1158 Modeling Electrical Pitting on Tilting-pad Thrust Bearings**  
Paolo Pennacchi, Pietro Borghesani, Steven Chatterton, Andrea Vania, *Politecnico di Milano, Milano, Italy*
- 1211 Performance Characteristics of Low Speed, Heavily Loaded Two Axial Groove Cylindrical Journal Bearings of Mine Hoisting Machine**  
Grzegorz Standziak, *Katowice Coal Holding Company, Katowice, Poland*, Stanisław Strzelecki, *Institute of Textile Machinery "Polmatex-Cenaro", Łódź, Poland*, Zygmunt Towarek, *Łódź University of Technology, Łódź, Poland*

**1247 Effect of Lobe Geometry on the Maximum Oil Film Temperature of Multilobe Journal Bearings**Sobhy M. Ghoneam, *Menoufya University, Shebin El-Kom, Egypt*, Henryk Kapusta, Zdzisław Socha, Stanisław Strzelecki, *Institute of Textile Machinery "Polmatex-Cenaro", Łódź, Poland***EC – ECOTRIB 2013  
Tribology of Machine Elements****FR2-EC14 Wear**

ROOM 10 PERUGIA • 11:00 – 13:00

Chair: Paolo Pennacchi, *Politecnico di Milano, Milano, Italy*

- 326 The Influence of High Toughness Silicon Steels on Applications Demanding Low Friction and High Load Carrying Capacity**  
Christian Scholz, Dirk Spaltmann, Mathias Woydt, *BAM Federal Institute for Materials Research and Testing, Berlin, Germany*
- 470 Increase Wear Resistance and Microhardness of 18CrNi3Mo Low Carbon Steel by Surface Treatment**  
Mazhyn Skakov, Lyaila Bayatanova, D. Serikbaev East Kazakhstan State Technical University, *Ust-Kamenogorsk, Kazakhstan*, Michael Scheffler, *Otto-von-Guericke University, Magdeburg, Germany*
- 505 Contact Modeling of Rough Surfaces**  
Balázs Magyar, Bernd Sauer, *University of Kaiserslautern, Kaiserslautern, Germany*
- 591 Effects of Wall Roughness on Shear Stress in a Magnetorheological Fluid Shear Cell**  
Hanna G. Lager, Claas Bierwisch, Michael Moseler, *Fraunhofer Institute for Mechanics of Materials IWM, Freiburg, Germany*
- 1227 Investigating Seizure Load and Wear Characteristics**  
Philip De Vaal, Vivian Möller, Jacques Langenhoven, *University of Pretoria, Pretoria, South Africa*
- 1215 Electro-mechanical Contact between Pantograph Strip and Catenary Contact Wire: Laboratory Tests and Wear Model**  
Giuseppe Bucca, Andrea Collina, Ezio Tanzi, *Politecnico di Milano, Milano, Italy*

**MT – Tribology of Materials****FR1-MT10 Surfaces**

ROOM 1 TORINO • 08:30 – 10:30

Chair: Daniele Ugues, *Politecnico di Torino, Torino, Italy*

- 1058 Comprehensive Study of ZDDP-tribofilms Formed under Soft Contact Conditions**  
Kartik S. Pondicherry, *Materials Center Leoben GmbH, Leoben, Austria*, Florian Grün, Florian Summer, István Gódor, *Montanuniversität Leoben, Leoben, Austria*, Emmanuel Lainé, *Infineum UK Limited, Milton Hill, United Kingdom*, Martin Offenbecher, *Miba Bearing Group, Laakirchen, Austria*
- 1217 Study of Micro Hardness, Roughness, Wear and Corrosion behaviour of Ni/CNT and Ni/GNP Composite Coatings Produced by Electrodeposition**  
Muhammad R. Abdul Karim, Matteo Pavese, Daniele Ugues, Azhar Hussain, Andrea G. Pisa, *Politecnico di Torino, Torino, Italy*, Elisa P. Ambrosio, *Italian Institute of Technology, Torino, Italy*, Sara Biamino, Paolo Fino, Claudio F. Badini, *Politecnico di Torino, Torino, Italy*
- 1259 Wear Prediction from Energy Considerations in Alumina with Different Grain Sizes**  
Álvaro Rico, Felipe Orgaz, *Instituto de Cerámica y Vidrio, Madrid, Spain*, Jesús Rodríguez, *Universidad Rey Juan Carlos, Móstoles, Spain*

**1077 Wear of Different Material Pairings for the Piston Ring – Cylinder Liner Contact**

Thomas Wopelka, Claudia Lenauer, Johannes Sequard-Base, Karoline Steinschütz, Lukas Spiller, Andreas Pauschitz, Martin Jech, *AC<sup>2</sup>T Research GmbH, Wiener Neustadt, Austria*

**896 Ultra-Low Wear Nanocomposites**

Angela A. Pitenis, Brandon A. Krick, Jeffrey J. Ewin, W. Gregory Sawyer, *University of Florida, Gainesville, FL, United States*

**FR2-MT11 Coatings**

**ROOM 1 TORINO • 11:00 – 13:00**

Chair: Marcello Conte, *IK-4 Tekniker, Eibar, Spain*

**1140 Keynote: New Experimental Findings on the Role of Initial Material Transfer in Determining Friction and Surface Damage**

Staffan Jacobson, Jannica Heinrichs, *Uppsala University, Uppsala, Sweden*, Mikael Olsson

**1306 In Situ Detection of Hydrogen Evolution During Lubricated Sliding Contact**

Dominik Kuerten, Nicholas Winzer, Andreas Kailer, Wulf Pfeiffer, Matthias Scherge, *Fraunhofer Institute for Mechanics of Materials IWM, Freiburg, Germany*

**1136 Modeling the Propagation of Rolling Contact Fatigue (RCF) Cracks in the Presence of Lubricant**

Robert Balcombe, Mark T. Fowell, Amir Kadiric, Daniele Dini, Andrew V. Olver, *Imperial College London, London, United Kingdom*

**1283 Effects of Hydrogen on Friction and Wear Behavior of DLC Films**

Shinya Sasaki, Kenta Oshima, Ryo Tsuboi, *Tokyo University of Science, Tokyo, Japan*, Masahiro Kawaguchi, *Tokyo Metropolitan Industrial Technology Research Institute, Tokyo, Japan*

**1018 Hydrogen Uptake in Hardened Steels under Repeated Contact**

Joichi Sugimura, Takahiro Yamanaka, Hiroyoshi Tanaka, *Kyushu University, Fukuoka, Japan*

**939 Experimental Study of Hydrogen Sealing Ability and Wear Characteristics of Polymer Composites**

Hayato Ideguchi, Yoshinori Sawae, Takehiro Morita, Kazuhiro Nakashima, Joichi Sugimura, *Kyushu University, Fukuoka, Japan*

**JM – Joint Mechanics**

**FR1-JM3 Friction Damping in Aerospace Application**

**ROOM 10 PERUGIA • 08:30 – 10:30**

Chair: Lars Panning von Scheidt, *Leibniz Universität Hannover, Germany*

**255 Reduced Order Modelling of Nonlinear Structures with Frictional Interfaces**

Matthew R. Brake, *Sandia National Laboratories, Albuquerque, NM, United States*, Pascall Reuss, Lothar Gaul, *University of Stuttgart, Stuttgart, Germany*, Daniel J. Segalman, *Sandia National Laboratories, Albuquerque, NM, United States*

**1127 Modelling Friction Contacts in Nonlinear Vibration of Bladed Disks**

Loic Salles, Christoph Schwingshackl, Jeff Green, *Imperial College London, London, United Kingdom*

**1032 Dynamic Identification of Friction Damping in the Joints of an Engine-Like Bladed-Disks**

Daniele Botto, Christian Firrone, *Politecnico di Torino, Torino, Italy*, Paolo Calza, *AVIO S.p.A., Torino, Italy*, Muzio Gola, *Politecnico di Torino, Torino, Italy*

**599 Experimental Investigation on the Damping Effectiveness of Blade Root Joints**

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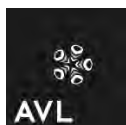
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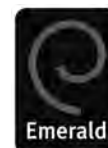


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