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OPENING AND PLENARY

Monday 9th 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 N/A
Dr. Paolo Giubellino, *ALICE Experiment Spokesperson, CERN & INFN*

PLENARY TALKS

11:20 – 12:00

Rolling Bearing Tribology: Successful Past – Bright Future Pg.3634
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 N/A
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 N/A
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 Pg.3637
Prof. Klaus Friedrich, *Institute for Composite Materials, Technical University of Kaiserslautern, Germany*

15:20 – 16:00

Space Tribology: Experiments in Low Earth Orbit Pg.3641
Prof. W. Gregory Sawyer, *University of Florida, Gainesville, FL, United States*

MONDAY

Monday, September 9th

ET – Ecotribology

MO1-ET1 Tribology for Energy Conservation I
ROOM 1 TORINO • 16:30 – 18:30

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

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Robert J.K. Wood, *University of Southampton, Southampton, United Kingdom*

1079 **Engine Tribology: From F1 Performance on Track to Energy Efficiency on Road** Pg.105
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** Pg.109
Jinjin Li, Chenhui Zhang, Jianbin Luo, *Tsinghua University, Beijing, China*

126 **Superlubricity: from Phosphoric Acid to Mixture of Acids and Polyhydroxy Alcohols Solutions** Pg.113
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Frank Bauer, *Universität Stuttgart, Stuttgart, Germany*

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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*

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1290 **Biotribology Simulation System** Pg.135
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ST – Surface Tribology

MO1-ST1 Coatings 1
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MO1-ST2 Contact Mechanics 1
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Chair: Daniele Dini, *Imperial College London, United Kingdom*

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FW – Dry Friction and Wear

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LA – Lubricants and Additives

MO1-LA1 Lubricants Chemistry and Rheology
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Chair: Adolfo Senatore, *University of Salerno, Italy*

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VI – VIENNANO'13-Nanotechnology

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

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BE – Bearings

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

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

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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*

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Tuesday, September 10th

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** Pg.313
Bharat Bhushan, *The Ohio State University, Columbus, OH, United States*

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127 **Global Impact of Friction on Energy Consumption, Environment and Economy** Pg.317
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348 **Controllable Superlubricity of Glycerol Solution via Environment Humidity** Pg.323
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** Pg.326
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995 **Surface Texture to Improve Friction Properties by Forming Smoother Surface on Silicon-based Ceramics in Water** Pg.329
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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** Pg.341
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Giorgio Figliolini, Pierluigi Rea, *University of Cassino and Southern Lazio, Cassino (Fr), Italy*, Ruggero Gambatesa, *MAD S.r.l., Roma, Italy*

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*

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579 **Boundary Lubrication of Stainless Steel and CoCrMo Materials Based on Phosphorous or Boron Containing Additives** Pg.387
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** Pg.391
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** Pg.393
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** Pg.395
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** Pg.399
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** Pg.400
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** Pg.404
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** Pg.407
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** Pg.409
Zikai Hua, Yongwei Fan, *Shanghai University, Shanghai, China*

1266 **Estimation of Wear Factors of MoM Hip Implants from Simulator Tests** Pg.413
Lorenza Mattei, Francesca Di Puccio, Enrico Ciulli, *University of Pisa, Pisa, Italy*

609 **Pre-clinical Testing of Total Disc Replacements Using a Stratified Approach** Pg.417
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** Pg.421
Claire L. Brockett, Louise M. Jennings, John Fisher, *University of Leeds, Leeds, United Kingdom*

858 **Wear Prediction of Acetabulum Inserts due to Multiple Human Routine Activities** Pg.424
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** Pg.428
Konttinen 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** Pg.432
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** Pg.433
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** Pg.434
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** Pg.437
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** Pg.441
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** Pg.445
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** Pg.448
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** Pg.452
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** Pg.456
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** Pg.459
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** Pg.461
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** Pg.464
Liang Zheng, Jing Zheng, Linmao Qian, Zhongrong Zhou, *Southwest Jiaotong University, Chengdu, China*

493 **Study of Lubricating Mechanisms in Artificial Hip Joints** Pg.467
Martin Vrbka, Ivan Křupka, 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** Pg.470
Mamoun Fellah, Mohammed Labaïz, 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 β Titanium Biomedical Alloys Obtained by Powder Metallurgy** Pg.474
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** Pg.478
Zenon Pawlak, *Tribochemistry Consulting, Salt Lake City, UT, United States*, Wieslaw 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** Pg.482
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** Pg.483
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** Pg.487
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** Pg.491
Jin-Hwak Park, Young-Ze Lee, *Sungkyunkwan University, Suwon, Republic of Korea*

879 **Tribological Tests of Particular Dental Materials** Pg.494
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** Pg.498
Piotr Kowalewski, Wojciech Wieleba, Dymitry Capanidis, *Wrocław University of Technology, Wrocław, Poland*

1123 **Procedural Approach on Using XRD to Qualify the Surface Roughness** Pg.502
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** Pg.506
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** Pg.510
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** Pg.514
Shuxue Piao, Nagaraj Chelliah Machavallvan, 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 MoS2 Matrices on Mechanical and Tribological Properties** Pg.517
Nathalie M. Renevier, *University of Central Lancashire, Preston, United Kingdom*, Xiaoling Li, *University of Birmingham, Birmingham, United Kingdom*, Xiaoling Zhen-Teer, *Miba, Droitwich, United Kingdom*

149 **The Effect of Coating Characteristics on the Performance of a-c:H And ta-c Coatings** Pg.518
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** Pg.521
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** Pg.523
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** Pg.527
Filippo Mangolini, James Hilbert, Jennifer R. Lukes, Robert W. Carpick, *University of Pennsylvania, Philadelphia, PA, United States*

718 **Zirconium Carbonitrides for Tribological Applications** Pg.531
Javier Barriga, Unai R. de Gopegui, Cristina Zubizzareta, *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** Pg.535
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, Oldemburg, Germany*, Elena Teidelt, *Berlin University of Technology, Berlin, Germany*

136 **Deterministic Analysis of Contacts - From Roughness to Inhomogeneity** Pg.539
Yuan-zhong Hu, *Tsinghua University, Beijing, China*

821 **The Multifractal Analysis of the Fatigue Fracture under the Process of Friction** Pg.541
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** Pg.545
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** Pg.549
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** Pg.553
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** Pg.557
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** Pg.561
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** Pg.564
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** Pg.568
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** Pg.572
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** Pg.574
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** Pg.578
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** Pg.581
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** Pg.583
Ari Tuononen, *Aalto university, Espoo, Finland*

1020 **Influence of the Pitch Point Position on Tooth Flanks Wear** Pg.587
Mileta Ristivojevic, Tatjana Lazovic, Aleksandar Vencl, *University of Belgrade, Belgrade, Serbia*

1030 **Mechanical and Thermal Contact of Regular Surfaces with Gas-Filled Interstitial Gaps** Pg.591
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 Nélias, *INSA-Lyon, Villeurbanne, France*

910 **Physical and Chemical Processes Affecting Performance of Super-low Friction Carbon Nitride Coatings in Various Gaseous Environments** Pg.594
Feodor M. Borodich, *Cardiff University, Cardiff, United Kingdom*

1010 **Effect of Relative Humidity on Super-low Friction of Carbon Nitride Coatings in N2 Gas Environment** Pg.598
Naohiro Yamada, Kyosuke Sato, Takanori Takeno, Koshi Adachi, *Tohoku University, Sendai, Japan*

689 **PVD Coatings for Automotive & Precision Wear Components** Pg.600
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** Pg.603
Kazunari Matsuzaki, Iwao Sasaki, Michiaki Ikeda, Kenji Matsuda, *Kyushu Institute of Technology, Kitakyushu, Japan*

403 **Tribological Properties of HVOF Sprayed WC-Ni Coatings** Pg.607
Monika Madej, Dariusz Ozimina, *Kielce University of Technology, Kielce, Poland*

135 **Nanoparticle-wall Collision in Fluid Jet and its Effect on Material Removal** Pg.608
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** Pg.610
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** Pg.614
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** Pg.618
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** Pg.622
Luis B. Varela Jiménez, Luis Espitia, André Tschiptschin, *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** Pg.626
Elena Torskaya, *Russian Academy of Sciences, Moscow, Russian Federation*

1209 **Design of a Twin Disc Test Machine** Pg.630
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** Pg.633
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* Pg.634

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* Pg.636

145 **Influence of Hydrogen Content on DLC Tribological Behavior: Tests in Mineral Base Oil** Pg.640
Choumad Ould, Christophe Héau, *IREIS-HEF, Andrézieux-Bouthéon, France*, Julien Fontaine, *École Centrale de Lyon, Écully, France*, Christophe Donnet, *Universite Jean Monnet, Saint-Etienne, France*

279 **Relation between Deposition Parameters and Properties of DLC Films by Using CVD with Pulsed-DC Plasma** Pg.644
Hirotaka 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** Pg.646
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** Pg.650
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** Pg.652
Deli Duan, Shu Li, Ziyang Hu, *Chinese Academy of Sciences, Shenyang, China*

720 **Tribocorrosion Response of TaN Coatings in Biological Environments** Pg.656
Raquel Bayón, Lucía Mendizabal, Unai R. de Gopegui, Javier Barriga, *IK4-Tekniker, Eibar, Spain*

1008 **Study of Sliding Bearing Lubricated in Ultra Pure Water** Pg.660
Kenichi Sugiyama, Junya Kawabata, *Ebara corporation, Fujisawa, Japan*

1100 **Tribocorrosion of ZrN and TiAlN Hard Coatings against Alumina Reinforced Polymers** Pg.664
Josef Brenner, Hakan Gocerler, Manel Rodriguez Ripoll, *AC²T Research GmbH, Wiener Neustadt, Austria*

1147 **Tribocorrosive Wear Phenomena Occurring in Oilfield Application** Pg.666
Andreas Trausmuth, Ewald Badisch, Fabian Weigel, Rainer Jahn, *AC²T 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** Pg.670
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** Pg.674
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** Pg.678
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)** Pg.680
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** Pg.684
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** Pg.688
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** Pg.692
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** Pg.696
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** Pg.703
Flavio Farroni, Michele Russo, Riccardo Russo, Francesco Timpone, *University Of Naples Federico II, Naples, Italy*

225 **Kinematic Analysis of Particles in Three-Body-Contacts**
Kristin M. de Payrebrune, Matthias Kröger, *Technische* Pg.709
Universität Bergakademie Freiberg, Freiberg, Germany

271 **Development and Accuracy of Ultra-Accelerated Quantum Chemical Molecular Dynamics Method for a Variety of Tribological Applications** Pg.713
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** Pg.717
Martin Zimmermann, *Leibniz Universität Hannover, Hannover, Germany*, Armin Hermann, Matthias Wangenheim, *Freudenberg Sealing Technologies, Schwalmstadt, Germany*

389 **Wear of Supported Graphene** Pg.721
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** Pg.723
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** Pg.727
Jianmeng Huang, Chenghui Gao, *Fuzhou University, Fuzhou, China*

554 **Renormalization Group Approach to Dissipative System** Pg.728
Shoichi Ichinose, *University of Shizuoka, Shizuoka, Japan*

563 **Transient Thermal Diffusion in Elliptic Contacts** Pg.732
Elisabetta Fava, Marco Barbieri, *Università di Modena e Reggio Emilia, Modena, Italy*

571 **A Mesoscopic Model for the Wear in Tetrahedral Amorphos Carbon under Shear** Pg.736
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** Pg.738
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** Pg.740
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** Pg.744
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** Pg.745
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*, Momoji Kubo, *Tohoku University, Sendai, Japan*

710 **Non-linear Hysteretic Instability in Rotating Machinery** Pg.747
Francesco Sorge, *Università di Palermo, Palermo, Italy*

866 **Modal Dynamic Instabilities Generated by Frictional Contacts** Pg.751
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** Pg.755
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** Pg.759
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** Pg.760
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** Pg.761
Ali Erdemir, *Argonne National Laboratory, Argonne, IL, United States*

919 **ToF-SIMS Investigation of MoS2 Based Coatings after Friction Test under Vacuum** Pg.764
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 MoS2-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* Pg.768

952 **Characteristics of Electroconductive Solid Lubricant Films for Space Applications** Pg.769
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** Pg.773
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** Pg.775
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** Pg.779
Grazyna Stachowiak, Mobin Salasi, Gwidon Stachowiak, *Curtin University, Bentley, Australia*

87 **Antagonism between Phosphites and Sulfides Additives explained by Gas Phase Lubrication** Pg.783
Maria Isabel De Barros Bouchet, *École Centrale de Lyon, Écully, France*, Samuel Mambingo-Doumbe, *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** Pg.786
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* Pg.787

701 **The Tribological Characteristics of ZDDP, Detergent and an Organic Antiwear Additive when Lubricating Ferrous and Aluminium-Silicon Surfaces** Pg.791
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** Pg.793
Cyrielle Forest, Maria Isabel De Barros Bouchet, *École Centrale Lyon, Écully, France*, Michaël Mazarin, *TOTAL Supply & 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** Pg.795
Shigeyuki Mori, I. Tada, Hidetaka Nanao, Kimihiro Kobayashi, *Iwate university, Morioka, Japan*

332 **Atomistic Simulations of Tribochemical Reactions at Carbon Surfaces** Pg.799
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** Pg.801
Frank J. DeBlase, Faith A. Corbo, *Chemtura Corporation, Naugatuck, CT, United States*

706 **The Influence of Boundary Lubrication Film on the Micropitting of Gears** Pg.804
Takuya Ohno, Yukitoshi Fujinami, Masahiro Kobessho, *Idemitsu Kosan Co.,Ltd., Ichihara, Japan*

208 **The Application of Quantitative Structure Tribo-ability Relationship Model** Pg.806
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** Pg.810
Alexander Grafl, Astrid Lebel, *AC²T 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** Pg.814
Yanfen Chen, Shengmao Zhang, Guangbin Yang, Pingyu Zhang, Zhijun Zhang, *Henan University, Kaifeng, China*

364 **Participation of Suspended Nanoparticles in Tribofilm Formation** Pg.815
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** Pg.819
Yukiya Moriizumi, Akihiro Kotaka, Kenji Yamamoto, Kazuhiro Umehara, Noriyoshi Tanaka, *ADEKA Corporation, Arakawaku, Japan*

TUESDAY

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* Pg.823

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** Pg.827
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** Pg.831
Yasunori Shimziu, Junya Iwasaki, Hiroshi Fujita, *Idemitsu Kosan Co. Ltd., Tokyo, Japan*

737 **How Commercial Gear Oils Behave in Rolling-Sliding and Pure Sliding Contacts** Pg.833
Balasubramaniam Vengudusamy, Alexander Grafl, *AC²T Research GmbH, Wiener Neustadt, Austria*, Franz Novotny-Farkas, *OMV Refining & Marketing GmbH, Vienna, Austria*, Werner Schöfmann, *Magna Powertrain AG & Co KG, Lannach, Austria*

PS1-LA Posters
ATRIUM • 09:00 – 16:30

32 **Optimizing Lubricant Viscosity Profile for Maximum Fuel Economy** Pg.836
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** Pg.838
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* Pg.842

121 **Rust Preventing Properties of Amino Acids and Their 1,3,5-triazine Derivatives** Pg.844
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)** Pg.848
Masakazu Nakasako, Hiroki Kakihara, Makoto Kamakura, Nobuhiko Tomioka, *Bab-Hitachi Industrial Co., Kure, Japan*

298 **Application of Nanotechnology for High Performance Solid Lubricant Coatings** Pg.849
Marco Enger, *Mannheim University of Applied Sciences, Mannheim, Germany*, Pavol Blaškovitš, *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** Pg.854
Dariusz Ozimina, Monika Madej, *Kielce University of Technology, Kielce, Poland*, Krystyna Marczewska – 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** Pg.857
György Pölczmann, Jenő Hancsók, *University of Pannonia, Veszprém, Hungary*

545 **Evaluation of Neat Cutting Oils in Tribological Test Rigs and Their Performance Validation in the Field** Pg.861
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)** Pg.864
Jenő Hancsók, László Bartha, György Pölczmann, *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 Tribotekhnichesky Properties of Friction Pairs** Pg.868
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** Pg.872
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** Pg.875
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** Pg.879
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** Pg.883
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** Pg.887
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** Pg.890
Eunjoo 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** Pg.894
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** Pg.897
Maciej Paszkowski, Sylwia Olsztyńska-Janus, *Wrocław University of Technology, Wrocław, Poland*

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*

TU2-LF3 Starved and Cavitated Lubrication
ROOM 7 BARI • 11:00 – 13:00

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

TU3-LF4 Hydrodynamic and Journal Bearings
ROOM 7 BARI • 14:00 – 16:00

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

TU4-LF5 EHL Modelling II
ROOM 7 BARI • 16:30 – 18:50

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

407 **Prediction of Stribeck and Traction Curves for Lubricated Elliptical Contacts Including Frictional Heating** Pg.984
Radu I. Popovici, Dirk J. Schipper, *University of Twente, Enschede, Netherlands*

408 **Stribeck and Traction Curves for Elliptical Contacts - Model Validation** Pg.988
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** Pg.992
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** Pg.996
Zhijian Wang, Xiaoyang Chen, Xuejin Shen, *Shanghai University, Shanghai, China*

1286 **CFD Modeling and Infrared Measurement of an EHL Line Contact** Pg.999
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** Pg.1003
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** Pg.1006
Frederik Wolf, *Anton Paar Germany GmbH, Ostfildern, Germany*

806 **Impact of Balancing Wedge Action in Textured Hydrodynamic Bearings** Pg.1009
Kazuyuki Yagi, Joichi Sugimura, *Kyushu University, Fukuoka, Japan*

930 **Study on the Transient Elastohydrodynamic Film Formation by the Artificial Surface Pattern Structure** Pg.1013
Siyoul Jang, *Kookmin University, Seoul, Republic of Korea*, Martin Hartl, Ivan Křupka, *Brno University of Technology, Brno, Czech Republic*

962 **Role of Interactions on Solid-liquid Interface for Friction Performance of Oil Lubricated Contacts** Pg.1016
Mitjan Kalin, Marko Polajnar, *University of Ljubljana, Ljubljana, Slovenia*

980 **A Novel Method to Determine EHL Film Thickness with Optical Interference** Pg.1017
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** Pg.1021
Ernst Meyer, Marcin Kisiel, Gregor Fessler, Thilo Glatzel, Markus Langer, Urs Gysin, Remy Pawlak, Shigeki Kawai, Sweetlana Fremy, *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** Pg.1022
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** Pg.1025
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** Pg.1029
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** Pg.1032
Olivier Noel, *University of Maine, Le Mans, France*, Pierre-Emmanuel Mazeran, *Universite de Technologie de Compiegne, Compiegne, 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** Pg.1035
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** Pg.1039
Lin-Feng Wang, Tian-Bao Ma, *Tsinghua University, Beijing, China*

306 **Low Friction Mechanism of Polyelectrolyte Brushes Analyzed by Coarse-Grained Molecular Simulations** Pg.1042
Hitoshi Washizu, Tomoyuki Kinjo, Hiroaki Yoshida, *Toyota Central R&D Labs., Nagakute, Japan*

113 **Viscosity of Highly Confined PFPE-Z Nanofilms with Molecular Dynamics** Pg.1044
Cristian Pirghie, *"Stefan cel Mare" University of Suceava, Suceava, Romania*, Stefan Eder, Georg Vorlaufer, András Vernes, Friedrich Franek, *AC²T Research GmbH, Wiener Neustadt, Austria*

578 **Giving Molecules the Squeeze: Molecular Dynamics Study of the Contact Mechanics Lubricated Asperity Contacts** Pg.1048
Bradley W. Ewers, James D. Batteas, *Texas A&M University, College Station, TX, United States*

786 **Friction Anisotropy and Asymmetry in Molecularly Thin Films** Pg.1049
Ahmad Jabbarzadeh, *University of Sydney, Sydney, Australia*

1324 **Friction Phase Diagram of Frenkel-Kontorova Atomistic Model** Pg.1053
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** Pg.1056
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 Pg.1060
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 Pg.1064
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 Pg.1067
Jiusheng Li, *Chinese Academy of Sciences, Shanghai, China*, Xiaohong Xu, *PetroChina Lanzhou Lubricating Oil R&D Institute, Lanzhou, China*

294 Investigation of Fullerence C60 Influence on Tribotechnical and Dynamical Mechanical Properties of Composite Materials Based on Phenilon Pg.1070
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, TiO2 Nanoparticles and Carbon Nano-horns Pg.1074
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* Pg.1078

690 Study of Frictional Properties of Epitaxial Graphene on SiC in UHV Pg.1079
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* Pg.1081

1130 Self-patterning Functionality of Nanostripe Surface During Sliding Pg.1085
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 Pg.1087
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) Pg.1089
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 Pg.1093
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 Creţu, *Technical University "Gheorghe Asachi", Iaşi, Romania*

592 Fatigue Life Extension of Rolling Element Bearings by Residual Stresses Induced Through Surface Machining Pg.1097
Timo Neubauer, Gerhard Poll, Berend Denkena, Oliver Maiß, *Leibniz Universität Hannover, Hannover, Germany*

625 CFD Analysis of Drag Loss in High Speed Bearings Pg.1100
Jun Wang, *SKF Engineering & Research Centre, Nieuwegein, Netherlands*

548 Inner Secrets of the Tapered Roller Bearing Pg.1101
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 Pg.1105
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 Pg.1109
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 Pg.1113
Elena Zadorozhnaya, *South Ural State University, Chelyabinsk, Russian Federation*

256 Tribometric Development Tools for Journal Bearings – a Novel Test Adapter Pg.1117
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 Pg.1121
Dirk Bartel, Lars Bobach, Ludger Deters, *Otto-von-Guericke Universität, Magdeburg, Germany*

437 Improving the Performances of Hydrodynamic Journal Bearings by Anisotropic Slip Boundary Pg.1125
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 Pg.1128
Conglin Dong, Chengqing Yuan, Qing Wu, *Wuhan University of Technology, Wuhan, China*

TUESDAY

440 **Experimental Investigation of the Temperature in Micro Gap High Speed Water-Lubricated Hybrid Journal Bearing** Pg.1132
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** Pg.1135
Mark T. Fowell, Amir Kadiric, *Imperial College London, London, United Kingdom*, Guillermo Morales -Espejel, Lars-Erik Stacke, *SKF Engineering and Research Centre, Nieuwegein, Netherlands*, Efstathios Ioannides, *Imperial College London, London, United Kingdom*

1183 **An Elastic-Plastic Approach on Misalignment Effects in Cylindrical Roller Bearings** Pg.1138
Spiridon Creţu, Marcelin Benchea, *Technical University of Iaşi, Iaşi, 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* Pg.1142

1280 **Serial Sectioning, FIB and TEM Investigations of Butterfly and White Etching Crack (WEC) Formation** Pg.1146
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** Pg.1150
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** Pg.1154
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** Pg.1158
Oliver Koch, Florian Böhm, Ernst Masur, Tobias Mederer, *Schaeffler Technologies AG & Co. KG, Herzogenaurach, Germany*

636 **Computing Structural Fatigue Damage in Rolling Bearing Cages** Pg.1161
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** Pg.1165
Dag Fritzson, Lars-Erik Stacke, *SKF Engineering & Research Centre, Göteborg, Sweden*

626 **Fluid Flow Simulation of Water Lubricated Ball Bearings at High Rotating Speed** Pg.1169
Jun Hyeon Jo, Choong Hyun Kim, *Korea Institute of Science and Technology, Seoul, Republic of Korea*

729 **Detailed Contacts in Dynamic Simulations – a Contradiction?** Pg.1171
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** Pg.1173
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** Pg.1177
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** Pg.1181
Johann-Paul Stemplinger, Karsten Stahl, Bernd-Robert Hoehn, Thomas Tobie, Klaus Michaelis, *Technische Universitaet Muenchen, Munich, Germany*

236 **The Effect of PVD Coatings on Scuffing and Pitting Resistance of Gears** Pg.1184
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** Pg.1188
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** Pg.1192
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** Pg.1196
Vincenzo D'Agostino, Adolfo Senatore, Mario Pisaturo, *University of Salerno, Fisciano (Sa), Italy*

640 **Rolling Contact Fatigue Tests on Wheel and Rail Steels** Pg.1200
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** Pg.1204
Daniel Sappok, Alexander Gummer, Bernd Sauer, *University of Kaiserslautern, Kaiserslautern, Germany*

38 **Wear Resistance of New Blade for Planetary Concrete Mixer** Pg.1208
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** Pg.1212
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** Pg.1216
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** Pg.1220
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** Pg.1224
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** Pg.1228
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** Pg.1232
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** Pg.1236
Aida Rezaei, *Queen's University, Kingston, Canada*, Azzedine Dadouche, *National Research Council Canada, Ottawa, Canada*

1246 **Modelling Lubrication in Gear Pairs** Pg.1240
Marco Barbieri, Francesco Pellicano, *Università di Modena e Reggio Emilia, Modena, Italy*

1289 **Load Independent Power Losses of Ordinary Gears: Numerical and Experimental Analysis** Pg.1243
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** Pg.1247
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** Pg.1251
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** Pg.1255
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** Pg.1259
Hannes Allmaier, David E. Sander, Franz M. Reich, *Virtual Vehicle Competence Center, Graz, Austria*

537 **Wear Condition Monitoring for Automotive Engines via OLVF** Pg.1260
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** Pg.1264
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)** Pg.1265
Guibin Tan, Shuhai Liu, Deguo Wang, Si-wei Zhang, *China University of Petroleum-Beijing, Beijing, China*

PS1-EC Posters
ATRIUM • 09:00 – 16:30

11 **Prediction on Friction Characteristics of Industrial Brakes Using Artificial Neural Networks** Pg.1268
Wojciech Grzegorzek, Stanislaw F. Scieszka, *Silesian University of Technology, Gliwice, Poland*

85 **Knowledge Integration for Design of Tribo-systems** Pg.1272
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** Pg.1276
Keiji Imado, Hironori Nakata, Atsuhiro Shou, Kiyoshi Terada, *Oita University, Oita, Japan*

104 **Experimental and Numerical Investigation of Thermo-mechanical Instability of the Industrial Disc Brakes** Pg.1279
Stanisław 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** Pg.1283
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** Pg.1287
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** Pg.1288
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** Pg.1292
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** Pg.1296
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** Pg.1300
Aleksandar Marinkovic, Milos Stankovic, Ljubica Milovic, *University of Belgrade, Belgrade, Serbia*

1092 **On Friction-drive Model of Metal Belt Continuously Variable Transmission** Pg.1303
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** Pg.1307
Alexey Moshkovich, Aleks Laikhtman, Vladislav Perfilyev, Igor Lapsker, Lev Rapoport, *Holon Institute of Technology, Holon, Israel*

21 **Tribotesting System for Hardmetals Mechanical Characterization** Pg.1311
Stanislaw F. Scieszka, Wojciech Grzegorzek, Marcel Zolnierz, *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** Pg.1315
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** Pg.1320
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** Pg.1323
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** Pg.1327
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** Pg.1331
Evgeny A. Deulin, *Bauman Moscow State Technical University, Moscow, Russian Federation*, Ekaterina Ikonnikova, *Azov Steel Co, Mariupov, 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 MoS2/WS2 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 MoS2-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 11th

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** Pg.1335
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** Pg.1338
Chatra Sathwik, *Indian Institute of Science, Bangalore, India*, Pamarthy Varsha, *SASTRA University, Thanjvur, 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 Universitat Wien, Austria*

738 Keynote: **Impulse Talk: Ecotribology – Development, Prospects and Challenges** Pg.1342
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** Pg.1344
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: µCT-based 3D Model and Multi-Body Simulation of Joint Kinematics** Pg.1348
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** Pg.1352
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** Pg.1356
Danai I. Karampela, Ken Mao, *University of Warwick, Coventry, United Kingdom*

925 **A Strain-Dependent, Linear Viscoelastic Model of Articular Cartilage** Pg.1360
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?** Pg.1364
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)** Pg.1366
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** Pg.1368
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** Pg.1371
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)** Pg.1374
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** Pg.1375
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** Pg.1379
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** Pg.1381
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** Pg.1382
Virginia Sáenz de Viteri, Raquel Bayón, Amaya Igartua, *IK-4 Tekniker, Eibar, Spain*, Miren G. Barandika, *University of Basque Country (UPV/EHU), Vitoria, Spain*

681 **Micro/nanotribological Properties of Natural and Synthetic Fibers** Pg.1385
Srinath R. Kistampally, Sriram Sundararajan, *Iowa State University, Ames, IA, United States*

153 **Sealing Properties of Mechanical Seal for Ventricular Assist Device** Pg.1387
Koki Kanda, Hirotsuna 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** Pg.1390
Hirotsuna 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 Pg.1392
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 Pg.1396
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 Pg.1399
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 Pg.1403
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 Al2O3/SiO2 Mixed Oxide Coatings Deposited by Sol-gel Route on Stainless Steels Pg.1406
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 Pg.1408
Xue Fan, Liwei Yu, Dongfeng Diao, *Xi'an Jiaotong University, Xi'an, China*

1061 Wear Behaviour of Nanoporous Alumina Coatings from Anodic Oxidation Pg.1412
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 Pg.1416
Arnold Ismailov, Erkki Levänen, *Tampere University of Technology, Tampere, Finland*

1114 Friction of Ice Sublimating from Rough Surfaces Pg.1418
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 Pg.1421
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 Pg.1425
Ich T. Tran, Francois Robbe-Valloire, Muriel Quillien, *LISMMA, Saint-Ouen, France*

890 Roughness-induced Optical Properties of Tribological Surfaces Pg.1429
Peter Somkuti, András Vernes, *AC²T Research GmbH, Wiener Neustadt, Austria*

933 Experiment Study on Friction and Adhesion Behaviors of an Equal Rough Surface by Using an AFM Pg.1432
Tianmao Lai, Yanfei Fang, Qianqian Yang, Ping *Huang, South China University of Technology, Guangzhou, China*

1223 Elastic Contact of Fibrillar Features on Rough Surface Pg.1436
Peyman Ansari, Bilsay Sümer, *Hacettepe University, Ankara, Turkey*

743 A New Approach for Rough Surface Generation Pg.1440
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 Pg.1444
Thibaut Chaise, Benjamin Fulleringer, Daniel Nélias, *Université de Lyon, Villeurbanne, France*

614 Fundamental Aspects in Friction and Wear Mechanisms of Hard Amorphous Carbon Coatings Pg.1447
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 Pg.1449
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 Pg.1453
Ming Xu, Longqiu Li, *Harbin Institute of Technology, Harbin, China*, Andrey Ovcharenko, *Western Digital Corporation, San Jose, CA, United States*, Wenping Song, Guangyu Zhangh, *Harbin Institute of Technology, Harbin, China*

752 Molecular Dynamics Study of Tribological Properties of Ultra-thin Diamond-like Carbon Films Deposited on Diamond Substrates Pg.1457
Qingkang Liu, Wenping Song, Longqiu Li, *Harbin Institute of Technology, Harbin, China*, Andrey Ovacharenko, *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 Pg.1461
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) Pg.1464
Jonathan Ukpai, Richard Barker, Anne Neville, *University of Leeds, Leeds, United Kingdom*

202 Representation of Wear Data by Power Curves Pg.1468
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* Pg.1472

238 **The Effect of Elastomer Surface Splitting on Stick-Slip Motion**
Yuri Kligerman, Michael Varenberg, *Technion - Israel Institute of Technology, Haifa, Israel* Pg.1476

1161 **Atomic Origins of Wear in Ionic Solids** Pg.1479
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** Pg.1481
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** Pg.1485
Martin Dienwiebel, Tim Feser, Spyridon Korres, *Karlsruhe Institute of Technology, Pfinztal, Germany*

527 **Wear Characteristics of Phenolic Resin Matrix Composites with Addition of Metal Oxide** Pg.1487
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** Pg.1490
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** Pg.1494
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** Pg.1496
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** Pg.1500
Chunli Zou, Guoshun Pan, Xiaolei Shi, Gong Hua, *Tsinghua University, Beijing, China*

469 **Investigation on the Acid Final Chemical Mechanical Polishing of Aluminum Alloy** Pg.1504
Hua Gong, Guoshun Pan, Zhonghua Gu, Xinchun Lu, *Tsinghua University, Beijing, China*

222 **Prediction of the Surface Roughness of Shot Peened Surfaces** Pg.1508
Mandikizinoyou Taro, Thibaut Chaise, Daniel Nélias, *Université de Lyon, Villeurbanne, France*

683 **Viscoelastic Contact Mechanics: Numerical Simulations with Experimental Validation** Pg.1511
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** Pg.1515
Gonzalo G. Fuentes, E. Almandoz, *Asociación de la Industria Navarra, Galar-Pamplona, Spain*

1093 **Wavelet Packet Decomposition for Failure Analysis Monitoring** Pg.1516
Davide Bianchi, Erwyn Mayhofer, *AC²T Research GmbH, Wiener Neustadt, Austria*, Martin Gröschl, András Vernes, Gerhard Betz, *Technische Universitat Wien, Wien, Austria*

565 **Tribological Characteristics of Self-lubricating Spherical Plain Bearings Treated by the Rare Earth** Pg.1518
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** Pg.1522
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** Pg.1526
Agnieszka Winogrodzka, Matthijn B. de Rooij, Dirk J. Schipper, *University of Twente, Enschede, Netherlands*

1073 **Influence of Tribological Parameters on Wear Behaviour** Pg.1530
Claudia Lenauer, Thomas Wopelka, Martin Jech, András Vernes, *AC²T Research GmbH, Wiener Neustadt, Austria*

1091 **Discrete Elements Models of Heterogeneous Friction Material: a Numerical Study of Wear** Pg.1534
Matthieu Champagne, *INSA-Lyon, Villeurbanne, France*, Mathieu Renouf, *Universite Montpellier 2, Montpellier, France*, Yves Berthier, *INSA-Lyon, Villeurbanne, France*

1156 **Competition between 3rd Body Flows and Local Contact Dynamics** Pg.1538
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** Pg.1541
George Gavril , Spiridon Creţu, *Technical University "Gheorghe Asachi", Iaşi, Romania*

1232 **The Role of Micro-slip in Static and Kinetic Friction** Pg.1545
Jeffrey Streator, *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** Pg.1549
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(CaCO3)** Pg.1553
Hitoshi Shindo, Mai Kobayashi, *Chuo University, Tokyo, Japan*, Kaori Niki, *Chiba University, Chiba, Japan*

44 **Is There a Third Abrasive Wear Mode?** Pg.1555
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/SiO2 Pair** Pg.1559
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** Pg.1562
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** Pg.1566
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** Pg.1570
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** Pg.1574
Nicola Fois, Jonathan Stringer, Matthew Marshall, *University of Sheffield, Sheffield, United Kingdom*

807 **A Particle Shape Definition Related to Third-body Abrasive Wear** Pg.1578
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** Pg.1582
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** Pg.1585
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** Pg.1587
Hamid Zaïdi, Adji C. Ba, *Universite de Poitiers, Futuroscope Chasseneuil, France*, A. Fnidki, *Universite de Rouen, Rouen, France*, Jean Frêne, *Universite de Poitiers, Futuroscope Chasseneuil, France*

1051 **Influences of Non-friction Time, Temperature and Humidity on Severe-mild Wear Transition of Iron** Pg.1591
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/Al2O3-TiO2 Ceramic Coating** Pg.1592
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** Pg.1596
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** Pg.1599
Wilfred Tysoe, *University of Wisconsin Milwaukee, Milwaukee, WI, United States*

252 **IF-MoS2 Based Lubricants: Influence of Shape and Crystal Structure** Pg.1600
Fabrice Dassenoy, Imène Lahouij, Béatrice Vacher, *École Centrale of Lyon, Écully, France*

650 **Comparative Consideration of Microscopic Friction Characteristic of Tribofilms Produced from Different ZnDTPs** Pg.1601
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** Pg.1605
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** Pg.1608
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** Pg.1612
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** Pg.1614
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** Pg.1618
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 Pg.1621
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 Pg.1625
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 Pg.1627
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 Pg.1631
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 Pg.1635
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 Pg.1638
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 Pg.1642
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 Pg.1646
Yuriko Kondo, Ryo Tsuboi, Shinya Sasaki, *Tokyo University of Science, Tokyo, Japan*

209 Uncovering the Crucial Properties for IL-mediated Lubrication Pg.1647
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 Pg.1649
Yoshiyuki Suetsugu, Yusuke Nakanishi, Yusuke Iseki, Hiroki Sekiguchi, Yukitoshi Fujinami, *Idemitsu Kosan Co.,Ltd., Sodegaura, Japan*

413 Grease-lubricated Reciprocated Sliding of a ZrO2 - Al2O3 Couple in High Vacuum Pg.1651
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 Pg.1652
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 Pg.1655
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 Pg.1659
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 Pg.1662
Simon Medina, Daniele Dini, Mark Fowell, Andrew V. Olver, *Imperial College London, London, United Kingdom*

740 Effect of Dimples on the Line Contacts Pg.1666
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 Pg.1670
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 Pg.1671
Francesco S. Guerrieri Paleotti, Bernhard Scheichl, *AC²T Research GmbH, Wiener Neustadt, Austria*

1048 Numerical Investigation on the Effects of Surface Geometry in Transient Flow Conditions Pg.1675
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 Pg.1679
Motohiro Kaneta, *Brno University of Technology, Brno, Czech Republic*, Feng Guo, Jing Wang, *Qingdao Technological University, Qingdao, China*, Ivan Křupka, Martin Hartl, *Brno University of Technology, Brno, Czech Republic*

950 Effect of Surface Ridges on Oil Film Temperature in EHL Contacts Pg.1683
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 Pg.1686
Petr Sperka, Ivan Křupka, 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** Pg.1689
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** Pg.1693
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** Pg.1697
Salima Senhadji, *Université d'Oran, Oran, Algeria*, Francois Robbe-Valloire, *Laboratoire d'Ingenierie des Sytèmes 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** Pg.1701
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** Pg.1705
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** Pg.1708
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** Pg.1712
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** Pg.1713
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** Pg.1717
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** Pg.1720
Bharat Bhushan, *Ohio State University, Columbus, United States*

1199 **A Model of Friction between a CNT and a Surface** Pg.1721
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** Pg.1723
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** Pg.1725
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** Pg.1727
Fabrice Dassenoy, Imène Lahouij, Béatrice Vacher, *École Centrale de 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** Pg.1728
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 WS2 Nanoparticles: in Situ TEM Approach** Pg.1732
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** Pg.1733
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** Pg.1736
Shu Sawai, Yuya Nakahara, Naohiro Matsumoto, Junho Choi, Takahisa Kato, *University of Tokyo, Bunkyo, Japan*

1043 **Nanotribological "Zero-Wear" Effect** Pg.1740
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** Pg.1743
James D. Batteas, *Texas A&M University, College Station, TX, United States*

PS2-VI Posters
ATRIUM • 09:00 – 16:30

267 **Estimation of Triboresistance during Surface Nanoscanning** Pg.1744
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** Pg.1747
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** Pg.1751
Christopher J. Tourek, Sriram Sundararajan, *Iowa State University, Ames, IA, United States*

937 **Drag Reduction over Superhydrophobic Surface in Microchannel** Pg.1752
Yunle Chang, Huichen Zhang, *Dalian Maritime University, Dalian, China*

976 **In Situ TEM Investigation of Nanoindentation Behavior of Carbon Coated Silicon Substrate** Pg.1756
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** Pg.1760
Damien Joly, Caroline Richard, René Leroy, *University of Tours, Tours, France*

1291 **Friction Properties of Artificial Turf Pitches: Macro and Nano Characterization** Pg.1761
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** Pg.1764
Jianjun Du, Jie Shan, *Harbin Institute of Technology, Shenzhen, China*

1009 **Experimental Verification of Slot Restrictor Shape Influence on Gas Bearing Characteristics** Pg.1768
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** Pg.1771
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** Pg.1775
Andy Tirta, Eungryul Baek, Pyung Hwang, *Yeungnam University, Gyeongsan, Republic of Korea*

1263 **High Speed Rotors with Elliptic Gas Journal Bearings** Pg.1778
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** Pg.1782
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** Pg.1786
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** Pg.1790
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** Pg.1794
Wei Chen, Junning Li, Libo Zhang, *Xi'an Jiaotong University, Xi'an, China*

169 **Contact Analysis of Blade Bearing in Wind Turbine** Pg.1795
Shiyuan Pei, Xiwei Zhou, Hua Xu, *Xi'an Jiaotong Univerisity, 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** Pg.1798
Shoji Noguchi, *Tokyo University of Sciene, Noda, Japan*, Tohru Kanada, Norifumi Miyanaga, *Kanto Gakuin University, Yokohama, Japan*

1076 **Contact Mechanism of Four Row Cylindrical Roller Bearing on Mill Roller** Pg.1802
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** Pg.1806
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** Pg.1810
Jack R. Naumann, Robert Dwyer-Joyce, Matt B. Marshall, *University of Sheffield, Sheffield, United Kingdom*

481 **Ferrograph Image Segmentation Using Morphology Watershed and Ant Colony Algorithm** Pg.1814
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** Pg.1817
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** Pg.1821
Per-Oskar Westin, *Institute of Applied Hydraulics, Örnsködsvik, Sweden*, Pär Marklund, *Luleå University of technology, Luleå, Sweden*, Jon Sandström, *Institute of Applied Hydraulics, Örnsködsvik, 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** Pg.1825
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** Pg.1829
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*

WEDNESDAY

533 **Experimental Study of the Performance of Tilting-pad Journal Bearings** Pg.1833
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* Pg.1837

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** Pg.1841
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** Pg.1844
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** Pg.1848
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** Pg.1852
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** Pg.1855
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** Pg.1856
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?** Pg.1860
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** Pg.1864
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** Pg.1865
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** Pg.1869
Toshiro Hamatake, *Oita University, Oita, Japan*, Mitsuhiro Soejime, *Kyushu Sangyo University, Fukuoka, Japan*

158 **Toward Eco-tribological Design of Honed Surface Texture in Vehicle Engines** Pg.1873
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** Pg.1877
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** Pg.1881
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** Pg.1882
John Durham, Adam Kidson, *Lubrizol Limited, Hazelwood, United Kingdom*

1299 **Ab-initio Investigation of Chemical-bond Formation at the DLC Surafce** Pg.1884
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** Pg.1887
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** Pg.1891
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** Pg.1893
Hirotaka 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** Pg.1895
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 Pg.1899
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 Pg.1903
Khouloud Ayadi, Noël Brunetière, Bernard Tournerie, *CNRS-Université de Poitiers, Futuroscope Chassenuil, France*, Didier Fribourg, Abdelaghani Maoui, *CETIM Pôle Technologies de l'Etanchéité, 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 Pg.1907
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 Pg.1911
Janaína A. Pereira, Álisson Rocha Machado, *Federal University of Uberlândia, Uberlândia, Brazil*

942 Computational Study on Chemical Mechanical Polishing Properties of Perovskite Oxide Abrasive Grain Pg.1915
Nobuki Ozawa, Miho Nakamura, Kentaro Kawaguchi, Takeshi Ishikawa, Yuji Higuchi, Momoji Kubo, *Tohoku University, Sendai, Japan*

989 Modeling of Abrasive Tool Wear in Machining Using Statistical and Tribological Approaches Pg.1917
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 Pg.1921
Markus Varga, M. Buranich, *AC²T Research GmbH, Wiener Neustadt, Austria*, Karl Adam, Rudolf Wimberger, *Voestalpine Stahl GmbH, Linz, Austria*, Ewald Badisch, *AC²T Research GmbH, Wiener Neustadt, Austria*

WE4-MF2 Wear
ROOM 7 BARI • 16:10 – 17:30

Chair: Janaína 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 Pg.1925
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 Pg.1929
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 Pg.1933
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 Pg.1937
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 Pg.1939
Saurabh Dixit, Satish V. Kailas, Kamanio Chattopadhyay, *Indian Institue 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* Pg.1942

487 Effect of Micro Texturing at Cutting Tool Rake Face on Friction Force Pg.1944
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 Pg.1946
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 Pg.1950
Zhengying Lin, Youxi Lin, Wangli Hou, *Fuzhou University, Fuzhou, China*

622 Self-Sharpening of Cutting Tool Edges in CFRP Machining Pg.1954
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 Pg.1956
Kenji Yanagisawa, Manabu Okada, *Nagano National College of Technology, Nagano, Japan*

777 Influence of Feed Speed on Surface Quality of Several Building Stones Pg.1958
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 Pg.1962
Amit Ganguli, Anshuman Dube, *Ducom Instruments, Bangalore, India*, Deepak H. Veeregowda, *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 Pg.1966
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 Pg.1968
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** Pg.1971
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** Pg.1973
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* Pg.1977

619 **Iron Based Self-lubricating Composites** Pg.1980
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* Pg.1984

283 **Different Mechanisms of Acoustic Emission in Sliding Friction of Various Metal Pairs** Pg.1987
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 bissalicylaldehyde-ethylenediamine** Pg.1991
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 Unversity of Technology, Wuhan, China*

156 **Tribology of Thermoplastic Nanocomposites** Pg.1995
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** Pg.1999
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** Pg.2003
Takashi Fujimoto, *Yuge National College of Maritime Technology, Ochi, Japan*

521 **Friction-Induced Vibrations of the Water-Absorbed Thermoplastic Ester Elastomers** Pg.2007
Yoshitaka Uchiyama, *Kanazawa University, Kanazawa, Japan*

1302 **An Examination of the Role of In-situ HDD Additives on Head-disk Interface Tribology** Pg.2011
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** Pg.2015
Sebastian Schula, Jens Schneider, *Technische Universität Darmstadt, Darmstadt, Germany*

228 **Research on Green Automotive Brake Materials With High Performance** Pg.2019
Chenghui Gao, Fushan He, *Fuzhou University, Fuzhou, China*

234 **Tribological Behavior of a Silicon Carbide/Carbone Dry Contact** Pg.2023
Stéphanie Lafon-Placette, Karl Delbé, Hélène Welemane, Jean Denape, *Université de Toulouse, Tarbes, France*, Marc Ferrato, Patrick Chéreau, *BOOSTEC, Bazet, France*

350 **In-situ Investigation of Lateral Junction Growth by Nanoindentation** Pg.2027
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** Pg.2031
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** Pg.2035
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** Pg.2039
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** Pg.2042
Mehmet Bagci, *Selcuk University, Konya, Turkey*

660 **The Effect of a Coating-substrate System on the Pitting of Lubricated PVD Coated Elements** Pg.2046
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** Pg.2050
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** Pg.2054
Yuji Ohue, Keita Miyoshi, *Kagawa University, Takamatsu, Japan*

830 Nanomechanical Properties of C-Pd films Pg.2159
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 Pg.2162
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 Pg.2165
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 Pg.2169
Géraldine Theiler, Thomas Gradt, *BAM - Federal Institute for Materials Research and Testing, Berlin, Germany*

902 Friction and Wear Characteristics of Advanced Ceramic Materials Pg.2171
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 Pg.2175
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. Pg.2178
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* Pg.2181

1003 Measurement of Friction Behaviour of Modified NBR and CR Rubbers Pg.2185
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 TiB2-B4C Composite Pg.2189
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 Pg.2193
Fjodor Sergejev, Liina Lind, Maksim Antonov, Priidu Peetsalu, Eron Adoberg, *Tallinn University of Technology, Tallinn, Estonia*

1098 Mechanical Conditions and Infuence of Oxidation on White Etching Layers Formation Pg.2197
Sarah Zitouni, Aurélien Saulot, Samuel Simon, Fabrice Ville, Jerôme Cavoret, *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 Pg.2201
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 Pg.2205
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 TiO2 Sprayed Films on the Abrasive Wear Resistance Pg.2209
Mara Kandeva, *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 Pg.2213
Jadna Catafesta, *Universidade de Caxias do Sul, Bom Princípio, Brazil*, María 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 Pg.2217
Michell F. Cano Ordoñez, Israel Krindges, César Aguzzoli, Israel J. Rabin Baumvol, Carlos A. Figueroa, María C. Moré Farias, *Universidade de Caxias do Sul, Caxias do Sul, RS, Brazil*

1269 Tribological Behavior of Spheroidal Graphite Cast Irons with Nanoadditives Pg.2221
Julieta Kaleicheva, Valentin Mishev, *Technical University of Sofia, Sofia, Bulgaria*, Georgi Avdeev, Zdravka Karaguiozova, *Bulgarian Academy of Sciences, Sofia, Bulgaria*, Mara Kandeva, *Technical University of Sofia, Sofia, Bulgaria*

1277 Friction of Thin Multi-component Oxide Films: Experiments and Modeling Pg.2225
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 Pg.2228
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 Pg.2232
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 Pg.2236
Marcelo Braga dos Santos, Francisco P. Lepore Neto, *Federal University of Uberlândia, Uberlândia, Brazil*

3 Semi-active Control of Structures Assembled by Bolted Joints Pg.2240
Lothar Gaul, *University of Stuttgart, Stuttgart, Germany*, Jens Becker, *Moog GmbH, Boblingen, Germany*

Thursday, September 12th

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** Pg.2244
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* Pg.2248

519 **Tactile Friction of Topical Formulations** Pg.2249
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** Pg.2252
Hassan Zahouani, Mehdi Djaghloul, Roberto Vargiolu, *ENISE - École Centrale de Lyon, Saint-Etienne, France*

692 **Tactile Device for Textile Fabrics Simulation and Tactile Perception Study** Pg.2256
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* Pg.2260

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** Pg.2264
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** Pg.2265
Matthew A. Darden, Christian J. Schwartz, *Iowa State University, Ames, IA, United States*

1167 **Dynamic Modelling of Finger-surface Contacts** Pg.2266
Ramona Fagiani, *Università degli studi di Parma, Parma, Italy*, Marco Barbieri, *Università di Modena e Reggio Emilia, Modena, Italy*

582 **Tribology, Texture and Touch** Pg.2270
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** Pg.2274
Jérômre 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** Pg.2276
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** Pg.2279
Seido Yarimitsu, Kazuhiro Nakashima, Yoshinori Sawae, Teruo Murakami, *Kyushu University, Fukuoka, Japan*

428 **Elution and Wear of PVA Hydrogels by Reciprocating Friction** Pg.2283
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** Pg.2287
Tetsuo Yamaguchi, Teruo Murakami, *Kyushu University, Fukuoka, Japan*

1273 **Mechanical and Frictional properties of Laminated Alpha-TCP filled Polyvinyl Alcohol Hydrogel** Pg.2289
Tomoaki Iwai, Kanae Yamamoto, Keisuke Asahara, Yutaka Shoukaku, *Kanazawa University, Kanazawa, Japan*

66 **Effecte of Irradiation Dose on Mechanical Properties of PVA/PVP Hydrogels as Articular Cartilage** Pg.2290
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** Pg.2294
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** Pg.2295
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** Pg.2298
Sara Ehsani Majd, Roel Kuijer, *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** Pg.2300
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** Pg.2303
Teruo Murakami, Seido Yarimitsu, Kazuhiro Nakashima, Tetsuo Yamaguchi, Yoshinori Sawae, Nobuo Sakai, Atsushi Suzuki, *Kyushu University, Fukuoka, Japan*

150 **Nanomechnical Characterization of Biological Surfaces Using Combination of Nanotribology and Instrumented Indentation** Pg.2307
Jiri Nohava, Fanny Ecarla, *CSM Instruments, Peseux, Switzerland*, Gilles Weder, *CSEM, Neuchâtel, Switzerland*

1323 **Ultralow Friction of Soft Matters and Antibiofouling Application** Pg.2308
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, Evanzton, IL, United States*

390 Multi-Body Contact Problem for a Nonhomogeneous Elastic Coated Foundation with Wear Pg.2309
Alexander V. Manzhirov, *Russian Acadmy of Sciences, Moscow, Russian Federation*

684 Mechanothermodynamic Analysis of Volumetric Damage in Complex Systems with Contact Interaction Pg.2313
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 Pg.2317
Amir Rostami, Robert L. Jackson, *Auburn University, Auburn, United States*

881 Microstructure and Linear Scratch Test of Low Temperature Plasma Nitrided Stainless Steels Pg.2321
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 Pg.2325
Severin Nugent, Armin Fischer, Sotiraq Ilo, Georg Vorlaufer, *AC²T Research GmbH, Wiener Neustadt, Austria*

1162 Sliding Contact Problems Involving Multi-layered Elastic Materials Pg.2329
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 Pg.2333
Stéphane Valette, Pavel Bizi-Bandoki, *École Centrale de Lyon, Écully, France*, C. Mauclair, *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 Pg.2337
Mohd Danial Ibrahim, Mohd Shahril Osman, *Universiti Malaysia Sarawak, Kota Samarahan, Malaysia*, Norifumi Miyanaga, *Waseda University, Shinjuku-ku, Japan*, Amir Azam Khan, *Universiti Malaysia Sarawak, Kota Samarahan, Malaysia*

883 Optical Characterisation of Polished Steel Surfaces Pg.2341
M. L. Miranda-Medina, Peter Somkuti, Bern Steiger, *AC²T Research GmbH*, *Wiener Neustadt, Austria*, D. Bader, *Berndorf Band GmbH, Berndorf, Austria*, Martin Jech, András Vernes, *AC²T 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 Pg.2344
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 Pg.2346
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 Pg.2350
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, *AC²T Research GmbH, Wiener Neustadt, Austria*

165 Mechanical and Tribological Behaviour of Thin Ceramic Coatings Deposited on PET and PEN Substrates Pg.2354
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 Bbehaviour of HVOF- and HVAF-sprayed Cermet Coatings Pg.2358
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 Pg.2359
Shu Li, Deli Duan, Siyang Gao, *Chinese Academy of Sciences, Shenyang, China*

981 Effectiveness of Hard Coatings for Vacuum Lubrication by Space Liquid Lubricants Pg.2363
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 Pg.2365
Aleksandar Vencl, *University of Belgrade, Belgrade, Serbia*

499 Study on the Residual Stress of Si Doped CNx Films Pg.2366
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 Pg.2367
Hiroyuki Suzuki, Matt Marshall, Robert Dwyer-Joyce, *University of Sheffield, Sheffield, United Kingdom*

37 Starved Lubrication of Textured Surfaces Pg.2371
Henara L. Costa, *Universidade Federal de Uberlândia, Uberlândia, MG, Brazil*

118 A Homogenization Method of Modeling Surface Texturing Effect in Full Film Lubrication Pg.2375
Shiyuan Pei, Lin Wang, Hua Xu, *Xi'an Jiaotong Univerisity, Xi'an, China*

423 Improvement of Ffriction Characteristics on Reciprocating Machinery by Surface Texturing Pg.2379
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 Pg.2382
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 Pg.2385
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 Pg.2388
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 Pg.2391
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 Pg.2395
Emilia Assenova, *Society of Bulgarian Tribologists, Sofia, Bulgaria*, Gottlieb Polzer, *Tribology Unit, Schönfels, Germany*, Dr. Tsermaa, *University of Ulan Bator, Ulan Bator, Mongolia*, Mara Kandeva, *Technical University - Sofia, Sofia, Bulgaria*

1029 Study on Anti-Micropitting Protective Mechanisms of Black Oxide Coating Pg.2399
Victor Brizmer, Andriy Rychahivskyy, Bo Han, *SKF Engineering & Research Centre, Nieuwegein, Netherlands*

1080 PVD Refractory Metal Bbased Coatings for Tribological Applications Pg.2401
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 Aoad on Tribological Behaviour of PVD-CrN Coatings Pg.2405
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 Brunetiere, *Université de Poitiers, Futuroscope Chasseneuil, France*

191 Investigation on the Load Carrying Capacity of Textured Surface Based on Interferometry Measurements Pg.2409
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 Pg.2411
Mohand Adjemout, Noël Brunetière, Jean Bouyer, *CNRS-Université de Poitiers, Chasseneuil, France*

638 CFD Investigation of Influence of Surface Texturing on the Wedge Effect Pg.2415
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 Pg.2417
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 Pg.2421
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 Pg.2423
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 Pg.2427
Hermann Schmid, *PTS Munich, Munich, Germany*, Wolfgang P. Weinhold, *Innowep GmbH, Wurzburg, Germany*

444 Directional Fractal Signature and Optimization of Surface Textures Pg.2428
Pawel Podsiadlo, Gwidon Stachowiak, *Curtin University, Perth, Australia*

445 Numerical Characterization of AFM Images of Self-structured Surface Textures Pg.2431
Marcin Wolski, Pawel Podsiadlo, Gwidon W. Stachowiak, *Curtin University, Perth, Australia*

953 Reduced Description of Three-dimensional Measured Surface Texture Pg.2435
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 Pg.2438
Marco A. Álvarez-Valenzuela, Sergio Jiménez-López, Juan Sanchez Garcia Casarrubios, Efren Diez-Jimenez, 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 Pg.2440
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 Pg.2443
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** Pg.2447
Masaaki Yamane, Kumiko Yoshihisa, *IHI Corporation, Yokohama, Japan*

446 **Effects of Bamboo Fiber Modifications on the Tribological Performance of their Reinforced Brake Composites** Pg.2451
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** Pg.2455
Alessandro Zanini, *Metal Improvement Company, Piacenza, Italy*

PS3-ST Posters
ATRIUM • 09:00 – 16:30

75 **Nitriding of AISI 4140 Steel by EDM** Pg.2459
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** Pg.2463
Chao Zhou, Chenghui Gao, *Fuzhou University, Fuzhou, China*

218 **Tribological Behavior of AISI H13 Steel Subjected to Boriding Thermochemical Treatment** Pg.2464
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* Pg.2468

275 **Experimental Simulation of Grid-to-Rod Fretting in a Single Nuclear Fuel Rod** Pg.2469
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** Pg.2472
Jeong-Eui Yun, Joo-Ho Kim, *Kangwon National University, Samcheok, Republic Of Korea*

311 **Soft-chemo Mechanical Surface Tribology** Pg.2476
Wolfgang P. Weinhold, *Innowep GmbH, Würzburg, Germany*, Ralph Stengler, *University of Applied Sciences, Darmstadt, Germany*, Helen Wang, *AMT Advanced Material Technology Inc., Bejing, China*, M. Nuss, *University of Wurzburg, Wurzburg, Germany*

316 **Micromechanical and Microtribological Surface Analysis of Wind Turbine Blades coated with Nanoparticles** Pg.2479
Wolfgang P. Weinhold, *Innowep GmbH, Würzburg, Germany*, Ralph Stengler, *University of Applied Sciences, Darmstadt, Germany*, Helen Wang, *AMT Advanced Material Technology Inc., Bejing, China*, M. Nuss, *University of Wurzburg, Wurzburg, Germany*

319 **The Impact of Slider Surface Roughness on the Touchdown-Takeoff Hysteresis Phenomenon** Pg.2481
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** Pg.2485
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** Pg.2488
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** Pg.2492
Guoshun Pan, Hua Gong, Zhonghua Gu, *Tsinghua University, Beijing, China*

486 **Friction and Wear Properties by Laser-textured Piston-ring Surfaces** Pg.2496
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** Pg.2497
Mamoun Fellah, Mohammed Labaïz, 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** Pg.2501
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** Pg.2505
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** Pg.2507
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** Pg.2511
Clotilde Minfray, Sandrine Bec, Anton Rusanov, Matthieu Guibert, Thierry Le Mogne, *École Centrale de Lyon, Écully, France*

712 **Microtopographic Features of Worn Surfaces** Pg.2513
Árpád Czifra, Béla Palásti Kovács, *Óbuda University, Budapest, Hungary*

856 **Working and Application of the Combined, non-polluting Methods of a Covering-greasing** Pg.2517
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** Pg.2520
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** Pg.2524
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** Pg.2528
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** Pg.2532
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** Pg.2536
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** Pg.2540
Michimasa Uchidate, Akira Iwabuchi, Tomoharu Shimiu, *Iwate University, Morioka, Japan*

THURSDAY

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* Pg.2544

1085 **Complex Wear Measurement on Thin PVD Coatings Using a Novel Tribometer** Pg.2548
Cesare Di Cesare, Luca Bosio, Marco Bacchereti, Massimiliano Cecconi, *Scienzia Machinale 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** Pg.2549
Yimin Zhao, Chao Wei, Jibin Hu, Shihua Yuan, *Beijing Institute of Technology, Beijing, China*

1122 **Friction on Ice: Influence of Surface Topography** Pg.2553
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** Pg.2557
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** Pg.2561
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), CO2 and Solid Particulates (SiO2) Fractions** Pg.2565
Fernando Nunes da Silva, Jardel Dantas da Cunha, Fabiana Fernandes de Lima, Djalma Ribeiro da Silva, JoãoT. 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 Kandeva, *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* Pg.2569

1262 **Tribological Properties of Textured Copper Alloy Surface Containing Micro Sized Sulfide Phase** Pg.2573
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** Pg.2577
Diego A. Santamaria Razo, Diego Pellerej, Pietro Buonfico, *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** Pg.2578
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** Pg.2582
Marc Bellantonio, *TRIBOtechnic, Clichy, France*

FW – Dry Friction and Wear

TH1-FW10 Experiment, Equipment, Test Methods 1
ROOM 5 NAPOLI • 08:30 – 10:30

Chair: Michael Varenberg, *Technion, Haifa, Israel*

54 **Keynote: Ranking of Particulate Abrasivity** Pg.2584
Kenneth G. Budinski, *Bud Labs, Rochester, NY, United States*

1261 **Impact-sliding Wear Characteristics of Nitrided Stainless Steel at 400°C** Pg.2587
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** Pg.2591
Mike Evans, Sam Akehurst, Patrick Keogh, *University of Bath, Bath, United Kingdom*

95 **Dynamic Friction Measurement and Modelling - A Review** Pg.2595
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** Pg.2599
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** Pg.2603
Enrico Galvagno, Mauro Velardocchia, Alessandro Vigliani, *Politecnico di Torino, Torino, Italy*

TH2-FW11 Experiment, Equipment, Test Methods 2
ROOM 5 NAPOLI • 11:00 – 13:00

Chair: Lorella Ceschini, *Università di Bologna, Bologna, Italy*

230 **Influence Study of Wear Parameters in three-body Abrasion** Pg.2607
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** Pg.2611
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** Pg.2614
Christian Berndt, Ringo Nepp, Matthias Kröger, *TU Bergakademie Freiberg, Freiberg, Germany*

401 **Limiting States of Metal/Polymer System under Sliding Friction** Pg.2617
Leonid Sosnovskiy, *Interdepartmental Laboratory "Tribo-Fatigue", 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** Pg.2620
Andreas Trausmuth, Ewald Badisch, *AC²T 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** Pg.2624
Wolfgang Molnar, Markus Varga, J. Brenner, *AC²T Research GmbH, Wiener Neustadt, Austria*, Markus Keller, *Semperit Technische Produkte GmbH, Wimpassing im S., Austria*, Ewald Badisch, *AC²T Research GmbH, Wiener Neustadt, Austria*

THURSDAY

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** Pg.2628
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** Pg.2632
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** Pg.2640
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* Pg.2636

728 **Research on Tribological Properties of Cast Iron at High-Speed Dry Sliding Condition** Pg.2644
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** Pg.2648
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** Pg.2649
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** Pg.2653
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** Pg.2657
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* Pg.2661

1194 **Studies Friction Behaviour and Wear Rate of Poly(methylmethacrylate) by New Design Reciprocating Test Machine** Pg.2662
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** Pg.2666
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** Pg.2670
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** Pg.2674
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** Pg.2676
Demófilo Maldonado Cortés, *University of Monterrey (UDEM), San Pedro Garza García, Mexico*

187 **Complex of Tribological Researches «ITRIB-System»** Pg.2679
Viacheslav Khovanskiy, *Moscow Automobile and Road Construction State Technical University, Moscow, Russian Federation*

210 **The Global Wear Parameter for Rail-wheel Metro System** Pg.2683
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** Pg.2687
Amin H. Zavieh, Nuria Espallargas, *Norwegian University of Science and Technology, Trondheim, Norway*

243 **Energetic Aspects of Scuffing Resistance Forming of 42CrMo4 Steel** Pg.2690
Łukasz Wojciechowski, *Poznań University of Technology, Poznań, Poland*

249 **Tribological Behavior of Ultramid Reinforced with Cloisite** Pg.2694
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.** Pg.2695
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** Pg.2696
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** Pg.2698
Dymitry Capanidis, *Wrocław University of Technology, Wrocław, Poland*

1012 **A Study on Friction Characteristics of Magnetorheological Elastomer** Pg.2702
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** Pg.2704
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* Pg.2708

1067 Boundary-controlled Barostats for Slab Geometries in Molecular Dynamics Simulations Pg.2712
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 Pg.2716
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 Pg.2720
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 Pg.2724
Markus Varga, Ewald Badisch, Horst Winkelmann, *AC²T 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 Pg.2728
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 Pg.2729
Mara Kandeva, 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* Pg.2733

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 Pg.2735
Ksenija Topolovec Miklozic, *Powertrib Limited, Oxford, United Kingdom*

155 Prediction of Micropitting Performance of Oil/Additive Solutions in Rolling and Sliding Contacts Pg.2736
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 Pg.2739
Lu Huang, Dan Guo, Shizhu Wen, *Tsinghua University, Beijing, China*

288 A Study of the Grease with Water Resistance and Low Friction Torque Pg.2741
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 Pg.2744
Martin Kucera, *Vienna University of Technology, Vienna, Austria*, Tomás Manzaneque, José L. Sánchez-Rojas, *Universidad de Castilla-La Mancha, Ciudad Real, Spain*, Nicole Dörr, *AC²T 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 Industryto Adapt to this Lubricant Class? Pg.2748
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 Pg.2752
Nicole Dörr, Andjelka Ristic, Alexander Kassler, *AC²T Research GmbH, Wiener Neustadt, Austria*

688 The Study about Ultra Low Ash and No Phosphorus Engine Oil Pg.2753
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 Pg.2757
André Ernesto, Denis Mazuyer, Juliette Cayer-Barrioz, *École Centrale de Lyon, Écully, France*

1321 Synthetic Lubricants: from Molecular Design to Engineering Applications Pg.2758
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 Pg.2760
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 Pg.2764
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 Pg.2768
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 Pg.2772
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* Pg.2775

512 **Evaluation of Tribological Property for Hydraulic Fluid by Roller on Disk Test** Pg.2776
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** Pg.2778
Miki Nakano, Koji Miyake, Atsushi Korenaga, *National Institute of Advanced Science and Technology, Tsukuba, Japan*, Yasuhisa Ando, *Tokyo University of Agriculture and Technology, Tokio, 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** Pg.2780
Hakan Kaleli, *Yıldız Technical University, İstanbul, Turkey*, Yves Berthier, *Institut National des Sciences Appliquées de Lyon, Lyon, France*, Dogus Özkan, Levent Yüksek, *Yıldız Technical University, İstanbul, Turkey*

124 **Energetic Investigations of the Structural Degradation of Lubricating Greases Caused by Friction** Pg.2784
Erik Kuhn, *Hamburg University of Appl.Sc., Hamburg, Germany*

534 **A New Biocompatible Ionic Liquid as an Antiwear Additive for Biodegradable Lubricants** Pg.2786
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** Pg.2790
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** Pg.2794
Fumihiko Yokoyama, Yuka Iwama, Masahiro Maruyama, Mitsuo Sano, *IHI Corporation, Yokohama, Japan*

130 **Experimental Analysis of Anti-wear Performance of Marine Engine Lubricants** Pg.2798
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** Pg.2799
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** Pg.2803
Yingjun Chen, Yazhen Wang, Ping Huang, *South China University of Technology, Guangzhou, China*

510 **Localized Boundary Effect on EHL Film Shape** Pg.2807
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** Pg.2811
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** Pg.2814
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** Pg.2818
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** Pg.2822
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** Pg.2823
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 Sudies of Si and Ti Surfaces Lubricated by Aqueous Copolymer** Pg.2827
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** Pg.2830
Xiaoyong Yang, Yonggang Meng, Yu Tian, *Tsinghua University, Beijing, China*

567 **On the Effect of DLC Coating on Full Film EHL Friction** Pg.2832
Marcus Björling, Pär Marklund, Roland Larsson, *Luleå University of Technology, Luleå, Sweden*

1143 **Evaluation of Polymer Wear Assessment Methods** Pg.2836
Sophie Froeland, Ion M. Sivebaek, *Technical University of Denmark, Lyngby, Denmark*

823 **Ashless Friction Modifier and Lubrication Surface: Stribeck Curve Approach** Pg.2840
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** Pg.2842
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 Pg.2845
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 Pg.2849
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 Pg.2853
Junning Li, Wei Chen, Youbai Xie, *Xi'an Jiaotong University, Xi'an, China*

847 Study of the Short Term Effect of Fe3O4 Particles in Rolling Element Bearings Pg.2854
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* Pg.2858

64 Observation of Spherical Surfaces using a Laser Microscope with Wide Field of View Pg.2862
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 Pg.2866
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 Pg.2870
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 Pg.2874
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 Pg.2878
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 Pg.2882
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 Pg.2886
Ignacio Valiente-Blanco, Efren Diez-Jimenez, Cristian Cristache, Marco A. Álvarez-Valenzuela, Juan Sanchez-Garcia-Casarrubios, Jose L. Perez-Diaz, *Universidad Carlos III de Madrid, Madrid, Spain*

1103 Non-hysteretic Passive Magnetic Linear Bearing for Cryogenic Environments Pg.2890
Victor Castro-Fernandez, Efren Diez-Jimenez, Ignacio Valiente-Blanco, Jose L. Perez-Diaz, *Universidad Carlos III de Madrid, Leganés, Spain*

1164 Stability Analysis of an Automated Maglev People Mover System Pg.2894
Roberto Bassani, Massimo Losa, Antonino Musolino, Rocco Rizzo, *University of Pisa, Pisa, Italy*

1166 Permanent Magnet Bearings Pg.2898
Antonino Musolino, Rocco Rizzo, Ernesto Tripodi, *University of Pisa, Pisa, Italy*

277 Friction and Wear Behaviors of Polymer/Steel Laminated Composites at Elevated Temperatures Pg.2902
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 Pg.2905
Wojciech Litwin, *Gdańsk University of Technology, Gdańsk, Poland*

673 Creep Characteristics of White Metal Lined Bearings Pg.2908
Tomoaki Yamashita, Saburo Usami, *Hitachi Research Labratory, Hitachi, Japan*

700 Sensitivity Analysis of Non-Linear Forces in Oil-Film Journal Bearings Pg.2909
Andrea Vania, Paolo Pennacchi, Steven Chatterton, Ezio Tanzi, *Politecnico di Milano, Milano, Italy*

722 Influences of Journal Rotating Direction on Cryogenic Hybrid Journal Bearings Pg.2913
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 Pg.2917
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 Pg.2921
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 Pg.2925
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 Pg.2929
Pyung Hwang, Van Trang Nguyen, *Yeungnam University, Gyeongsan, Republic of Korea*

747 **Influences of Raceway Texture on the Torque of Needle Roller Thrust Bearing** Pg.2933
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** Pg.2935
Xiaoran Zhu, Yongsheng Zhu, Youyun Zhang, *Xi'an Jiaotong University, Xi'an, China*

872 **Stability Analysis of Journal Bearings Lubricated by Viscoelastic Fluids** Pg.2939
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** Pg.2943
Norifumi Miyanaga, Jun Tomioka, *Waseda University, Tokyo, Japan*

969 **Effect of Nanoparticle on Load Capacity in Gas Film Lubrication** Pg.2947
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** Pg.2951
Marat A. Bronovets, *Russian Academy of Sciences, Moscow, Russian Federation*

179 **Trouble-free Tribo-Design Implementation from Learning Case Studies** Pg.2955
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** Pg.2959
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** Pg.2960
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.** Pg.2964
Giuseppe Adriani, Matteo Campatelli, *Mecoil Diagnosi Meccaniche srl, Florence, Italy*, Edoardo Bassanini, *Vipetrol S.p.a., Vigevano (Pv), Italy*, Alessandro Paccagnini, *Mecoil Diagnosi Meccaniche srl, Florence, Italy*

637 **Automated System for On-line Oil Analysis** Pg.2968
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** Pg.2972
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** Pg.2976
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** Pg.2980
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** Pg.2983
Stefan Klien, Anke Ristow, Florian Ausserer, Alexander Diem, *V-Research GmbH, Dornbirn, Austria*

1025 **Lab-scale Modeling of Rail Damage Phenomena** Pg.2987
Thomas Lebersorger, Ewald Badisch, Andreas Trausmuth, *AC²T Research GmbH, Wiener Neustadt, Austria*, Stephan Scheriau, Hans P. Brantner, *Voestalpine Schienen GmbH, Leoben, Austria*, Friedrich Franek, *AC²T Research GmbH, Wiener Neustadt, Austria*

813 **The Effect of Gaseous Environments on Friction and Wear of Steel-steel Contacts** Pg.2991
Florian Ausserer, Igor Velkavrh, Stefan Klien, *V-Research GmbH, Dornbirn, Austria*, Josef Brenner, *AC²T 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** Pg.2995
Luca Gorasso, Liqin Wang, *Harbin Institute of Technology, Harbin, China*

576 **Modeling Oil Film Flows in an Aeroengine Bearing Chamber** Pg.2999
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** Pg.3003
Fangfang Duan, Aurélien Saulot, Yves Berthier, *INSA-Lyon, Villeurbanne, France*

1108 **Study of Effects of Wheel Flange/Rail Gauge Contact Lubrication** Pg.3007
Milan Omasta, Josef Frýza, Martin Hartl, Ivan Křupka, *Brno University of Technology, Brno, Czech Republic*

373 **Investigation of Thermoelastic Instabilities in the Wet Clutch System with an Equivalent Friction Coefficient** Pg.3010
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** Pg.3014
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** Pg.3018
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** Pg.3022
Alessandro Tasora, Edzeario Prati, *Università di Parma, Parma, Italy*

460 **Experimental Study on Grooved Faces in a 2-phase Mechanical Seal** Pg.3026
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* Pg.3029

949 **Evaluation of Lip-Seal Properties against Pressurized Ethanol Flow for Turbopump in Rocket Engine** Pg.3033
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** Pg.3037
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* Pg.3040

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* Pg.3044

39 **A Novel Sensor for Lubrication and Contact Measurement in Metal Rolling** Pg.3048
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** Pg.3052
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** Pg.3056
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,* Pg.3060
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** Pg.3063
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** Pg.3067
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** Pg.3071
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** Pg.3075
Kentaro Kawaguchi, Takeshi Ishikawa, Yuji Higuchi, Nobuki Ozawa, Momoji Kubo, *Tohoku University, Sendai, Japan*

608 **The Study of the Tribological Performance of Ti Based Nitride Coating** Pg.3077
Jiesong Tu, Jianhua Xu, Jian Li, *Wuhan Research Institute of Materials Protection, Wuhan, China*

645 **Application of MoS2 and (PTFE+graphite) Coating on End Mill Cutters for Arresting BUE During Machining of Pure Aluminium** Pg.3080
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** Pg.3084
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** Pg.3088
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** Pg.3092
Koffi E. Koumi, Julien Leroux, Thibaut Chaise, Daniel Nélias, *INSA-Lyon, Villeurbanne, France*

842 **Tribological Characteristics between Snow and Mechanical Materials and in Snow** Pg.3094
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** Pg.3098
Antti Vaajoki, *VTT Technical Research Centre of Finland, Espoo, Finland*, Hiroyoshi 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** Pg.3102
Federica Bartoli, *Gabinetto Polizia Scientifica Arezzo, Arezzo, Italy*, Diego Pellerej, Diego Santamaria, Elena Alba, Pietro Buonfico, *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** Pg.3106
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.** Pg.3109
Vanesa Martínez Nogués, *University of Southampton, Southampton, United Kingdom*, María 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** Pg.3113
Sunghan Kim, Hong Liang, *Texas A&M University, College Station, TX, United States*

657 **Tribology of Self-lubricating SU-8 Composites for MEMS Applications** Pg.3116
Prabakaran Saravanan, Nalam Satyanarayana, Hai Minh Duong, *National University of Singapore, Singapore*, Sujeet K. Sinha, *Indian Institute of Technology, Kanpur, India*

483 **Friction Coefficient Mapping (FCM) andContact AdhesionMapping (CAM): Surface Microstructure and Function** Pg.3120
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** Pg.3122
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** Pg.3126
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** Pg.3129
Irina Hussainova, Maksim Antonov, Jakob Kübarsepp, *Tallinn University of Technology, Tallin, Estonia*

840 **Modeling of Wear in Silicon Nitride in Rolling-sliding Contact** Pg.3133
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?** Pg.3137
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** Pg.3141
Isidoro Martínez-Mateo, Francisco-José Carrión-Vilches, Maria-Dolores Bermúdez, *Universidad Politécnica de Cartagena, Cartagena, Spain*

1219 **Effect of Ethanol on Lubricated Sliding Wear of Al and Mg Alloys and Composites** Pg.3144
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** Pg.3145
Youxi Lin, Wei Xie, Fushan He, Chenghui Gao, *Fuzhou University, Fuzhou, China*

6 **The Importance of Wall Friction between Particulate Solids and Elastomeric Belt** Pg.3149
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** Pg.3153
Arash Golchin, *Luleå University of Technology, Luleå, Sweden*, Tan Dat Nyguyen, 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** Pg.3157
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** Pg.3161
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** Pg.3165
Christopher J. Dyson, Malcolm F. Fox, *University of Leeds, Leeds, United Kingdom*, Bill Hopkins, *ROCOL Lubricants, Leeds, United Kingdom*, Martin Priest, *University of Leeds, Leeds, United Kingdom*

THURSDAY

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** Pg.3168
Juozas Padgurskas, Raimundas Rukuiža, *Aleksandras Stulginskis University, Kaunas, Lithuania*, Ramutis Bansevičius, *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** Pg.3172
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** Pg.3176
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** Pg.3180
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** Pg.3184
Siegfried Fouvry, Benjamin Van-Peteghem, Mariana Mendes, Patricia Neubauer, *École Centrale de Lyon, Écully, France*

999 **Simulation of Starved Lubrication in Spherical Joints** Pg.3188
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** Pg.3192
Matthew R. Brake, *Sandia National Laboratories, Albuquerque, NM, United States*, Robert R. Flicek, David A. Hills, Anothai Thaitirarot, *University of Oxford, Oxford, United Kingdom*

PS3-JM Posters
ATRIUM • 09:00 – 16:30

148 **Tribological Aspects of Shaft Hoist Ropes Wear and Durability** Pg.3196
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., Lędziny, 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?** Pg.3200
Ian Sherrington, *University of Central Lancashire, Preston, United Kingdom*, Sergei Glavatskikh, *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** Pg.3204
Susanne Beyer-Faiss, Werner Stehr, *Dr. Tillwich GmbH Werner Stehr, Horb, Germany*

1113 **Effects of Interfacial Free Energy on Adhesive Friction Behavior of Elastomer Surfaces under Wet Condition** Pg.3208
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** Pg.3212
Lei Shan, Yu Tian, Jun Zhang, Yonggang Meng, *Tsinghua University, Beijing, China*

906 **Lubrication Issues in Granular Suspension Rheology** Pg.3215
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** Pg.3216
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** Pg.3220
Eng Seng Ooi, Robert Dwyer-Joyce, *Sheffield University, Sheffield, United Kingdom*

904 **The Real-Time Measurement of Wear using Ultrasonic Reflectometry** Pg.3224
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** Pg.3228
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** Pg.3232
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** Pg.3236
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** Pg.3238
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** Pg.3242
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** Pg.3243
Toshiaki Wakabayashi, *Kagawa University, Takamatsu, Japan*, Yasuha Tokumo, Kentaro Yamaguchi, Kiyomi Sakamoto, Yuji Shitara, *JX Nippon Oil & Energy Corporation, Yokohama, Japan*

93 **Wear Characterization of a Masonry Brick towards the Sudy of its Particle Emission Tendency** Pg.3247
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** Pg.3250
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** Pg.3254
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** Pg.3255
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** Pg.3257
Ken Nakano, Chiharu Tadokoro, Naohiro Kado, *Yokohama National University, Yokohama, Japan*

Friday, September 13th

BM – Biomimetics

FR1-BM2 Superhydrophobic, Self-cleaning, Low Friction Surfaces
ROOM 4 VENEZIA • 08:30 – 10:30

Chair: Giuseppe Carbone, *Politecnico di Bari, Bari, Italy* Pg.3259

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** Pg.3260
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* Pg.3263

705 **Controllable Partial Wetting on Microwrinkle Surfaces**
Takuya Ohzono, *Nanosystem Research Institute, AIST, Tsukuba, Japan* Pg.3267

325 **Aqueous Lubrication of Sliding Contacts of Polymeric Surfaces by means of Polymer Brushes** Pg.3269
Troels Røn, Irakli Javakhishvili, Søren Hvilsted, Seunghwan Lee, *Technical University of Denmark, Kgs. Lyngby, Denmark*

623 **Bioinspired Solutions for Lubrication** Pg.3272
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* Pg.3275

714 **Adhesive Performance of Mushroom-shaped Micro-pillars with Interfacial Micro-bubbles of Air** Pg.3276
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** Pg.3280
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** Pg.3283
Luciano Afferrante, Francesco Bottiglione, Elena Pierro, Giuseppe Carbone, *Politecnico di Bari, Bari, Italy*

874 **Dynamic Analysis of an Adhesive Fibrillar Contact** Pg.3287
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** Pg.3291
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** Pg.3295
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** Pg.3299
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** Pg.3301
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** Pg.3305
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** Pg.3306
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** Pg.3310
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** Pg.3311
Ying Wang, Jing Yang, Xia Li, Jianning Ding, Ningyi Yuan, *Changzhou University, Changzhou, China*

320 **The Adhesive and Fictional Properties of Pillar Patterned Surface** Pg.3314
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** Pg.3317
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** Pg.3321
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** Pg.3324
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** Pg.3326
Jianliang Li, Dangsheng Xiong, Yongkun Qin, Heguo Zhu, *Nanjing University of Science and Technology, Nanjing, China*

FRIDAY

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 Pg.3330
Ana-Eva Jimenez, Tulia Espinosa, Jose Sanes, Maria-Dolores Bermúdez, *Universidad Politecnica 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 Pg.3334
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 Pg.3338
Davide Verdi, Miguel Á. Garrido-Maneiro, Claudio J. Múnez, Pedro Poza, *Universidad Rey Juan Carlos, Móstoles, Spain*

898 Multi-probe Scratching Technique as an Interfacial Adhesion Measurement in Coated Systems Pg.3342
Vincent Le Houérou, Leandro Jacomine, Christian Gauthier, *Institut Charles Sadron, Strasbourg, France*

987 Tribological Investigation of Laser Cladded Ceramic Al2O3 Coatings on Aluminium Pg.3346
Florian Pape, Christian Nölke, Stefan Kaierle, *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 Pg.3350
Fahmi Mubarok, *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 Pg.3354
Yazhen Wang, Yingjun Chen, Xinping Zhang, Ping Huang, *South China University of Technology, GuangZhou, China*

168 Nanoscale Sliding Contacts between Multi-Asperity Tips and Textured Surfaces Pg.3358
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 Pg.3362
Tasuku Onodera, Kenji Kawasaki, Takayuki Nakakawaji, *Hitachi Research Laboratory, Hitachi, Japan*, Yuji Higuchi, Nobuki Ozawa, Kazue Kurihara, Momoji Kubo, *Tohoku University, Sendai, Japan*

365 Stick-slip and Wear Behavior of Ceramic and Polymer Materials under Reciprocating Sliding Conditions Pg.3365
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 Pg.3369
Anne Rubin, *Strasbourg University, Strasbourg, France*, Christian Gauthier, *Strasbourg University, Strasbourg, France*

760 Study of Mechanisms Occurring During Friction of Textile Surfaces Pg.3371
Michel Tourlonias, 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 Pg.3375
Takeshi Yamaguchi, Toshihiro Shimakura, Takahiro Kawasaki, Kazuo Hokkirigawa, *Tohoku University, Sendai, Japan*

574 Effects of Photoageing on the Tribological Properties of Engineering Plastics Pg.3379
Haitao Duan, Ding Wang, Kali Gu, *Wuhan Research Institute of Materials Protection, Wuhan, China*

771 Influence of Environmental Factors on Slip of Rubber Vulcanizates Pg.3382
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 Pg.3386
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 Pg.3389
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 Pg.3393
Kwang-Seop Kim, Kyungmin Jo, Bongkyun Jang, Jae-Hyun Kim, Hak-Joo Lee, *Korea Institute of Machinery & Materials, Daejong, Republic of Korea*

818 The Wear Behaviors of Basalt Base Glass-ceramic Coatings by Plasma Spray Coating Technique Pg.3395
Gunhan Bayrak, Senol Yilmaz, Ugur Sen, Ediz Ercenk, *Sakarya University, Sakarya, Turkey*

880 Sliding Wear Behavior of Chromium Boride Coated AISI 52100 Steel Pg.3398
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 Pg.3402
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 (ITeE-PIB), Radom, Poland*

1294 Tribosystems for Dry Running, High Performance Rolling Sliding Contacts Pg.3405
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 Pg.3409
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 (Al2O3-Titan Alloy) Pg.3412
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 Pg.3416
Yilun Xu, Daniel S. Balint, Daniele Dini, *Imperial College London, London, United Kingdom*

324 Tribological Behaviour of MoS2 in Hydrogen Environment
Thomas Schneider, Thomas Gradt, *BAM Bundesanstalt für Materialforschung, Berlin, Germany*, Bernd Vierneusel, Stephan Tremmel, Sandro Wartzack, *Friedrich-Alexander-University Erlangen-Nuremberg, Erlangen, Germany* Pg.3420

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 Pg.3423
Yasushi Hoshi, Hidetaka Nanao, Shigeyuki Mori, *Iwate University, Morioka, Japan*

736 Microencapsulation for Next Generation Lubricants Pg.3426
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 Pg.3429
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 Pg.3432
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 Pg.3436
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 Pg.3440
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 Pg.3443
Markus Grebe, Paul Feinle, *Mannheim University of Applied Sciences, Mannheim, Germany*, Pavol Blaškovitš, *Slovak University of Technology in Bratislava, Trnava, Slovak Republic*

224 Comparison of the EHL Characteristics for Different Roller Axial Profiles Pg.3447
Tae-Jo Park, *Gyeongsang National University, Jinju, Republic of Korea*

192 Radial Stiffness of an Angular Contact Ball Bearing under Cryogenic Temperature Pg.3451
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 Pg.3455
Zhenhuan Ye, Liqin Wang, *Harbin Institute of technology, Harbin, China*

984 Refrigerant-Lubricated Gas Foil Bearings - A Thermo-Hydrodynamic Study Pg.3459
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 Pg.3462
Shaona Jiang, Xiaoyang Chen, *Shanghai University, Shanghai, China*, Jiaming Gu, *Shanghai Tian An Bearing Co. Ltd, Shanghai, China*

FR1-BE15 Fluid-Film Bearings 5
ROOM 9 BOLOGNA • 08:30 – 10:30

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

926 Experimental Study on a Hydrodynamic Centered Pivot Tilting-pad Thrust Bearing Pg.3466
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 Pg.3470
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 Pg.3474
Anders Vølund, *MAN Diesel & Turbo SE, Copenhagen, Denmark*

1313 Experimental Investigation of Innovative Low Viscosity Synthetic Oils for Journal Bearings in Turbomachinery Applications Pg.3478
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 Pg.3482
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 Pg.3486
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 Pg.3490
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 Pg.3492
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 Pg.3495
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 Pg.3499
Matteo Giacopini, 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 Pg.3503
Antonio Strozzi, Matteo Giacopini, 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 Pg.3507
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 Pg.3508
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 Pg.3512
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* Pg.3516

1211 Performance Characteristics of Low Speed, Heavily Loaded Two Axial Groove Cylindrical Journal Bearings of Mine Hoisting Machine Pg.3520
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 Pg.3524
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 Pg.3528
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 Pg.3532
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 Pg.3536
Balázs Magyar, Bernd Sauer, *University of Kaiserslautern, Kaiserslautern, Germany*

591 Effects of Wall Roughness on Shear Stress in a Magnetorheological Fluid Shear Cell Pg.3539
Hanna G. Lagger, Claas Bierwisch, Michael Moseler, *Fraunhofer Institute for Mechanics of Materials IWM, Freiburg, Germany*

1227 Investigating Seizure Load and Wear Characteristics Pg.3543
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 Pg.3547
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 Pg.3551
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 Pg.3554
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 Pg.3558
Álvaro Rico, Felipe Orgaz, *Instituto de Cerámica y Vidrio, Madrid, Spain*, Jesús Rodríguez, *Universidad Rey Juan Carlos, Móstoles, Spain*

FRIDAY

1077 **Wear of Different Material Pairings for the Piston Ring – Cylinder Liner Contact** Pg.3562
Thomas Wopelka, Claudia Lenauer, Johannes Sequard-Base, Karoline Steinschütz, Lukas Spiller, Andreas Pauschitz, Martin Jech, *AC²T Research GmbH, Wiener Neustadt, Austria*

896 **Ultra-Low Wear Nanocomposites** Pg.3566
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* Pg.3569

1306 **In Situ Detection of Hydrogen Evolution During Lubricated Sliding Contact** Pg.3573
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** Pg.3577
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** Pg.3580
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** Pg.3581
Joichi Sugimura, Takahiro Yamanaka, Hiroyoshi Tanaka, *Kyushu University, Fukuoka, Japan*

939 **Experimental Study of Hydrogen Sealing Ability and Wear Characteristics of Polymer Composites** Pg.3582
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** Pg.3585
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** Pg.3589
Loic Salles, Christoph Schwingshackl, Jeff Green, *Imperial College London, London, United Kingdom*

1032 **Dynamic Identfication of Friction Damping in the Joints of an Engine-Like Bladed-Disks** Pg.3590
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** Pg.3591
Christian M. Firrone, Ilaria Bertino, Stefano Zucca, Muzio Gola, *Politecnico di Torino, Torino, Italy*

Additional Paper

859 Reduction of graphite lamella size in grey cast iron: Impact on the friction and damage mechanisms activated during braking Pg.3647
Anne-Lise Cristol, Mathilde Collignon, David Balloy, Gilles Regheere, Yannick Desplanques

412 **The Effect of Friction Contacts on the Dynamics of a Rotating Vane Segments Array : Simulation and Comparison with Experimental Results** Pg.3595
Teresa Berruti, Christian M. Firrone, Muzio Gola, *Politecnico di Torino, Torino, Italy*, Paolo Calza, *AVIO S.p.A., Rivalta di Torino (To), Italy*

539 **Investigation of under-platform Damper Kinematics and its Interaction with Contact Parameters (Nominal Friction Coefficient)** Pg.3599
Muzio Gola, Tong Liu, *Politecnico di Torino, Torino, Italy*, Marcelo Braga dos Santos, *Federal University of Uberlândia, Uberlândia, Brazil*

NT – Novel Aspects in Tribology

FR1-NT4 Novel Applications
ROOM 8 PALERMO • 08:30 – 10:30

Chair: Ken Nakano, *Yokohama National University, Japan*

947 **Tribological Behavior of Friction Materials in Lubricated Ultrasonic Motors** Pg.3603
Wei Qiu, Yosuke Mizuno, Kentaro Nakamura, *Tokyo Institute of Technology, Yokohama, Japan*

604 **Investigation of Slider Disk Contact Behavior in Helium-Air Gas Mixtures** Pg.3607
Zhengqiang Tang, *South China University of Technology, Guangzhou, China*, Pablo A. Salas Mendez, Frank E. Talke, *University of California, San Diego, La Jolla, CA, United States*

405 **Surface Characterization of Spline Coupling Teeth Subjected to Fretting Wear** Pg.3611
Vincenzo Cuffaro, Francesca Curà, Andrea Mura, *Politecnico di Torino, Torino, Italy*

627 **Microstructuring of Thermo-Mechanically Highly Stressed Surfaces for Application in Internal Combustion Engines**
Hubertus Ulmer, Friedrich Dinkelacker, Florian Engelke, Eduard Reithmeier, *Leibniz Universität Hannover, Hannover, Germany*, Tim Göttsching, Berend Denkena, Christoph Hübsch, Friedrich-Wilhelm Bach, *Leibniz Universität Hannover, Garbsen, Germany*, Hermann Fast, Adrian Rienäcker, *Universität Kassel, Kassel, Germany* Pg.3615

125 **The Effect of Oil Availability on the Operation of a Piston-ring in a Large Two-stroke Marine Diesel Engine** Pg.3619
Graham Calderbank, Edward Smith, Ian Sherrington, *University of Central Lancashire, Preston, United Kingdom*

FR2-NT5 New Frontiers
ROOM 8 PALERMO • 11:00 – 13:00

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

550 **How is Energy Dissipated through Plastic Deformation During Fretting: A Concept of Entropy Generation** Pg.3621
Yi Song, Zhendong Dai, *Nanjing University of Aeronautics and Astronautics, Nanjing, China,* Qunji Xue, *Lanzhou Institute of Chemical Physics, Lanzhou, China*

811 **Anisotropic Thermal Conductivity Modelling by Discrete Element Method** Pg.3625
Jérôme Rivière, *INSA-Lyon, Villeurbanne, France*, Mathieu Renouf, *Université Montpellier 2, Montpellier, France*, Yves Berthier, *INSA-Lyon, Villeurbanne, France*

763 **Quasi-Stick-Slip Motion Generated by Angular Misalignment** Pg.3629
Ken Nakano, Chiharu Tadokoro, Naohiro Kado, *Yokohama National University, Yokohama, Japan*

1017 **Novel Tribological Aspects in Space Mechanisms: Dynamic Failure of Metallic Adhesion** Pg.3630
Daniele Bortoluzzi, Matteo Benedetti, Carlo Zanoni, *University of Trento, Trento, Italy*

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