World Congress on Micro and Nano Manufacturing

Congress Chair

Joško Valentinčič, *University of Ljubljana, Slovenia*

Congress Co-Chairs

Stefan Dimov, *University of Birmingham, UK*
Martin Byung-Guk Jun, *Purdue University, USA*
Kuniaki Dohda, *Northwestern University, USA*

Congress Programme

Remisens Hotel Metropol, Portorož, Slovenia
18th – 20th September 2018

Tuesday 18th September 2018

Time 8:00-9:00

Registration

Time 9:00-9:30

Opening & Welcome Speeches

- WCMNM 2018 Chair, Professor Joško Valentinčič, *University of Ljubljana, Slovenia*
- University of Ljubljana Mechanical Engineering Dean, Prof. Kalin Mitjan, *Slovenia*
- WCMNM 2018 Co-Chair, Professor Martin Byung-Guk Jun, *Purdue University, USA*
- WCMNM 2018 Co-Chair, Professor Kuniaki Dohda, *Northwestern University, USA*

Time 9:30-10:30

Plenary Session I
Chair: Joško Valentinčič
Invited talk: "3D Printing of Complex Micro- and Nano-Optics", Professor Harald Giessen, University of Stuttgart

Time 10:30-11:30

Session 1: µMilling I
Chair: Shiv Kapoor
Room: Tartini

24. **Wear Mechanism of Tungsten Carbide Tool in Flood Cooling for Titanium Alloy and Cryogenic with Nano-Enhanced MQL Machining**

Gi-Dong Yang
Dong Yoon Lee
Seok-Woo Lee
Patrick Kwon
Kyung-Hee Park

79. **Forces in Green Micromachining of Aluminum Nitride Ceramics**

Recep Onler
Sundar V. Atre
Burak Ozdoganlar

Session 2: µInjection Molding
Chair: Giuliano Bissacco
Room: Largo

5. **Challenges in the Fabrication of Microstructured Polymer Optics**

Marcel Roeder
Peter Schilling
Karl-Peter Fritz
Thomas Guenther
Andre Zimmermann

26. **Effect and Modeling of Ultrasound-Assisted Ejection in Micro Injection Molding**

Giovanni Lucchetta
Davide Masato
Marco Sorgato
Nicola Milan

Session 3: Nanotech
Chair: Simon Park
Room: Allegro

20. **Study on Structure and Optimization of Hybrid Silica Particles on Chemical Mechanical Polishing of Sapphire**

Natthaphon Bun-Athuek
Hiroko Takazaki
Takuo Yasunaga
Yutaka Yoshimoto
Panart Khajornrungruang
Keisuke Suzuki

55. **Pulsed Light Sintering of Silver Nanowires on Polycarbonate for Transparent Conductive Electrodes**

Michael Dexter

91. **Micromachinability of Biodissolvable Carboxymethyl Cellulose (CMC)** *Toygun Cetinkaya* *Ant Yucesoy* *Burak Ozdoganlar*	46. **Effect of Laser-Induced Periodic Surface Structures on Wall Slip of Polypropylene in Thin-Wall Injection Molding** *Davide Masato* *Marco Sorgato* *Afif Batal* *Stefan Dimov* *Giovanni Lucchetta*	*Zhongwei Gao* *Chih-hung Chang* *Rajiv Malhotra* 86. **Long-term hydrophilicity of TiO2 nanotubes induced by oxygen plasma treatment** *Metka Benčina* *Ita Junkar* *Tomaž Lampe* *Matic Resnik* *Matjaž Valant* *Veronika Kralj Iglič* *Miran Mozetič* *Aleš Iglič*
Time 11:30-12:00		
Coffee Break		
Time 12:00-13:00		
Session 4: µManufacturing I **Chair:** Lawrence Kulinsky **Room:** Tartini 3. **Influence of the Planetary Movement of Tool on the Aspect Ratio of Micro Holes Machined by Micro-USM** *Senwang Lei* *Zuyuan Yu* *Kai Zhou* *Jianzhong Li* *Renke Kang*	**Session 5:** Surface Functionalization I (UKIERI) **Chair:** Suhas Joshi **Room:** Largo 16. **Combined Surface Hardening and Laser Patterning for Producing Wear Resistant Hydrophobic Surfaces** *Antonio Garcia-Giron* *J.M. Romano* *Y. Liang* *B. Dashtbozorg* *H. Dong* *P. Penchev* *S. Dimov*	

7. **Fine Micro-Fabrication of Stainless Steel Nozzle Array by Plasma Printing** *Tatsuhiko Aizawa* *Kenji Wasa* 19. **Deburring of the Holes on CFRP Using the Electron Beam Irradiation** *Jisoo Kim* *Hyung Wook Park*	22. **A Preliminary Investigation of the Chip Formation Mechanism and Cutting Force Signatures in Orthogonal Micromachining of Bulk Metallic Glass (BMG)** *Nilanjan Banerjee* *Karuna Dhale* *Rinku Mittal* *Ramesh Singh* 89. **Response of Saos-2 Osteoblast-Like Cells to Nanosecond, Femtosecond Pulsed Laser Surface Texturing and Hydroxyapatite Coating on CoCrMo Alloy Surfaces** *Afif Batal* *Rachel Sammons* *Stefan Dimov*	
Time 13:00-14:15		
Lunch		
Time 14:15-15-15		
Session 6: Surface Functionalization II **Chair:** Tatsuhiko Aizawa **Room:** Tartini 64. **Surface Micro Texturing through Wire Mask-Assisted Rolling for Anti-Friction Applications** *Ashwin Prabhakaran* *Anvesh Gaddam* *Amit Agrawal* *Suhas Joshi*	**Session 7:** Laser Processing I **Chair:** Sylvie Castagne **Room:** Largo 9. **Triangular self-organized surface textures produced by femtosecond laser irradiation on stainless steel and titanium alloy** *Jean-Michel Romano* *Antonio Garcia-Giron* *Pavel Penchev* *Stefan Dimov*	**Session 8:** Microman I **Chair:** Massimiliano Annoni **Room:** Allegro 17. **Evaluation of an Improved Micro Milling Strategy for the Generation of Tool Steel Micro Features with Optical Functionality** *Dongya Li* *Ali Davoudinejad* *Yang Zhang* *Guido Tosello*

66. **Autonomously Generating Nano-Micro Textured Ultra Flat Smooth Surfaces by Applying Molecular Beam Epitaxy with Helicon Sputtering Molecular Beam Source for Nanoimprint Die** *Akira Kakuta* *Maruta Shuhei* 90. **Surface Nanostructuring of TiN Coated Microstructured Mold, Application to a Biodiagnostic Platform** *Nicolas Blondiaux* *Raphaël Pugin*	15. **Effects of Focusing Lenses and Laser Fluence in Drilling High Aspect Ratio Micro Holes** *Vahid Nasrollahi* *Pavel Penchev* *Stefan Dimov* *kyunghan kim* 85. **Finishing of Titanium ALM parts by laser ablation** *Petko Petkov* *Pavel Penchev* *Franck Lacan* *Samuel Bigot*	71. **Near Real Time Milling Stability Indicator** *Shashwat Kushwaha* *Benjamin Gorissen* *Jun Qian* *Dominiek Reynaerts* 92. **Micromilling of Metallic Feedstock Produced by Extrusion Additive Manufacturing** *Sandeep Kuriakose* *Paolo Parenti* *Salvatore Cataldo* *Massimiliano Annoni*
Time 15:15-15:45		
Coffee Break		
Time 15:45-17:30		
Session 9: µMachining I **Chair:** Ming-Chyuan Lu **Room:** Tartini 13. **Improving the Surface Quality of Additive Manufactured Metal Parts by Ultrasonic Vibration-Assisted Burnishing** *Akinori Teramachi* *Jiwang Yan* 29. **Experimental Study on Hole Quality of Carbon Fiber Reinforced Plastics During Micro-Hole Drilling Process**	**Session 10:** µHandling & Assembly **Chair:** Gracious Ngaile **Room:** Largo 28. **Miniaturized Optical Encoder with Micro Structured Encoder Disk** *André Bülau* *Jonathan Seybold* *Karl-Peter Fritz* *Alexander Frank* *Cor Scherjon* *Joachim Burghartz* *Andre Zimmermann*	**Session 11:** Microman II **Chair:** Matteo Calaon **Room:** Allegro 8. **Prediction of shrinkage and warpage effects of a micro component via injection molding process simulation** *Antonio Luca* *Henrik Siesenis* *Oltmann Riemer* 18. **On the Applicability of Micro-Injection Moulding Simulations to Multivariate Integrated Process/product Optimization**

Jaewoo Seo *Hyung Wook Park* 44. **AFM Tip-Based Cutting of Grooves on Permalloy Nanowires for Controlling the Motion of Magnetic Domain Walls** *Josh Jones* *Emmanuel Brousseau* *Dan Read* 76. **Experimental Investigation of Bubble-Mixed Cutting Fluid Delivery for Micro-Deep-Hole Drilling** *Chi-Ting Lee* *Soham Sanjeev Mujumdar* *Shiv G. Kapoor*	35. **Clamping of Microspheres with Low Melting Metals** *Finn Meiners* 52. **The Study of Particle-Particle Interaction and Assembly under the Influence of Dielectrophoretic Force Experienced between Carbon Microelectrodes** *Chih-I Cheng* *Jennifer Cortez* *Iridian Chino Dorantes* *Edgar Rodriguez* *Sina Habibi Zad* *Lawrence Kulinsky* 83. **A Product Development Approach in the Field of Micro Assembly with Emphasis on Conceptual Design** *Christoph Gielisch* *Karl-Peter Fritz* *Andre Zimmermann*	*Federico Baruffi* *Matteo Calaon* *Guido Tosello* *René Elsborg* 31. **Characterisation of Zirconia-Based Ceramics after Micro-Grinding** *Pablo Fook* *Oltmann Riemer* 94. **Simulation Study of Dynamic Behaviour of Water Droplet on Laser Machined Surface** *Yukui Cai* *Xichun Luo*
End of Day I		

Wednesday 19th September 2018

Time 9:00-10:00

Plenary Session II
Chair: Martin Byung-Guk Jun
Invited talk: "3D Printed Graphene-based Structures for Sensor Applications", Professor Ehsan Toyserkani, University of Waterloo

Time 10:00-11:00

Session 12: Modeling & Simulation I
Chair: Kuniaki Dohda
Room: Allegro

2. **Verification of the Accuracy of FE-Models in Bulk-Forming of Micropins from Sheet Metal**

Martin Kraus
Thomas Hufnagel
Marion Merklein

14. **Predictive Cutting Force Modeling for Cryogenic Machining Process Considering Micro-Structural Analysis of Ti-6Al-4V Alloy**

Do Young Kim
Dong Min Kim
Hyung Wook Park

40. **FEM Modeling of Micro-Extrusion of Square Section from Al 6063 round Bar Using Cosine Die Profile**

Kalipada Maity

Session 13: Surface Engineering
Chair: Ramesh Singh
Room: Largo

11. **Large-Area Electron Beam Melting: Frequency Analysis and Critical Frequency Prediction**

Brodan Richter
Frank Pfefferkorn

12. **Stress Relaxation Behavior of Cavitation Processed Low Alloy Steel**

Kumiko Tanaka
Bin Shinohara
Yudai Kitano
Daichi Shimonishi
Daisuke Nakagawa
Masataka Ijiri
Toshihiko Yoshimura

47. **Low Temperature Plasma Nitriding of Mini-/micro-Tools and Parts**

Tatsuhiko Aizawa
Hiroshi Morita

Session 14: Sensors & Systems
Chair: Steffen Scholz
Room: Allegro

6. **Development of Hydraulic-Driven Devices Using Metal Bellows Structure**

Tohru Sasaki
Naotoshi Matsumoto
Yudai Fujiwara
Masao Hebisawa
Kenji Terabayashi
Kuniaki Dohda

53. **Rapid Micro-Patterning of Hybrid Copper Nano-Inks Using Selective IPL**

Zachary Kockerbeck
Allen Sandwell
Simon Park

74. **Development of a 3D Digital Image Correlation Setup for a Multiaxial Miniature Testing System**

Farhan Rahman
Tasnim Hassan

	Kenji Wasa	*Gracious Ngaile*
Time 11:00-11:30		
Coffee Break		
Time 11:30-13:00		
Session 15: µEDM **Chair:** Samuel Bigot **Room:** Tartini 30. **Study on Zirconium Boride Machined by Micro-EDM** *Mariangela Quarto* *Giuliano Bissacco* *Gianluca D'Urso* *Claudio Giardini* 49. **A Study on Improving Accuracy of Micro Probes Using Wire Electric Discharge Grinding** *Krishnaraj Vijayan* *Mouleeswaran Senthilkumar* *Sindhumathi Ramalingam* *Josko Valentincic* 50. **Effects of Electrode and Workpiece Materials on the Sustainability of Micro-EDM Drilling Process** *Gianluca D'Urso* *Giancarlo Maccarini* *Mariangela Quarto* *Chiara Ravasio*	**Session 16:** µMilling II **Chair:** Paolo Parenti **Room:** Largo 23. **Methodologies for Characterization of Smearing Micro Geometry on Ball End Milled Tool Steel Surfaces** *Francesco Giuseppe Biondani* *Giuliano Bissacco* *Hans Noergaard Hansen* 36. **Experimental Comparison of Micromilling Pure Titanium and Ti-6Al-4V** *Fabio Oliveira Campos* *Anna Carla Araujo* *Shiv G. Kapoor* 59. **Micro Inclined Hole Machining on Thin Wire** *Takashi Matsumura* *Masaki Serizawa* 70. **Drag Reduction in Lubricant-Infused Textured Microchannels Fabricated by Micro Milling** *Reshma Yasmin Siddiquie* *Anvesh Gaddam*	**Session 17:** µFabrication **Chair:** André Zimmermann **Room:** Allegro 21. **Influence of Micro Structure on Metal Flow of Micro Forward-Backward Extrusion of 6063 Aluminum Alloy** *Tatsuya Funazuka* *Norio Takatsuji* *Kuniaki Dohda* 51. **Effect of Carbon Microposts Integrated Onto Asymmetric Electrodes for AC Electroosmotic Pumping** *Matias Vazquez-Pinon* *Lawrence Kulinsky* *Marc Madou* *Sergio Martinez-Chapa* 77. **Mechanics of Oxide Skin During Micro-Extrusion-Based 3D-Printing of Liquid Metals and Alloys** *Abhishek Gannarapu* *Bulent Arda Gozen*

75. **Experimental Investigation of Atomized Dielectric-Based Electrical Discharge Machining (EDM)** *Asif Tanveer* *Soham Sanjeev Mujumdar* *Shiv G. Kapoor*	*Amit Agrawal* *Suhas Joshi*	88. **Fabrication of Nonplanar Microfluidics Using Sonication-Assisted Dissolution** *Pin-Chuan chen* *Ching-Chan Chou*
Time 13:00-14:15		
Lunch		
Time 14:15-15-15		
Session 18: µManufacturing II **Chair:** Zuyuan Yu **Room:** Tartini 27. **Development of Low-Temperature Diffusion Bonding Process Using Plasma Activation and High-Frequency Induction Heating** *Tomomi Shiratori* *Takuya Aihara* *Tomoaki Satoh* *Tatsuhiko Aizawa* 43. **Experimental Study of Micro-Groove Surface Using Three Dimensional Elliptical Vibration Texturing** *Rendi Kurniawan* *Saood Ali* *Ki Moon Park* *Jung Sang Tae* *Tae Jo Ko*	**Session 19:** µMachining II **Chair:** Takashi Matsumura **Room:** Largo 38. **Effect of Tool Wear on Dynamic Stability in High Speed Micromilling of Ti-6Al-4V** *Chinmay Maheshwari* *Rinku Mittal* *Ramesh Singh* 63. **Comparative Analysis of Machine Structures for High Speed Micromachining** *Rushikesh Ingle* *Rinku Mittal* *Ramesh Singh* 84. **Experimental Study on Micro-Drilling of Carbon Fiber Reinforced Plastic (CFRP) Composite Using Nano-Solid Air Spray Lubrication**	**Session 20:** HIMALAIA **Chair:** Pavel Penchev **Room:** Allegro 10. **Towards large area submicron surface texturing by femtosecond laser irradiation of microparticle arrays** *Jean-Michel Romano* *Rajib Ahmed* *Antonio Garcia-Giron* *Pavel Penchev* *Olivier Delléa* *Stefan Dimov* 33. **New Ways to Nanotexture Model Polymer Surface** *Florence Dubelley* *Ali Nourdine* *Julien Giboz* *Sylvain Carrier* *Yannick Molméret*

67. **Process Chain for Micro-Manufacturing: A Combination of Micro-AWJ and Micro-WEDM** Francesco Modica *Vito Basile* *Francesco Viganò* *Francesco Arleo* *Massimiliano Annoni* *Irene Fassi*	*Jinwoo Kim* *Byoung Joo Kang* *Sang Won Lee*	*Lionel Tenchine* *Bertrand Fillon* *Mele Mele* 41. **Laser Induced Ripples' Gratings for Fabrication Periodic Pattern of Diffraction Holograms** *Tahseen Jwad* *Pavel Penchev* *Vahid Nasrollahi* *Stefan Dimov*
Time 15:15-15:45		
Coffee Break		
Time 15:45-17:30		
Session 21: Additive manufacturing I **Chair:** Kornel Ehmann **Room:** Tartini 34. **Rapid Multi-Material 3D Printing with Projection Micro-Stereolithography Using an Enclosed Printing Chamber** *Daehoon Han* *Jay Tobia* *Nicholas Fang* *Howon Lee* 57. **Investigation into the influence of process parameters on surface roughness of down-facing surfaces in Selective Laser Melting** *Amal Charles*	**Session 22:** µMachining III **Chair:** Burak Ozdoganlar **Room:** Largo 32. **Time Dependent Evolution of Metal Bonded Microgrinding Tool Topography Due to Wear** *S Anandita* *Rakesh Mote* *Ramesh Singh* 61. **Effects of the Half Vertex Angle of Edge Serrations on the Brittle Fracture in the Glass Cutting** *Takenori Ono*	**Session 23:** Modeling & Simulation II **Chair:** Roussi Minev **Room:** Allegro 4. **The Cutting Force Simulation in Laser Assisted Milling of Inconel 718** *Tsungpin Hung* *Yu-Ting Lu* *Zhipeng Pan* *Yixuan Feng* *Steven Y. Liang* 48. **Investigation on Staggered Herringbone Micromixer Design Suitable for Micro EDM Milling** *Izidor Sabotin*

Ahmed Elkaseer *Tobias Mueller* *Lore Thijs* *Veit Hagenmeyer* *Steffen Scholz* 62. **Capability of Desktop 3D Printers to Produce Mezo-Micro Features for Bio Implantable Meshes** *Roussi Minev* *Dimitar Kamarinchev* *Ekaterin Minev* *Mariana Ilieva* *Emil Yankov* 81. **Electrical Property Control of 3D Printed Stainless Steel 420 Structures Using Chemically Induced Sintering** *Truong Do* *Xiaolu Huang* *Hawke Suen* *Yaozhong Zhang* *Tyler Bauder* *Haseung Chung* *Patrick Kwon* *Junghoon Yeom* 93. **Mechanical characterization of PLA/CNT composite scaffolds fabricated by Fused Deposition Modeling**	65. **A Comprehensive Study of Scratch Speed Effects on Ductile-Brittle Transition in Silicon** *Chirag Akreja* *Sathyan Subbiah* 87. **Experimental Investigation of Cutting Force and AE Signals for Cutting Mode Transform in the Machining of Zirconium Oxide** *Li-Ting Yang* *Ming-Chyuan Lu* *Shih-Ming Wang*	*Gianluca Tristo* *Andrej Lebar* *Marko Jerman* *Miha Prijatelj* *Josko Valentincic* 72. **The Geometrical Predictions of the 3D Milling Process for Carbon Fiber Reinforced Polymer (CFRP) Machining** *Kyeongeun Song* *Xingyu Fu* *Dong Min Kim* *Gyuho Kim* *Jung Soo Nam* *Tae-Gon Kim* *Hyo-young Kim* *Seok-Woo Lee* *Byung-Kwon Min* *Martin Byung-Guk Jun* 80. **Radial Throw in Micromilling: The Effects on Surface Location Error, Sidewall Surface Roughness and Uncut Chip Thickness** *Sudhanshu Nahata* *Recep Onler* *Burak Ozdoganlar*

Claudia Pagano *Lara Rebaioli* *Irene Fassi*		
End of Day II		

Thursday 20th September 2018

Time 9:00-10:00		
Plenary Session III **Chair:** Stefan Dimov **Invited talk:** "Surface finishing procedures for custom made medical implants", Dr. Ita Junkar, Josef Stefan Institute		
Time 10:00-10:30		
Coffee Break		
Time 10:30-12:15		
Session 24: Additive manufacturing II **Chair:** Irene Fassi **Room:** Tartini 37. **A Preliminary Study of Robotic Restoration Using Micro-Scale Laser Cladding of CPM 9V on Carbon Steels** *Sachin Alya* *Bhargavi Ankamreddy* *Ramesh Singh* 42. **Surface Finish of AM parts using Plasma electrolytic Polishing** *Henning Zeidler* *Falko Böttger-Hiller* 58. **Digital Detection and Correction of Errors in As-built Parts: a Step Towards Automated Quality Control of Additive Manufacturing** *Ahmed Elkaseer* *Tobias Mueller* *Steffen Scholz*	**Session 25:** Laser Processing II **Chair:** Sathyan Subbiah **Room:** Largo 45. **Numerical and Experimental Analysis of Laser Surface Modification of Ti6Al4V for Biocompatible Applications** *Nakul Ghate* *Amber Shrivastava* 54. **Microfabrication Techniques Using a Femtosecond Laser for Fabrication of High Precision Optical Components** *Hang-Eun Joe* *Kaveh Nazeri* *Yonghyun Cho* *Farid Ahmed* *Martin Byung-Guk Jun* 56. **Impact on Cells Viability of Laser Surface Modification of Rare Earth Containing Magnesium Alloy through Simulated Body Fluid** *Indira Khadka*	

69. **Using 3D Metal Printing and Micro Milling Processes to Manufacture Structures with Pyramid Features** *Yin Chuang* *X. B. Wang* *Jack Y. C. Lin* 78. **Effect of DC Voltage Polarity and AC Fields on Near-Field Electrospinning** *Nicolas Martinez-Prieto* *Jian Cao* *Kornel Ehmann*	*Zhongke Wang* *Hongyu Zheng* *Sylvie Castagne* 73. **Enhancement of Tribological Properties of Stainless Steel 904L by Laser Surface Nano-Texturing** *Hasnaa Meliani* *Michael Fontaine* *Mohamed Assoul* *Guy Monteil* *Takashi Matsumura*	
Time 12:15-14:00		
Lunch		
End of WCMNM 2018		