

## Program NMJ 2023 (November 21, 2023)

Sunday, November 26, 2023

16:00-18:00	<b>Registration</b>
18:00-20:00	<b>Welcome Reception</b>

Monday, November 27, 2023

From 08:00	<b>Registration</b>
	Chair: G. Wagner, S. Hausner
08:50-09:20	<p><b>Opening - Welcome – Introduction</b></p> <p>Dr. Andreas Handschuh (Video greeting) Saxon State Ministry for Science, Culture and Tourism, Germany Secretary of State</p> <p>Dr. Gabriele Goldfuß Office for International Affairs Mayor's Department of Leipzig</p> <p>Prof. Anja Strobel (Video greeting) Chemnitz University of Technology, Germany Vice President for Research and University Development</p> <p>Prof. Lars Jeurgens Empa, Switzerland President of the Nanojoining and Microjoining Association</p>
09:20-09:45	<p>- Keynote -</p> <p><b>4D materials for electronic skin and microrobotic systems</b> <u>O.G. Schmidt</u> Chemnitz University of Technology, Germany</p>
09:45-10:00	<p><b>Impulse lectures from the industry</b></p> <p>EUROMAT GmbH FOCUS GmbH</p>
10:00-10:35	<b>Group Photo, Coffee Break, Poster Session and Industrial Exhibition</b>
	Chair: O.G. Schmidt, L. Jeurgens
10:35-11:00	<p>- Keynote -</p> <p><b>Bonding process of electronic package using IPL energy and Its Reliability of BGA Component</b> <u>S.-B. Jung</u> Sungkyunkwan University, Korea</p>
11:00-11:20	<p><b>Microstructure Analysis of Induction Sintered Ag Micro Particle Layers for Die-Attach Applications</b> <u>P. Rochala</u><sup>1</sup>, <u>C. Hofmann</u><sup>2</sup>, <u>M. Kroll</u><sup>1</sup>, <u>K. Hiller</u><sup>2</sup></p> <p><sup>1</sup> Institute for Machine Tools and Production Processes (IWP), Professorship for Forming and Joining, Chemnitz University of Technology, Germany <sup>2</sup> Fraunhofer Institute for Electronic Nano Systems ENAS, Chemnitz, Germany</p>

11:20-11:40	<p><b>Characterization of microscale mechanical property and fracture behavior of sintered Ag/semiconductor material interface</b></p> <p><u>T. Matsuda</u>, R. Seo, M. Kambara, A. Hirose Division of Materials and Manufacturing Science, Graduate School of Engineering, Osaka University, Japan</p>
11:40-12:00	<p><b>Thermal effect on fracture behaviour of porous sintered silver nanoparticles by phase-field method</b></p> <p><u>X. Long</u>, J. Zhu, Y. Su School of Mechanics, Civil Engineering and Architecture, Northwestern Polytechnical University Xi'an, China</p>
12:00-13:05	<p><b>Lunch</b></p>
	<p>Chair: M. Türpe, N. Zhou</p>
13:05-13:30	<p>- Keynote -</p> <p><b>Latest integrated power module and unit technology using WBG devices</b></p> <p><u>Y. Takahashi</u> Tohoku University, Japan</p>
13:30-13:50	<p><b>Cross-Correlation of Interconnection Technologies – A Case Study of Reduced Wire Bond Quality after Ultrasonic Welding</b></p> <p><u>A. Groth</u><sup>1,2</sup> and M. Hempel<sup>1</sup> <sup>1</sup> Fraunhofer IZM, Berlin, Germany <sup>2</sup> Technische Universität Berlin, Research Center for Microperipheric Technologies, Berlin, Germany</p>
13:50-14:10	<p><b>Nanopaste sinter-bonding for transfer and integration of functional thin films</b></p> <p><u>B. Rheingans</u><sup>1</sup>, F. La Mattina<sup>2</sup>, J. Bouaziz<sup>1,2</sup>, C. Cancellieri<sup>1</sup>, L. P. H. Jeurgens<sup>1</sup>, J. Janczak-Rusch<sup>1</sup> <sup>1</sup> Laboratory for Joining Technologies and Corrosion, Empa - Swiss Federal Laboratories for Materials Science and Technology, Switzerland <sup>2</sup> Transport at Nanoscale Interfaces Laboratory, Empa - Swiss Federal Laboratories for Materials Science and Technology, Switzerland</p>
14:10-14:30	<p><b>Joining of gold nanoparticles prepared by laser ablation with halide salt</b></p> <p><u>L. Catanzaro</u><sup>1</sup>, V. Scardaci<sup>1</sup>, M. Scuderi<sup>2</sup>, M. Condorelli<sup>1</sup>, L. D'Urso<sup>1</sup>, G. Compagnini<sup>1,3</sup> <sup>1</sup> Department of Chemical Sciences (University of Catania), Italy <sup>2</sup> CNR—Institute for Microsystems and Microelectronics, Catania, Italy <sup>3</sup> Istituto Nazionale Scienza e Tecnologia dei Materiali (INSTM), Catania, Italy</p>
14:30-15:00	<p><b>Coffee Break, Poster Session and Industrial Exhibition</b></p>
	<p>Chair: G. Zou, S.-B. Jung</p>
15:00-15:20	<p>- Invited -</p> <p><b>Joining Diamond with Copper in Additive Manufacturing</b></p> <p><u>Y. Lu</u> University of Nebraska-Lincoln, USA</p>
15:20-15:40	<p>- Invited -</p> <p><b>High-strength bonding with low-temperature sintering copper nanoparticles</b></p> <p><u>T. Yonezawa</u> Hokkaido University, Japan</p>
15:40-16:00	<p><b>Sub 250°C sintering of substrates to baseplates with micro scale copper sinter paste</b></p> <p><u>S.K. Bhogaraju</u><sup>1</sup>, D. Busse<sup>2</sup>, A. Dahlbüdding<sup>2</sup>, G. Elger<sup>1</sup> <sup>1</sup> Institute of Innovative Mobility (IIMo), Technische Hochschule Ingolstadt, Germany <sup>2</sup> Budetec GmbH, Berlin, Germany</p>

16:00-16:20	<p><b>Enhanced Thermal Conductivity in Micro Composite Structure Joints Utilizing Porous Cu Sheets</b></p> <p><u>H. Tatsumi</u>, H. Nishikawa Joining and Welding Research Institute, Osaka University, Japan</p>
16:20-16:40	<p><b>Modified Nickel nanopastes to avoid high pressures during joining process</b></p> <p><u>B. Sattler</u>, S. Hausner, G. Wagner Chemnitz University of Technology, Group of Composites and Material Compounds, Germany</p>
16:40-17:00	<p><b>Ultrafast laser selective welding of sapphire and Invar alloy</b></p> <p><u>J. Yang</u><sup>1</sup>, Q. Jiang<sup>1</sup>, M. Yang<sup>1</sup>, Y.X. Zhao<sup>1</sup>, R. Pan<sup>2</sup> <sup>1</sup> School of Materials Engineering, Shanghai University of Engineering Science, China <sup>2</sup> Faculty of Materials and Manufacturing, Beijing University of Technology, China</p>
19:00-21:00	<p><b>Dinner</b></p>

Tuesday, November 28, 2023

From 08:00	<b>Registration</b>
	Chair: J. Janczak-Rusch, Y. Takahashi
08:55-09:20	- Keynote - <b>Femtosecond laser processing in photonics -scribing, welding and 3D nano-structuring</b> <u>P. Herman</u> University of Toronto, Canada
09:20-09:40	- Invited - <b>Cu@Ag nanoparticles: synthesis, characterization, sintering mechanism and applications for power and flexible printed electronics</b> <u>H. Ji</u> Harbin Institute of Technology (Shenzhen), China
09:40-10:00	<b>Femtosecond laser induced nanofusion and nanoalloying of high-entropy alloy nanoparticles</b> <u>A. Hu</u> <sup>1</sup> , <u>D. Fieser</u> <sup>1</sup> , <u>J. Whitlow</u> <sup>2</sup> , <u>P.K. Liaw</u> <sup>2</sup> <sup>1</sup> Department of Mechanical, Aerospace and Biomedical Engineering, University of Tennessee Knoxville, USA <sup>2</sup> Department of Materials Science and Engineering, University of Tennessee Knoxville, USA
10:00-10:20	<b>Broadening the scope of sintering: silver and copper/ silver mixed pastes for substrate and die-attach on challenging surfaces such as Cu, Ni and Al-finishes</b> <u>B. Rabay</u> Nano-Join GmbH, Berlin, Germany
10:20-10:40	<b>A novel strategy for nano-alloys preparation for power electronics packaging</b> <u>Q. Jia</u> <sup>1</sup> , <u>B. Zhou</u> <sup>1</sup> , <u>H. Hu</u> <sup>1</sup> , <u>Y. Wang</u> <sup>1</sup> , <u>F. Guo</u> <sup>1</sup> , <u>G. Zou</u> <sup>2</sup> <sup>1</sup> Faculty of Materials and Manufacturing, Beijing University of Technology, China <sup>2</sup> Department of Mechanical Engineering, State Key Laboratory of Tribology, Tsinghua University, China
10:40-11:10	<b>Coffee Break, Poster Session and Industrial Exhibition</b>
	Chair: A. Hu, M. Calame
11:10-11:30	- Invited - <b>Heterogeneous Direct Bonding: From Microelectronics to Biomedical Implantation</b> <u>C. Wang</u> Harbin Institute of Technology, China
11:30-11:50	<b>Microwelding of NiTi to stainless steel</b> <u>K. Zhang</u> , <u>A. Shamsolhodaie</u> , <u>S. Rathod</u> , <u>P. Peng</u> , <u>N. Zhou</u> Centre for Advanced Materials Joining (CAMJ), University of Waterloo, Canada
11:50-12:10	<b>Micro welding of glasses with USP-lasers – process models, results and applications</b> <u>D. Nodop</u> , <u>M. Kahle</u> ifw Jena - Günter Köhler Institute for Joining Technology and Materials Testing, Jena, Germany
12:10-12:30	<b>Laser Irradiation of Porcine Skeletal Muscle Tissue</b> <u>K. Zhang</u> <sup>1,2</sup> , <u>Y. Zhou</u> <sup>1,2</sup> , <u>M. Mayer</u> <sup>1,2</sup> <sup>1</sup> Dept. of Mechanical and Mechatronics Engineering, University of Waterloo, Canada <sup>2</sup> Centre for Advanced Materials Joining, University of Waterloo, Canada
12:30-13:30	<b>Lunch</b>

	Chair: P. Herman, T. Yonezawa
13:30-13:50	- Invited - <b>Direct laser writing of composite structures: process and application</b> <u>S. Rathod</u> , P. Peng, N. Zhou University of Waterloo, Canada
13:50-14:10	<b>Laser spiral spot welding of Al and Cu foils: process, microstructure and properties</b> <u>W. Du</u> , R. Xiao, T. Huang High-Power and Ultrafast Laser Manufacturing Lab, Faculty of Materials and Manufacturing, Beijing University of Technology, China
14:10-14:30	<b>Plasmonic-assisted heterogeneous integration of oxide-semiconductor interconnects under ultrafast laser irradiation</b> <u>L. Lin</u> , Y. Hu, Z. Li School of Materials Science and Engineering, Shanghai Jiaotong University, China
14:30-14:50	<b>Tuning Wettability of Graphene Oxide by Laser Induced Reduction in Liquids</b> <u>V. Scardaci</u> <sup>1</sup> , G. D'arrigo <sup>2</sup> , G. Condorelli <sup>1</sup> , G. Compagnini <sup>1</sup> <sup>1</sup> Department of Chemistry, University of Catania, Catania, Italy <sup>2</sup> CNR—Institute for Microsystems and Microelectronics, Catania, Italy
14:50-15:10	<b>Additive fabrication and adhesion enhancement of conformal interconnections on Al substrates with arbitrary 3D structures</b> <u>Y. Li</u> <sup>1</sup> , J. Li <sup>1</sup> , P. Du <sup>1</sup> , W. Li <sup>1</sup> , H. Guo <sup>2</sup> , X. Yu <sup>3</sup> , P. Zhang <sup>1</sup> <sup>1</sup> School of Materials Science and Engineering, Harbin Institute of Technology at Weihai, China <sup>2</sup> Shenzhou Information Technology Research Institute at Weihai, China <sup>3</sup> Shandong Kaer Electric Co., Ltd., Weihai, China
15:10-15:40	<b>Coffee Break, Poster Session and Industrial Exhibition</b>
	Chair: J. Pomeroy, H. Ji
15:40-16:00	- Invited - <b>Sintering behavior of nano porous film for device integration including power electronics, chiplet and flexible electronics</b> <u>L. Liu</u> , G. Zou, W. Wang, B. Feng, Q. Jia, H. Bai Department of Mechanical Engineering, State Key Laboratory of Tribology, Tsinghua University, Beijing, China
16:00-16:20	<b>Thermal fatigue damage mechanism of nano-foam sintered layer in the SiC device during thermal reliability testing</b> <u>H. Zhang</u> , C. Yin, Z. Peng, W. Guo School of Mechanical Engineering and Automation, Beihang University, Beijing, China
16:20-16:40	<b>Alloy-type lithium anode prepared by connecting nanosized alloy-type material with conductive material</b> <u>T. Huang</u> High-Power and Ultrafast Laser Manufacturing Lab, Faculty of Materials and Manufacturing, Beijing University of Technology, Beijing, China
16:40-17:00	<b>Transition metal chalcogenide cathode for printed flexible zinc ion batteries</b> <u>S. Wang</u> , X. Wang, J. Feng, Y. Tian State Key Laboratory of Advanced Welding and Joining, Harbin Institute of Technology, Harbin, China
17:00-17:20	<b>Fabrication of Flexible Electrodes by Nanojoining and Printing of Metal Nanowires</b> <u>H. Zhang</u> , <u>Y. Tian</u> State Key Laboratory of Advanced Welding and Joining, Harbin Institute of Technology, Harbin, China
19:00-21:00	<b>Dinner at Auerbachs Keller</b>

Wednesday, November 29, 2023

From 08:00	<b>Registration</b>
	Chair: Z. Gu, Y. Tian
08:55-09:20	- Keynote - <b>Heterogenous Integration - Thermal and Mechanical Challenges</b> <u>J. Pomeroy</u> University of Bristol, United Kingdom
09:20-09:40	- Invited - <b>Integrating Low Dimensional Materials for Quantum Technology and Sensing</b> <u>M. Calame</u> EMPA, Switzerland
09:40-10:00	<b>Intra/interlayer Atomic Diffusion Behavior of Al/Ni Reactive Multilayer Nanofolios Excited by Electrical/Thermal/Mechanical Multi-fields</b> <u>L. Cheng, Z. Yansong</u> Shanghai Key Laboratory of Digital Manufacture for Thin-Walled Structure, Shanghai Jiao Tong University, China
10:00-10:20	<b>Atomistic Modeling of Nano-Multilayers for Nano-/Micro-Joining Applications</b> <u>V. Turlo</u> Empa – Swiss Federal Laboratories for Materials Science and Technology, Switzerland
10:20-10:40	<b>Contribution of molecular dynamics to the study of metallic nanometric multilayers</b> <u>O. Politano<sup>1</sup>, Y. Li<sup>1</sup>, V. Turlo<sup>2</sup>, F. Baras<sup>1</sup></u> <sup>1</sup> Laboratoire Interdisciplinaire Carnot de Bourgogne, UMR 6303, CNRS-Université de Bourgogne, France <sup>2</sup> Laboratory for Advanced Materials Processing, Empa - Swiss Federal Laboratories for Materials Science and Technology, Switzerland
10:40-11:00	<b>Ag directional outflow in Ag/AlN nano-multilayers</b> <u>C. Cancellieri<sup>1</sup>, A.V. Druzhinin<sup>2</sup>, L.P.H. Jeurgens<sup>1</sup>, B.B. Straumal<sup>2</sup>, J. Janczak-Rusch<sup>1</sup></u> <sup>1</sup> Empa, Swiss Federal Laboratories for Materials Science and Technology, Laboratory for Joining Technologies and Corrosion, Switzerland <sup>2</sup> Ospiyann Institute of Solid State Physics, Russian Academy of Sciences, Russian Federation
11:00-11:20	<b>Coffee Break, Poster Session and Industrial Exhibition</b>
	Chair: Y. Lu, Y. Joseph
11:20-11:40	- Invited - Thermo-mechanical characterization and reliability of advanced system integration technologies <u>B. Wunderle</u> Chemnitz University of Technology, Germany
11:40-12:00	<b>Microstructural evolution of Cu-Nb nanomultilayer on Si substrate upon annealing</b> <u>J. Yeom, G. Lorenzin, C. Cancellieri, L.P.H. Jeurgens, J. Janczak-Rusch</u> Empa, Swiss Federal Laboratories for Materials Science and Technology, Laboratory for Joining Technologies and Corrosion, Switzerland
12:00-12:20	<b>Controlled directional Cu outflow in Cu/W nanomultilayers for joining technologies</b> <u>G. Lorenzin, B. Rheingans, J. Janczak-Rusch, L.P.H. Jeurgens, C. Cancellieri</u> Empa, Swiss Federal Laboratories for Materials Science and Technology, Laboratory for Joining Technologies and Corrosion, Switzerland

12:20-12:40	<p><b>Reactive joining for temperature sensitive strain sensors</b>  <u>J. Böttcher</u><sup>1</sup>, A. Schumacher<sup>2</sup>, P. Meyer<sup>2</sup>, G. Dietrich<sup>1</sup>, E. Pflug<sup>1</sup>, S. Knappmann<sup>2</sup>,  A. Dehé<sup>2,3</sup></p> <p><sup>1</sup> Fraunhofer-Institut für Werkstoff- und Strahltechnik IWS Dresden, Germany  <sup>2</sup> Hahn-Schickard-Gesellschaft für angewandte Forschung e.V., Villingen-Schwenningen, Germany  <sup>3</sup> Albert-Ludwigs-Universität Freiburg, IMTEK, Georg H. Endress Professur für Smart Systems Integration, Germany</p>
12:40-13:00	<p><b>Interfacial melting and low-temperature reactive bonding in sequential Sn and Bi layers for hybrid flip chip joining in flexible electronics</b>  <u>Sri Harini Rajendran</u>, Seong Min Seo, and Jae Pil Jung  Department of Materials Science and Engineering, University of Seoul, Rep. of Korea</p>
13:00-13:20	<p><b>Hybrid material joining with Al/Ni multilayers directly sputtered on thermoplast substrates</b>  <u>M. Glaser</u><sup>1</sup>, E. Vardo<sup>2</sup>, S. Matthes<sup>2</sup>, J. Hildebrand<sup>1</sup>, P. Schaaf<sup>2</sup>, J.P. Bergmann<sup>1</sup></p> <p><sup>1</sup> Department Production Technology Group, TU Ilmenau, Germany  <sup>2</sup> Department Materials for Electrical Engineering, TU Ilmenau, Germany</p>
13:20-14:00	<p><b>Lunch</b></p>
	<p>Chair: L. Liu, C. Wang</p>
14:00-14:20	<p>- Invited -  <b>New Materials for Joining Microelectronic Components</b>  <u>Y. Joseph</u>  TU Bergakademie Freiberg, Germany</p>
14:20-14:40	<p><b>Low Temperature In-bearing Solders for Microelectronic Applications</b>  <u>C.R. Kao</u>, F. L. Chang, Y. S. Lin, and Y. J. Fang  Department of Materials Sci and Engineering, National Taiwan University, Taipei, Taiwan</p>
14:40-15:00	<p><b>Site-Selective Solder Deposition on Multi-Segment Nanowires as a New Approach for Nanowire Joining and Interconnection</b>  <u>E. Fratto</u><sup>1</sup>, J. Wang<sup>1</sup>, Z. Yang<sup>1</sup>, H. Sun<sup>2</sup>, <u>Z. Gu</u><sup>1</sup></p> <p><sup>1</sup> Department of Chemical Engineering, University of Massachusetts Lowell, U.S.  <sup>2</sup> Department of Mechanical and Industrial Engineering, Northeastern University, Boston, U.S.</p>
15:00-15:20	<p><b>Transient Liquid Phase Infiltration Bonding of Copper for Die-attach</b>  <u>S. Fukumoto</u>, S. Kuroiwa, R. Miyajima, Y. Masuda, M. Matsushima  Graduate School of Engineering, Osaka University, Japan</p>
15:20-15:40	<p><b>Effect of Reducing Agent on Bridge Formation and Thermal Conductivity of Metal Bridged Electrically Conductive Adhesive</b>  <u>M. Matsushima</u>, T. Senda, K. Taniyama, S. Fukumoto  Graduate School of Engineering, Osaka University, Japan</p>
15:40-15:50	<p><b>Closing Remarks</b></p> <p>Prof. Guntram Wagner  Chemnitz University of Technology, Germany  Head of the Composites and Material Compounds Group</p> <p>Prof. Lars Jeurgens  Empa, Switzerland  President of the Nanojoining and Microjoining Association</p>
15:50-16:20	<p><b>Coffee Break</b></p>

**Can Nanojoining be an alternative to brazing?**

S. Hausner, B. Sattler, G. Wagner

Chemnitz University of Technology, Group of Composites and Material Compounds, Germany

**Cu/Mo layered composites: from macro- to nanoscale**

L. Ghisalberti, J. Yeom, T. Burgdorf, B. Rheingangs, G. Lorenzin, C. Cancellieri, H. R. Elsener, L.P.H. Jeurgens, J. Janczak-Rusch

Empa, Swiss Federal Laboratories for Materials Science and Technology, Laboratory for Joining Technologies and Corrosion, Switzerland

**Effect of aging conditions on the surface state of CuO nanopowders as studied by in-situ X-ray Photoelectron Spectroscopy**

A. Batenkova<sup>1,2</sup>, B. Rheingangs<sup>1</sup>, J. Kollender<sup>1</sup>, P. Schmutz<sup>1</sup>, M. Kovalenko<sup>2</sup>, L.P.H. Jeurgens<sup>1</sup>

<sup>1</sup>Empa, Laboratory for Joining Technologies and Corrosion, Switzerland

<sup>2</sup>ETH Zürich, Department of Chemistry and Applied Biosciences, Switzerland

**Free-standing Silver Nanobelt Foils for Sintering Die Bonding of Power Electronics and Its Power Cycle Reliability**

X. Wang, W. Guo, T. Liu, H. Zhang, P. Peng

School of Mechanical Engineering and Automation, Beihang University, China

**High power femtosecond laser induced additive manufacturing of refractory materials**

A. Hu, D. Fieser

Department of Mechanical, Aerospace and Biomedical Engineering, University of Tennessee Knoxville, USA

**Influence of alumina fiber on characteristics of hybrid bonding**

Jiwan Kang<sup>1,2</sup>, S.H. Rajendran<sup>1</sup>, J.P. Jung<sup>1</sup>

<sup>1</sup>Department of Materials Science and Engineering, University of Seoul, Rep. of Korea

<sup>2</sup>Department of Mechanical Design and Robot Engineering, Seoul National University of Science and Technology, Rep. of Korea

**Influence of nano additive shape in Sn-3.0Ag0.5Cu (SAC 305) nanocomposite solder**

G.A. Lee, S.H. Rajendran, J.P. Jung

Department of Materials Science and Engineering, University of Seoul, Rep. of Korea