

Technical Program

December 3, 2012 (Monday) 8:00-12:00

Meeting Room 1

Opening Remarks, Chair: Norman Zhou

8:01-8:04 **Luisa Quintino**, Executive Director, European Federation for Welding, Joining and Cutting (EWF), and Board Member, International Institute of Welding (IIW)

8:04-8:07 **Yi Zhang**, Vice Provost for International Affairs, and Director, Office for International Cooperation and Exchange, Tsinghua University

8:07-8:10 **Qiang Chen**, President of the Chinese Welding Society (CWS), Professor of Tsinghua University

Keynote Presentation Session I

Chairs: Akio Hirose, Norman Zhou

8:10-8:50 **Creating Nanojunctions between Carbon Nanotubes, Graphene, and Metals by Focused Electron Beams**

J.-A. Rodríguez-Manzo, O. Cretu and **F. Banhart** (University of Strasbourg, France)

8:50-9:30 **Microwelding in Implantable Medical Devices: Trends, Challenges, and Opportunities**

M. Breven and M. Reiterer (Medtronic, Inc., USA)

9:30-10:00 **Photo Taking and Coffee Break**

Keynote Presentation Session II

Chairs: Jae Pil Jung, Yasuo Takahashi, Guisheng Zou

- 10:00-10:40 **3D Packaging Technologies in Mobile Era**
S. Kang (Samsung Electronics Corp., Korea)
- 10:40-11:20 **MEMS Systems for Microelectronic Packaging Testing**
O. Paul and B. Lemke (University of Freiburg, Germany)
- 11:20-12:00 **Ultrasonic Nanowelding: from Field-Effect Transistors to Solar
Microcells**
Y. F. Zhang¹, B. Zhao², C. Liu¹, Y. Z. Zhang¹, W. J. Gu¹, L. Y. Zhang¹, and
D. Xu¹ (¹Shanghai JiaoTong University, China; ²Jiangsu Normal University,
China)
- 12:00-13:00 **Lunch**

December 3, 2012 (Monday) 13:00-15:00

Meeting Room 1

Session I Laser Nanojoining and Microjoining (LNM)

Chairs: Minlin Zhong, Tomokazu Sano

- 13:00-13:20 [Invited] **Fundamentals and Applications of Femtosecond Laser Joining and Processing**
W. W. Duley (University of Waterloo, Canada)
- 13:20-13:40 **Femtosecond Laser Direct Joining of Cu with Polyethylene Terephthalate**
T. Sano, S. Iwasaki, Y. Ozeki, K. Itoh, and A. Hirose (Osaka University, Japan)
- 13:40-14:00 **Femtosecond Laser Nanowelding for Plasmonic Circuits**
A. Hu and Y. Zhou (University of Waterloo, Canada)
- 14:00-14:20 **Laser Microjoining of Graphene**
X. H. Ye¹, T. Huang¹, **M. L. Zhong**¹, L. Li², Z. Lin¹, J. Jiang¹ (¹Tsinghua University, China; ²The University of Manchester, UK)
- 14:20-14:40 **Investigation on Microwelding of Microchip by Laser Soldering**
J. W. Yuan, **J. M. Chen**, F. R. Liu, and C. Huang (Beijing University of Technology, China)
- 14:40-15:00 **Laser Hole Sealing of CP Titanium for Medical Device Applications**
A. Pequegnat¹, Y. D. Huang^{1,2}, M. I. Khan¹, J. C. Feng², and Y. Zhou¹
(¹University of Waterloo, Canada; ²Harbin Institute of Technology, China)
- 15:00-15:20 **Coffee Break**

Meeting Room 2

Session II **3D Electronics Packaging (3DEP)**

Chairs: Mustafa Yavuz, Yanhong Tian

- 13:00-13:20 [Invited] **Micro-interconnection Technology for Optoelectronic Devices**
J. H. Zhang (Shanghai University, China)
- 13:20-13:40 **High Speed Cu-filling to TSV and non-PR Solder Bumping for Si-chip Stacking**
J. P. Jung, M. Roh, S. Y. Park and D. H. Jung (University of Seoul, Korea)
- 13:40-14:00 **Development of Thermal Nano Coating and Micro Patterning Techniques**
S. Kirihara, Y. Itakura, and S. Tasaki (Osaka University, Japan)
- 14:00-14:20 **Morphologies of Cu_6Sn_5 in $\text{Sn}_{3.0}\text{Ag}_{0.5}\text{Cu}$ Lead-free Solder Joints on Single Crystal Cu Substrates**
Y. H. Tian, C.Q.Wang, and L.N. Niu (Harbin Institute of Technology, China)
- 14:20-14:40 **Microjoining by Means of Self-formation of Melting Solder Bump Patterns in Thermo-setting Resin**
K. Yasuda (Osaka University, Japan)
- 14:40-15:00 **Influences of Sputtering Power and Annealing Process on Sb_2Te_3 Film**
C. J. Hang, C. Q. Wang, M. L. Fu, and S. P. Sun (Harbin Institute of Technology, China)
- 15:00-15:20 **Coffee Break**

December 3, 2012 (Monday) 15:20-17:00

Meeting Room 1

Session III Medical Microwelding (MM)

Chairs: Rosa Miranda, Anming Hu

- 15:20-15:40 [Invited] **Review of Microwelding for Medical Device Applications**
M. I. Khan¹, A. Pequegnat², and Y. Zhou² (¹Smarter Alloys, Canada;
²University of Waterloo, Canada)
- 15:40-16:00 **Porosity Formation Mechanism in Laser Microwelding of Pt-10%Ir to 316LVM Stainless Steel**
Y. D. Huang^{1,2}, G. S. Zou^{2,3}, A. Pequegnat³, and Y. Zhou^{2,3} (¹ Nanchang Hangkong Universtiy, China; ²Tsinghua University, China; ³ University of Waterloo, Canada)
- 16:00-16:20 **Dissimilar Laser Welding of Shape Memory Alloys**
R. Miranda¹ and L. Quintino² (¹Universidade Nova de Lisboa, Portugal;
²Instituto Superior Técnico, Portugal)
- 16:20-16:40 **Microstructure of the Micro Laser Welded Joint of Ultrathin TiNi Shape memory Alloy**
Y. H. Chen, Y. D. Huang, and L. M. Ke (Nanchang Hangkong University, China)
- 16:40-17:00 **Latent Cracking of Tantalum - Titanium Welds due to Hydrogen Embrittlement Observed on Electrical Interconnects**
M. Reiterer, J. Heffenfinger, M. Hintz, M. Ringle, J. Hossick-Schott, and K. Gaffney (Medtronic, Inc., USA)
- 17:00-18:00 **Poster Session (P):** Meeting Room 1 and Corridor
- 18:00-19:00 **Dinner**

Meeting Room 2

Session IV **Micro-device Packaging (MDP)**

Chairs: Mingyu Li, Hiroaki Mori

- 15:20-15:40 [Invited] **Femtosecond Laser Welding for Micro-device Integration**
L. Liu¹, **L. Quintino**², G. Zou³, A. Hu¹, and Y. Zhou^{1,3} (¹University of Waterloo, Canada; ²Instituto Superior Técnico, Portugal; ³Tsinghua University, China)
- 15:40-16:00 **Microstructure of Nano-sized Ag-Cu/AlN Multilayers for Low-Temperature Joining Applications**
G. Pigozzi¹, A. Antušek^{1,2}, J. Janczak-Rusch¹, M. Parlinska-Wojtan^{1,3}, D. Passerone¹, C. A. Pignedoli¹, V. Bissig⁴, J. Patscheider¹, and **L. P. H. Jeurgens**¹ (¹Empa, Swiss Federal Laboratories for Materials Science and Technology, Switzerland; ²Slovak University of Technology in Bratislava, Slovak Republic; ³University of Rzeszow, Poland; ⁴Kirsten Soldering AG, Switzerland)
- 16:00-16:20 **Radial Anisotropic Growth of Cu₆Sn₅ Crystals in Sn/Cu Couples**
Z. H. Zhang, **M. Y. Li**, and C. Q. Wang (Harbin Institute of Technology, China)
- 16:20-16:40 **Effect of Substrate on Formation of Kirkendall Voids**
C. Yu, Y. Yang and H. Lu (Shanghai Jiao Tong University, China)
- 16:40-17:00 **Head-in-Pillow BGA Solder Defect**
X. J. Wang^{1,2}, Q. Chen², and H. Q. Xu² (¹Jiangsu University of Science & Technology, China; ²Unow Electronical Material Company Co. Ltd, China)
- 17:00-18:00 **Poster Session (P): Meeting Room 1 and Corridor**
- 18:00-19:00 **Dinner**

December 3, 2012 (Tuesday) 17:00-18:00

Poster Session (P)

Meeting Room 1 and Corridor

1. **Bonding of Cu Bulks through the Low Temperature Sintering of Ag Nanoparticles in-situ Formed using Micro-Ag₂O Composite Paste**
F. W. Mu¹, Z. Y. Zhao¹, G. S. Zou¹, J. F. Yan¹, H. L. Bai¹, A. P. Wu¹, Z. G. Sun¹, J. C. Yan², L. Liu³, Y. Norman Zhou^{1,3} (¹Tsinghua University, China; ²Harbin Institute of Technology, China; ³University of Waterloo, Canada)
2. **Effect of the Substrate Modes on the Nanojoining of Graphene under Ultrafast Laser Beam Irradiation**
X. Wu¹, H. Y. Zhao¹, M. L. Zhong¹, H. Murakawa², and M. Tsukamoto² (¹Tsinghua University, China; ²Osaka University, Japan)
3. **Numerical Simulation of Micro Bubble Behavior in Molten Metal of Aluminum Alloy**
Q. F. Zhou¹, H. Mori¹, and A. Sugiyama² (Osaka University, Japan; ²Osaka Sangyo University, Japan)
4. **Evolution of Interfacial Shear Force during Ultrasonic Ribbon Bonding**
M. Ando, M. Maeda, and Y. Takahashi (Osaka University, Japan)
5. **Pressureless Low Temperature Sintering of Ag Nanoparticles for Interconnects**
S. Wang, H. J. Ji, M. Y. Li, and C. Q. Wang (Harbin Institute of Technology, China)
6. **Effect of Argon Ion Irradiation on Ohmic Contact Formation on n-type Gallium Nitride**
K. Kimura, M. Maeda and Y. Takahashi (Osaka University, Japan)
7. **Interfacial Microstructure in Aluminum and Nickel Bonding Using Silver Nanoparticles Derived from Silver Oxide**
S. Takata, T. Ogura, and A. Hirose (Osaka University, Japan)
8. **Multi-walled Carbon Nano Tubes Junction by Fiber Laser Exposure**
Q. S. Su, J. M. Chen and F. R. Liu (Beijing University of Technology, China)
9. **Low Energy Resistance Spot Welding Using Silver Nanoparticle**
Y. Suzuki, T. Ogura, and A. Hirose (Osaka University, Japan)

10. **Micro-arc Welding of Nanostructured Al-Si alloy**
J. Milligan, R. Gauvin and M. Brochu (McGill University, Canada)
11. **Solute Distribution in Aluminum-Lithium Micro-weldments**
D. W. Heard¹, J. Boselli², R. Gauvin¹, and M. Brochu¹ (¹McGill University, Canada; ²ALCOA Technical Center, USA)
12. **Weld Interface Formation in Resistance Microwelding of Platinum Alloy to Nickel**
T. Hiraki¹, S. Fukumoto¹, M. Matsushima¹, K. Sakairi², Y. Nomura², K. Tanaka², and K. Fujimoto¹ (¹Osaka University, ²Tanaka Precious Metals, Japan)
13. **Characteristics of Environment-Friendly Ni Paste for Stainless Steel Brazing**
M. H. Roh¹, S. Y. Park¹, J. H. Lee², J. H. Park³, J. H. Oh³, W. Kim¹, and **J. P. Jung**¹ (¹University of Seoul, Korea; ²Korea Institute of Industrial Technology, Korea; ³Chem-tech Korea Co., Korea)
14. **Effects of Welding on NiTi Shape Memory Alloy Functional Properties**
A. Pequegnat and Y. Zhou (University of Waterloo, Canada)
15. **High Temperature Service Property Evaluation of Sintered Cu-Cu Joints Using Ag Nanoparticle Paste**
L. C. Lin¹, J. F. Yan¹, G. S. Zou¹, H. L. Bai¹, D. Y. Zhang¹, A. P. Wu¹, Z. G. Sun¹, L. Liu³ and Y. Norman Zhou^{1,2} (¹Tsinghua University, China; ²University of Waterloo, Canada)
16. **Low Temperature Sintering-Bonding Using Mixed Cu+Ag Nanoparticle Paste for Packaging Application**
Y. C. Zhang¹, J. F. Yan¹, G. S. Zou¹, L. C. Lin¹, D. Y. Zhang¹, A. P. Wu¹, Z. G. Sun¹, L. Liu² and Y. Zhou^{1,2} (¹Tsinghua University, China; ²University of Waterloo, Canada)
17. **The Effects of Ag-coated Cu Particles Added into Micro-Ag₂O Paste on the Sintered Joint Performance**
F. W. Mu¹, Z. Y. Zhao¹, G. S. Zou¹, F. Yan¹, H. L. Bai¹, A. P. Wu¹, Z. G. Sun¹, J. C. Yan², L. Liu³, and Y. Zhou^{1, 3} (¹Tsinghua University, China; ²Harbin Institute of Technology, China; ³University of Waterloo, Canada)

December 4, 2012 (Tuesday) 8:00-10:00

Meeting Room 1

Session V Nanowelding (NW)

Chairs: Tong Zhang, Tomo Ogura

- 8:00-8:20 **[Invited] Nanowelding Processes by Solder and Friction**
B. J. Inkson¹, K. Briston¹, K. Chatzimanolis¹, A. J. Lockwood¹, K. Anantheshwara², M. S. Bobji² and Y. Peng³ (¹University of Sheffield, UK; ²Indian Institute of Science (IISc), India; ³Lanzhou University, China)
- 8:20-8:40 **Bondability of Joints Using Ag₂O and CuO Combined Paste for Electronics Packaging**
T. Ogura, T. Yagishita, S. Takata, T. Fujimoto, and A. Hirose (Osaka University, Japan)
- 8:40-9:00 **Molecular Dynamics Simulation on Graphene Joining in Nano Scale**
H. Y. Zhao¹, X. Wu¹, M. L. Zhong¹, H. Murakawa², and M. Tsukamoto² (¹Tsinghua University, China; ²Osaka University, Japan)
- 9:00-9:20 **Synthesis and Characterization of Linked Plasmonic Nanostructures**
T. Zhang, X. Y. Zhang, L. D. Wang, Y. J. Song, M. N. Lin, L. N. Wang, S. Q. Zhu, and R. Z. Li (Southeast University, China)
- 9:20-9:40 **A Study of Sintering Bonding Using Silver Nanowires Paste**
W. Guo¹, S. P. Tang¹, Y. Zhu¹, J. F. Yan², G. S. Zou², Y. Norman Zhou^{2,3} (¹Beihang University, China; ²Tsinghua University, China; ³University of Waterloo, Canada)
- 9:40-10:00 **Coffee Break**

Meeting Room 2

Session VI Flip-chip Bonding (FCB)

Chairs: Chunqin Wang, Shinji Fukumoto

- 8:00-8:20 [Invited] **Recent Development of Room Temperature Bonding using the Surface Activation Method**
T. Suga (University of Tokyo, Japan)
- 8:20-8:40 **Stencil Printing for Fine Pitch BGA Ball Attachment**
Z. Y. Liu, **J. Cai**, Q. Wang and X. He (Tsinghua University, China)
- 8:40-9:00 **Reliability of Pb-free BGA Solder Joints under Random Vibration**
F. J. Wang, D. Y. Tang, H. B. Wen and M. F. Wu (Jiangsu University of Science & Technology, China)
- 9:00-9:20 **Surface Mounting Process Using Hybrid Resin Sheet Including Self-organizable Solder Particles**
S. Fukumoto, S. Inoue, R. Wakimoto, Y. Yamamoto, M. Matsushima, and K. Fujimoto (Osaka University, Japan)
- 9:20-9:40 **Effect of Low Temperature Flip Chip Joining on Chip-package-interaction of Low-k Device**
T. Hisada, K. Toriyama, Y. Yamada, and T. Aoki (IBM Japan Ltd., Japan)
- 9:40-10:00 **Coffee Break**

December 4, 2012 (Tuesday) 10:00-11:40

Meeting Room 1

Session VII Nano-effects in Joining (NEiJ)

Chairs: Mathieu Brochu, Baohua Chang

- 10:00-10:20 [Invited] **Melting Point Depression of Nanostructured Filler Metals for Brazing Applications**
J. Janczak-Rusch (Swiss Federal Laboratories for Materials Science and Technology, Switzerland)
- 10:20-10:40 **Ni Rich Al-Ni Nano Multilayers for Cu-Cu Micro Joining**
Y. P. Zhang¹, Y. Q. Yang^{1,2}, J. L. Yi¹, and H. C. Hu¹ (¹E. O. Paton Chinese-Ukrainian Institute of Welding, China; ² South China University of Technology, China)
- 10:40-11:00 **Controlling Solidification Grain Size in Electrosark Deposition by Alloy Engineering**
M. Brochu and J. G. Portillo (McGill University, Canada)
- 11:00-11:20 **Heat Generation in Ag Nanowires Induced by Femtosecond Laser Irradiation**
L. Liu¹, G. Zou², A. Hu¹, W. W. Duely², and Y. Zhou^{1,2} (¹University of Waterloo, Canada; ²Tsinghua University, China)
- 11:20-11:40 **Ag Nanoparticles and their Application in Low-Temperature Bonding of Cu**
H. Alarifi¹, M. Atis², C. Özdoğan³, A. Hu¹, M. Yavuz¹, and Y. Zhou¹ (¹University of Waterloo, Canada; ²Nevsehir University, Turkey; ³Çankaya University, Turkey)
- 11:40-13:00 **Lunch**

Meeting Room 2

Session VIII Wire Bonding (WB)

Chairs: Jian Cai, Michael Mayer

- 10:00-10:20 [Invited] **Unconventional Approaches in Wire Bonding**
F. Niklaus¹, A. C.Fischer¹, and J. Korvink² (¹KTH Royal Institute of Technology, Sweden; ² University of Freiburg, Germany)
- 10:20-10:40 [Invited] **Ultrasonic Bonding for Assembly of Power Electronics**
M. Maeda and Y. Takahashi (Osaka University, Japan)
- 10:40-11:00 **Ultrasonic Stresses in Copper Wire Bonding with Pre-Bleed Ultrasound**
M. Mayer (University of Waterloo, Canada)
- 11:00-11:20 **Fatigue Analysis of Thick Wire Bonds**
T. Dagdelen¹, K. El-Rayes¹, M. Khater¹, E.Abdel-Rahman¹, I. Sel² and M. Yavuz¹ (¹University of Waterloo, Canada; ²Orhan Gazi University, Turkey)
- 11:20-11:40 **An Incrementally Coupled Numerical Model for Copper Wire Thermosonic Bonding Process**
B. H. Chang¹, X. Y. Bai¹, W. Jiang¹, H. Huang¹, D. Du¹, M. Mayer², and Y. Zhou² (¹Tsinghua University, China; ²University of Waterloo, Canada)
- 11:40-13:00 **Lunch**

December 4, 2012 (Tuesday) 13:00-14:40

Meeting Room 1

Session IX Joining of Carbon Materials (JCM)

Chairs: Peng He, Hiroya Abe

13:00-13:20 [Invited] **Joining of Carbon-Nano-Tubes by Vacuum Brazing and their Structural Evaluation**

M. Yavuz¹, W. Wu¹, A. Hu¹, X. Li², J. Q. Wei², Q. Shu², K. L. Wang², I. Sel³ and Y. Zhou¹ (University of Waterloo, Canada; ²Tsinghua University, China; ³Orhan Gazi University, Turkey)

13:20-13:40 **Direct Transferring Aligned CNTs Patterns Using CNT Biological Gels**

H. Abe, Z. Tan, A. Kondo, and M. Naito (Osaka University, Japan)

13:40-14:00 **A Molecular Dynamics Model of Joining a SWCNT with a Gold Nano Particle**

P. He, T. S. Lin, and D. Xu (Harbin Institute of Technology, China)

14:00-14:20 **Joining of Graphene Domains**

L. L. Fan, X. L. Fan, K. L. Wang, and **H. W. Zhu** (Tsinghua University, China)

14:20-14:40 **Joining of Carbon Nanotube Yarns and Stainless Steel via Crimping**

F. Xu and **L. M. Li** (Tsinghua University, China)

15:00-17:30 **Tour of the Summer Palace**

17:30-19:30 **Banquet**

Meeting Room 2

Session X **Low Temperature Bonding Using Nanoparticles (LTB)**

Chairs: Hiroshi Nishikawa, Chunjin Hang

- 13:00-13:20 [Invited] **Joining Technology through Sintering of Nano Scale Particles**
A. Hirose (Osaka University, Japan)
- 13:20-13:40 **Transient Thermal Performance of Low-Temperature Sintered Nanosilver Joints**
G. Chen¹, Y. J. Cao¹, **Y. H. Mei**¹, T. Wang¹, X. Cao², G. Q. Lu², X. Chen¹
(¹Tianjin University, China; ²Virginia Polytechnic Institution and State University, USA)
- 13:40-14:00 **Improvement of Joint Strength of Cu/Cu Joint Using Cu Nanoparticle Paste**
H. Nishikawa¹, L. Wei¹, and N. Terada² (¹Osaka University, Japan; ²Harima Chemicals, Inc., Japan)
- 14:00-14:20 **Thermal Interface Materials Using Silver Nanoparticles for High Power Electronics**
L. L. Li and H. Yu (Tsinghua University, China)
- 14:20-14:40 **Metal–Metal Bonding Process Using Polyol Prepared Silver Nanoparticles**
J. F. Yan¹, G. S. Zou¹, A. P. Wu¹, Y. C. Zhang¹, L. C. Lin¹, J. X. Li¹, H. L. Bai¹, Z. G. Sun¹, J. C. Yan², A. Hu³, L. Liu³ and Y. Zhou^{1,3} (¹Tsinghua University, China; ²Harbin Institute of Technology, China; ³University of Waterloo, Canada)
- 15:00-17:30 **Tour of the Summer Palace**
- 17:30-19:30 **Banquet**