

C-I Additive Manufacturing, Thermal Cutting and Thermal Spray

72nd IIW Annual Assembly and International Conference 2019, Bratislava, 7–12 July 2019

Room: Listed by day of meeting

Chair: Doug Kautz (USA)

Monday 08 July 2019, 1415 – 1815 @ Room Paris (Crowne Plaza)

1. Opening of the Meeting
2. Request Meeting Secretary to write the Minutes of Meeting
3. Attendees and Apologies, Identification of C-I delegates
4. Approval of the minutes from the last annual assembly in Bali (Doc. I-1380-18)
5. Adoption and Agreement of Agenda (Doc. I-1401-19)
6. Discussion of Joint Intermediate Meeting in Greifswald, Germany
7. Presentation of documents:

Session 1: Thermal Cutting Papers (25 minutes per paper including questions)

- | | |
|-----|--|
| [1] | Advanced methods of high-precision 3D cutting and welding preparation processing & Highlights from MicroStep's integration of complex automated solutions
Jakub Daučo
Doc. I-1413-19 |
| [2] | Influence of oxygen cutting on properties of structural steels
Kolařík, L., Vondrouš, P., Roubíček, M., Kupka, J.
Doc. I-1412-19 |

Coffee Break

- | | |
|-----|--|
| [3] | Investigations on the development of process emissions during oxy-fuel flame cutting of plated thick-walled unalloyed materials
Thomas Hassel, Pascal Brüggemann, Klaus Büttner
Doc. I-1415-19 |
| [4] | Laser or Plasma Cutting – Is there a Choice?
Thomas Rügenapp, Volker Krink, Dr. Michael Schnick
Doc. I-1408-19 |
| [5] | IndustryFusion: An open ecosystem for the digital transformation of the manufacturing industry
Konstantin Kernschmidt
Doc. I-1411-19 |

Session 2: Additive Manufacturing (20 minutes per paper including questions)

- | | |
|-----|---|
| [6] | Inline process temperature monitoring of wire-based arc additive manufacturing for large aerospace titanium part
C. Halisch, T. Radel, D. Tyralla, T. Seefeld
Doc. I-1404-19 |
| [7] | Arc Characteristics and Metal Transfer Behavior in GMA-AM Process
Gang Zhang, Yu Shi, GuanYu He, Ming Zhu and Yufen Gu
Doc. I-1445-19 |
| [8] | Properties and anisotropy behaviour of a nickel base alloy material produced by robot based wire and arc additive manufactured (WAAM)
Thomas Hassel, Torben Carstensen
Doc. I-1416-19 |



8. Structure of Commission I: Election of Subcommittee Chair
9. Discussion on AM in IIW, led by D. Kautz (I-1424-19)
10. Visit from Secretariat (Will move to fit as needed)
11. Activities of Commission I
12. List of Documents (Doc. I-1381-19)
13. Joint Workshops/Meetings with Other IIW Units
14. Resolutions by Commission I from 2019 Meeting
15. Other Business <ul style="list-style-type: none"> • Recommendations for Welding in the World • Satisfaction Survey • Preparations for Upcoming Annual Assemblies and Intermediate Meetings
16. Adjournment to Joint Meetings

Joint Meeting of Comm.I, Comm.IV, Comm.XII and SG212

“Welding/joining and additive manufacturing technology”

Tuesday, 9 July 2019, 8:15 -18:35 @ Room “CP London I & II”

Morning Session, 8:15-12:35

[9]	Arc-welding based additive manufacturing for body reinforcement in automotive engineering Ann-Christin Josten (Germany) Doc. XII-2428-19/ I-1425-19/IV-1451-19/212-1641-19
[10]	Optimization of the controlled short circuit GMAW metal transfer process for the deposition rate increasing in Wire Arc Additive Manufacturing D. Kurushkin, I. Mushnikov, A. Popovich, O. Panchenko (Russia) Doc. XII-2352-19/ I-1426-19/IV-1452-19/212-1642-19
[11]	Increasing the manufacturing efficiency of WAAM by advanced cooling strategies Uwe Reisgen, Rahul Sharma, Samuel Mann, Lukas Oster (Germany) Doc. XII-2357-19/ I-1427-19/IV-1453-19/212-1643-19
[12]	Arc Characteristics and Metal Transfer Mode in Super-TIG Welding of Thick Wall Metal Additive Manufacturing S.M. Cho, G.J. Seo, J.H. Park, M. Cheepu (Korea) Doc. 212-1625-19/ I-1428-19/XII-2363-19/212-1644-19
[13]	Multi Signal Sensing, Monitoring and Control in Wire Arc Additive Manufacturing S.F. Goecke, G.F. Gottschalk, A. Babu and M.J.M Hermans (Germany) Doc. 212-1639-19/ I-1429-19/IV-1454-19 /XII-2364-19
[14]	Characterisation of heat transfer in wire arc additive manufacturing (WAAM) Philipp Henckell, Yarop Ali, Jan Reimann, Jean Pierre Bergmann (Germany) Doc. I-1417-19/IV-1455-19/XII-2365-19/212-1645-19

Coffee Break (10:15– 10:35)

[15]	Microstructural development during wire arc additive manufacturing of copper based components Justin Baby, Murugaiyan Amirthalingam (India) Doc.XII-2353-19/ I-1430-19/ IV-1456-19/212-1646-19
[16]	Wire arc additive manufacturing of high strength Al-Mg-Si aluminum alloys using similar filler wires with additional grain refiner René Winterkorn, Andreas Pittner, Robert Lahnsteiner, Michael Rethmeier (Germany) Doc. I-1410-19/IV-1457-19/XII-2366-19/212-1647 -19



[17]	Mechanical properties of Wire Arc Additive Manufactured Components of Ti-6Al-4V H. Staufer, Grunwald R. (Austria) Doc. IV-1434-19/ I-1431-19/ XII-2367-19/212-1648-19
[18]	In situ synthesis of a novel Si-containing FeCoCrNi high-entropy alloy fabricated by selective laser melting Danyang Lina, Liyong Xua, Hongyang Jinga, Yongdian Hana, Lei Zhaoa (China) Doc. XII-2354-19/ I-1432-19/ IV-1458-19/212-1649-19
[19]	Streamlining parameter development and minimizing material costs in laser powder bed fusion Colt Montgomery (USA) Doc. I-1403-19/IV-1459-19/XII-2368-19/212-1650-19
[20]	Multifunctional Large-Scale Machine for Additive Manufacturing – LASIMM E. Assunção, F. Barros, D. Barbosa (Belgium) Doc. XII-2435-19/ I-1433-19 /IV-1460-19/212-1651-19

Afternoon Session, 14:00-18:35

[21]	The effect of oxygen on the gas tungsten arc weldability of laser-powderbed fusion fabricated 304L stainless steel Devon S. Gonzales, Stephen Liu, Daniel Javernick, Matthew Johnson (USA) Doc. I-1405-19/IV-1461-19/XII-2369-19/212-1652-19
[22]	Bridging the “valley of death” in laser based metal additive manufacturing R. Bola, E. Assunção, L. Quintino (Portugal) Doc. IV-1432-19/ I-1445-19/ XII-2370-19/212-1653-19
[23]	Innovative Laser Beam Joining Technology for Additive Manufactured Parts B.Gerhards, M.Schleser, C.Otten, A.Schwarz, A.Gebhardt (Germany) Doc. IV-1449-19/ I-1434-19/ XII-2371-19/212-1654-19
[24]	Laserbeam-Hybrid-Welding – current results and prospect J. Brozek, S. Keitel (Germany) Doc. IV-1431-19/ I-1436-19/ XII-2373-19/212-1656-19
[25]	Experimental and numerical study of the influence of the Laser hybrid parameters in partial penetration welding on the solidification cracking in the weld root N. Bakir, Ö. Üstündag, A. Gumenyuk, M. Rethmeier (Germany) Doc. IV-1441-19/ I-1437-19/ XII-2374-19/212-1657-19
[26]	Laserbeam Submerged Arc Hybrid Welding – A novel hybrid welding technique for thick plate applications. U. Reisgen, S. Olschok, O. Engels (Germany) Doc. IV-1446-19/ I-1438-19/ XII-2375-19/212-1658-19

Coffee Break (16:20– 16:35)

[27]	Assessment of thermal cycles by combining thermo-fluid dynamics and heat conduction in keyhole mode welding processes A. Artinov, V. Karkhin, P. Khomich, M. Bachmann, M. Rethmeier (Germany) Doc. 212-1607-19/ I-1439-19//IV-1461-19/XII-2376-19
[28]	Numerical analysis of weld pool behavior in wire feed laser beam welding with oscillating magnetic field X. Meng, A. Artinov, M. Bachmann, M. Rethmeier (Germany) Doc. 212-1608-19/ I-1440-19/IV-1462-19/XII-2377-19
[29]	Participatory Design of Laser Keyhole Welding Process using CFD-based Coupled Simulations of Thermal, Metallurgical and Mechanical Behavior S.W. Han, L.J. Zhang, J.X. Zhang, S.J. Na (China) Doc. 212-1612-19/ I-1441-19/IV-1463-19/XII-2378-19
[30]	Effects of the Shielding Gas Flow on the Blowhole Generation for Aluminum Alloys Laser Welding T. Fujimoto, M. Hirano, E. Fujimoto, Y. Abe, M. Nakatani, M. Shigeta and M. Tanaka (Japan) Doc.212-1613-19/I-1442-19/IV-1464-19/XII-2379-19
[31]	Numerical modeling of keyhole instability and porosity formation in deep-penetration laser welding on NiCrMoV steel Y. Suna, H.C. Cui, X.H. Tang, F.G. Lu (China) Doc. 212-1623-19/ I-1443-19/IV-1465-19/XII-2380-19
[32]	The visualization of contamination phenomena and countermeasure performance on vacuum laser beam welding via experimental and numerical approaches Y.K. Lee, J. Cheon, B.K. Min, J.H. Cho and C.L. Kim (Korea) Doc. 212-1628-19/ I-1444-19/IV-1466-19/XII-2381-19



Joint Meeting of Comm.I and Comm.VII

“Micro- and nano-joining and additive manufacturing technology”

Wednesday, 10 July 2019, 14:15 -16:15 @ Room “CP London II & III”

Afternoon First Session, 14:15-16:15, Session Chair: Akio Hirose

- | | |
|------|--|
| [33] | Analysis of influencing factors on powder quality of Ti64 in L-PBF
A. Sebastian Matthes (Germany)
Doc. I-1418-19 |
| [34] | Microstructural Evolution of Ultrasonic-Welded Cu Stranded Wire
Chihiro Iwamoto (Japan)
Doc. I-1420-19 |
| [35] | Laser metal deposition using a coaxial direct diode laser head
F. Silze, N. Brocke, and M. Schnick (Germany)
Doc. I-1414-19 |
| [36] | Friction Stir Welding Technology of Curved Thin-walled Lap Joint with Aluminum Alloy
Li Fu (China)
Doc. I-1421-19 |
| [37] | Development of Parameters and Comparison of Mechanical and Microstructural Properties of Tungsten Nickel Iron (W-Ni-Fe) with Parts Fabricated from Laser Powder Bed Fusion (PBF)
Michael Brand, Colt Montgomery, Robin Pacheco, Joel Montalvo, Jessica Lopez, Adam Wachtor and John Carpenter (USA)
Doc. I-1402-19 |
| [38] | Microstructure and mechanical properties of CrCoNi medium-entropy alloy fabricated by selective laser melting
Kai Feng, Chengcheng Zhang, Hiroyuki Kokawa, Zhuguo Li, Paul K. Chu (China)
Doc. I-1446-19 |

Coffee Break (16:15– 16:45)

Afternoon Second Session, 16:45-18:15, Session Chair: Doug Kautz

- | | |
|------|--|
| [39] | Microstructure and Mechanical Properties of Additively Manufactured Co-Cr-W Alloy using Laser Metal Deposition Method
Tomokazu Sano (Japan)
Doc. I-1422-19 |
| [40] | Mechanical Properties and Formation Mechanism of Ti6Al4V/TiSiC System Gradient Material Fabricated by In-Situ Reaction Laser Deposition
Neng Lia, Wei Liua, Huaping Xionga, Shuai Huang, Guohui Zhanga, Chao Gaoa (China)
Doc. I-1407-19 |
| [41] | Facile Assembly of Metal Oxide Nanoparticles into Monodisperse Microspheres
Hiroya Abe (Japan)
Doc. I-1423-19 |
| [42] | Effects of Thermal Cycling on Wire and Arc Additive Manufacturing of Aluminum Components
Markus Köhler, Jonas Hensel, and Klaus Dilger (Germany)
Doc. I-1409-19 |
| [43] | PRACTICAL TRANSIENT THERMAL MODELLING FOR HARDNESS PREDICTION IN WIRE AND ARC ADDITIVE MANUFACTURED STEEL BLOCKS FOR DESIGN OPTIMISATION
Dennis van Kleinwee, Bin Hu, Zhaoxiang Chen, Marcel Hermans (Netherlands)
Doc. I-1445-19 |
| [44] | Discussion on: Strategy to make IIW a Leading Organization for the Additive Manufacturing Community
D. Kautz, A. Hirose, S. Egerland (if available) (USA)
Doc. I-1424-19 |

Closing by Akio Hirose and Doug Kautz

