Euro PM2021 International Powder Metallurgy Congress & Exhibition

18 – 22 October 2021

ONLINE EVENT

europm2021.com
EPMA Membership Benefits

10 Reasons to join the EPMA

1. Enhance your market knowledge through access to unique industry information using our range of powder metal PM statistics, presentations and papers.

2. Improve your product development through access to EU and EPMA Member initiated R&D programmes.

3. Save money by receiving substantial discounts on attending and exhibiting at the leading annual Euro PM Congress and Exhibition and our series of training courses and seminars.

4. Obtain unique international access to government via our lobbying of the EU on key issues such as REACH, ISO standards and health and safety legislation.

5. Promote your sales through free advertising via an entry in the EPMA Members Directory on one of the world’s most visited PM websites.

6. Keep updated on industry news and developments through the Email News service and the EPMA newsletter – both free to EPMA Members*.

7. Develop your high-level networking opportunities through EPMA Sectoral Groups, discounted seminars and the general assembly.


9. Access Member only content from a range of sources via the EPMA website Members Area.

10. Develop the market for your products by supporting promotion of PM technology via exhibitions and web-based information.

www.epma.com/membership
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About Euro PM2021 Virtual Congress

The Euro PM2021 Congress is the foremost event for the international powder metallurgy community, and provides the focal point for industry personnel, researchers, and suppliers to meet, network and develop their business.

The Euro PM2021 Congress programme will include over 140 technical papers presented in oral and poster sessions, including EPMA Keynote Paper Award presentations, as well as eleven in-depth Special Interest Seminars. Details of the full programme can be found on the following pages, and on our website www.europm2021.com.

The event will be held entirely online in 2021, allowing delegates to remotely access technical sessions either live, or on demand. Live Q&A sessions with authors will provide opportunity for in-depth PM discussions.

Congress Organiser

Euro PM2021 is sponsored and organised by the European Powder Metallurgy Association (EPMA), in co-operation with key members of the PM community and across Europe.

Founded in 1989, EPMA is the leading PM trade association representing the interests of the entire European PM community, and promoting PM technology throughout the world. EPMA Members will qualify for special discounts on their registration fees, and further information on membership, and EPMA’s services, can be found at www.epma.com

For further information on Euro PM2021 Congress please contact:

European Powder Metallurgy Association

Congress:
Congress Manager: Sabine Hazoume E: sh@epma.com
T: +33 (0)9 80 94 84 90
Congress Assistant: Maeva Gagneux E: mjg@epma.com
T: +33 (0)9 80 94 84 90

For Registration Enquiries, please contact:
Shocklogic : registration-epma@shocklogic.com

Sponsorship & Exhibition:
Membership & External Partnership Manager: Andy Cormack
E: ac@epma.com T: +44 750 422 3376

The EPMA reserves the right to make changes to the final programme. All programme timings, content and fees correct at time of creation. E&OE. An electronic version will be updated on www.europm2021.com as necessary.

Euro PM2021 Congress and all associated meetings, sessions and events are ruled according to EPMA Antitrust Guidelines. Details of which can be found here: www.epma.com/antitrust.
Rio Tinto Metal Powders (RTMP) was established in 1968 as Quebec Metal Powders Ltd. (QMP) and is wholly owned today by Rio Tinto, a renowned large scale international mining and metallurgical company. Rio Tinto Metal Powders' world headquarters are located in Sorel-Tracy, Canada with sales offices, technical representatives and agents around the globe.

RTMP also operates an annealing and blending facility with comprehensive customer support and distribution capabilities in Suzhou, China. RTMP is the only global powder supplier to manufacture its products entirely from a consistent, single ore base. Consequently, RTMP offers products of exceptional cleanliness and consistency.

RTMP offers a full range of ferrous powder products for virtually all Powder Metallurgy (PM) applications, and is committed to helping customers produce the best quality components possible by supplying superior powder products.

Hyperion Materials & Technologies is a global leader in advanced materials with nearly seven decades of experience developing and manufacturing tungsten carbide powders, cemented carbide, synthetic diamond, and cubic boron nitride products. Hyperion specializes in premium base materials, toolmaker components, engineered products, and process tools and solutions for the most demanding applications. With about 1,600 employees worldwide, Hyperion has its production footprint in North and South America, Europe, and Asia. We apply our materials science, engineering and manufacturing expertise to position our customers to win.

Höganäs develops, manufactures and sells metal powders that open up a world of opportunities. Our product range includes pure iron powders, low-alloy steel powders, stainless steel powders and press-ready powder mixes. Höganäs products are tailored to meet demands on part precision, productivity, performance and cost, and many of our brands, such as Distaloy®, AstaloyTM and Starmix®, are regarded as industry standards.

In the Höganäs Customer Development Centre, we invite customers and end users to work alongside our expert team with application engineering and prototyping.

Miba is one of the leading strategic partners of the international engine and automotive industry. Our product portfolio includes sintered components, engine bearings, friction materials, power electronics components and coatings.

Miba products makes conventional passenger vehicles and battery electric vehicles, trains, ships, aircraft and power plants more efficient, more reliable and more environmentally friendly.

Plansee High Performance Materials is an expert in the field of molybdenum, tungsten, tantalum, niobium and chromium components. Alloys and composite materials from Plansee come into their own in electronics, coating technology or high-temperature furnaces - wherever traditional materials are stretched beyond their limits.
Tekna is world leader in induction plasma technology related to high performance materials. Over the last 30 years, Tekna has designed and manufactured more than 250 turnkey plasma systems. Our customer service and maintenance centers are dispatched in Americas, Europe and Asia.

The product offer ranges from R&D plasma systems for rapid material development easily scalable to industrial solutions for 24/7 operation:

- Spheroidization process allows to transform angular powder into highly spherical powder especially designed for advanced part manufacturing processes such as Additive Manufacturing, Metal Injection Molding and near net shape Hot Isostatic Pressing.

- Nanopowder synthesis process is designed to produce a wide range of high purity materials (Ceramics, Pure Metals, Alloys,…) at high yield even below 100 nm. Tekna is also leading manufacturer of plasma atomized spherical metal powders for Additive Manufacturing and MIM.

Tekna powders have been integrated in every AM platform and are part of major OEM’s supply chains in different industrial segments, such as aerospace, defense, medical, automotive, and oil & gas. The product portfolio for materials is currently composed of titanium alloys (Ti-6Al-4V), nickel-based alloys (718, 625, HX)*, aluminum alloys (AlSiMg) and specialty refractories: tungsten, tantalum, and molybdenum.

* Imphytek powders, JV between Tekna and Aperam

www.tekna.com
www.imphytekpowders.com

Gas atomised metal powders, superalloy PM billets, HIPped and HIP clad components.


www.aubertduval.fr

Part of global industrial engineering group Sandvik, Sandvik Coromant is at the forefront of manufacturing tools, machining solutions and knowledge that drive industry standards and innovations demanded by the metalworking industry now and into the next industrial era.

Educational support, extensive R&D investment and strong customer partnerships ensure the development of machining technologies that change, lead and drive the future of manufacturing. Sandvik Coromant owns over 1,800 patents worldwide, employs over 7,600 staff, and is represented in 150 countries.

www.sandvikcoromant.com

Industrial gases play an essential role in Additive Manufacturing (AM) across the entire value chain from powder production and handling, to printing, through to surface finishing of the final printed part.

Linde’s ongoing research into the effects of the atmosphere on AM powders and parts ensures we provide you with the best knowledge and service possible to improve your processes – through increasing efficiency, boosting productivity, and raising product and material quality.

www.linde-am.com
SACMI is an Italian company world leader in the design, production and supply of industrial technologies and systems, specialized in equipment for ceramics, beverage & packaging, food processing and Powder Metal. SACMI Group is present in 30 Countries worldwide through a total of 80 Companies.

Driven by continuous investments in research, unwavering promotion of technological innovation, conscientious attention to product and service quality, effective responses in the real needs of world markets, SACMI proposes a wide range of new equipment and technologies for the Powder Metal Industry, the result of over 100 year old experience as equipment supplier, exploiting the synergies between the main Companies in the group in their specialized fields and backed up by a world wide network of after sales service centres.

SACMI also produces Sinter Hardening and High Temperature Furnace equipment.

www.sacmi.com/metals

Apart from all facilities to design and manufacture most types of furnaces for the PM industry, Fluidtherm Technology operates a versatile thermal process prototyping facility for process & product development, failure analysis and client servicing.

We manufacture Belt, Pusher & Walking Beam furnaces for operation to 1700°C for sintering, sinter hardening, powder processing, steam treatment & heat treatment of metal & ceramic parts.

Recent developments include low temperature pushers for Aluminum sintering and continuous carburising with gas quenching.

www.fluidtherm.com

CREMER is a world leading manufacturer of furnaces and thermal process plants for a wide range of processes and process temperatures (400°C < T< 2500°C) under various furnace atmospheres (e.g. H2, O2, Endo-gas, N2-mixtures and air) for the field of iron powder metallurgy in general, CIM, MIM, AM or the production of high performance oxide or non-oxide ceramic components.

The applications of the CREMER plants range from de-binding, sintering and combined debinding & sintering (e.g. the new MIM Master neo), to a wide range of thermal treatments for ferrous and non-ferrous powders and high performance ceramics. These include calcination, carburization (e.g. CARBIDE2500 furnace technology), carbonization, pyrolysis; and customized engineering processes under various furnace atmospheres (e.g. H2, 02, Endo-gas, N2-mixtures and air).

Since 2012 CREMER is also a manufacturer of Hot Isostatic Presses (HIP) and Cold Isostatic Presses (CIP). Therefore the product portfolio now not only includes thermal process plants for debinding & sintering, but also HIP and CIP plants for either AM applications or other processes where non-porous near net-shape parts are required.

CREMER stands for Made-in-Germany, continuity, flexibility and reliability. It is a middle sized family business with more than 100 employees, a high production depth and extensive know-how in plant engineering and process engineering. CREMER provides outstanding 24/7 global customer full-service support out of its own workshop including turnkey installation, commissioning, training classes, spare part service and maintenance.

www.cremer-polyfour.de
Join the PM Networking Event of 2021 – Reserve your Booth Today

Running in parallel to the Technical Sessions of the Euro PM2021 Virtual Congress, the Euro PM2021 Virtual Exhibition will become the EPMA’s first exclusively online exhibition, with representatives from across the world joining the international exhibition 18 -22 October 2021.

Euro PM2021 Virtual Exhibition will be the EPMA’s first ever online exhibition, offering the Powder Metallurgy community the opportunity to network with a global audience of Delegates, End-Users, Academics, Students, and fellow Exhibitors. Exhibition visitors will be encouraged by charging them the minimal admin fee of €50 to join the event.

Due to excellent early sales of Virtual Exhibition Space, our first Exhibition Hall is fully reserved. Ensure your company is represented at the heart of PM Industry by reserving your place in Exhibition Hall Two.

The layout will be identical to Hall One, with all sizes of Exhibition Booth still available for a limited time only. Find all the details in our Exhibition Package, or on our website at http://www.europm2021.com/exhibition.

As an exhibitor joining the Virtual Exhibition you will be able to:

• Communicate live to visitors on your stand, or arrange meetings with attendees in advance using PM2021’s new networking tool
• Promote your business through HD Video and PDF downloads
• Analyse post-event performance using analytics and reports on the number of clicks, views and downloads achieved during the event.

Find out more, and make your reservation at http://www.europm2021.com/exhibition; or please contact:

Sponsorship & Exhibition:
Membership & External Partnership Manager: Andy Cormack
E: ac@epma.com T: +44 750 422 3376

Reserve your booth ahead of the 30 June 2021 - Deadline
Técnica Cerámica

Since 1971

Professional magazine that informs about materials, equipment and manufacturing techniques for the industrial ceramics sector

www.tecnicaceramica.com

Contact: tecnicaceramica@publica.es
Congress Proceedings

Proceedings from PM2002 – PM2015 are free to download from the EPMA website.

Proceedings from PM2016 – PM2021 are available to purchase as:

• Individual papers (PDF download)
• Grouped by topic (PDF download)
• Complete proceedings available by downloading

Proceedings for Euro PM2021 are included in the 'full delegate' registration package. For all other participants, proceedings can be pre-ordered on the registration form or purchased on EPMA website.
Technical Sessions

- Technical Sessions
- Industry Corner
- Special Interest Seminars
- Keynote Paper Award
## Virtual Congress Schedule

The following seminars, technical sessions and meetings have been colour-coded to aid faster navigation throughout the Technical Programme and other EPMA booklets. Please see the guide below.

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<td>09:00 - 11:00 Plenary Session</td>
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<tr>
<td>11:00 – 11:15 Break</td>
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<tr>
<td>11:15 - 12:45 Session 1: Cermets and Applications</td>
<td>Room 1</td>
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<tr>
<td>11:15 - 12:45 Session 2: SIS HIP: Optimization of PM parts using HIP</td>
<td>Room 2</td>
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<tr>
<td>11:15 - 12:45 Session 3: AM Sinter Based Technologies: Extrusion-Based Methods in AM</td>
<td>Room 3</td>
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<tr>
<td>11:15 - 12:45 Session 4: Applications: Automotive KNP</td>
<td>Room 4</td>
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<tr>
<td>12:45 - 13:30 Lunch Break</td>
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<tr>
<td>13:30 - 15:00 Session 5: Materials for Press &amp; Sinter</td>
<td>Room 1</td>
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<tr>
<td>13:30 - 15:00 Session 6: SIS HIP: Key Industrial Applications of HIP</td>
<td>Room 2</td>
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<tr>
<td>13:30 - 15:00 Session 7: Industry Corner - 1</td>
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<td>13:30 - 15:00 Session 8: Applications: Biomedical</td>
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<th>Tuesday 19 October 2021</th>
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<td>09:00 - 10:30 Session 9: Modelling and Super Hard Materials</td>
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<tr>
<td>09:00 - 10:30 Session 10: SIS FM: Advances and Challenges for Hard Magnets</td>
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<tr>
<td>09:00 - 10:30 Session 11: AM Beam Based Technologies: Hard Metals and Hard Materials</td>
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<td>09:00 - 10:30 Session 12: Sintering</td>
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<td>10:30 - 10:45 Break</td>
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<td>10:45 - 12:15 Session 13: Non-Ferrous &amp; Ferrous Materials KNP</td>
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<td>10:45 - 12:15 Session 14: SIS FM: Functional Materials for Thermal Management</td>
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<td>10:45 - 12:15 Session 15: AM Beam Based Technologies: Steels</td>
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<td>10:45 - 12:15 Session 16: Compaction and Application</td>
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<tr>
<td>12:15 - 13:00 Lunch Break</td>
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<tr>
<td>13:00 - 14:30 Session 17: Magnetic and Iron based Functional Materials</td>
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<tr>
<td>13:00 - 14:30 Session 18: SIS MIM: Sustainability of MIM</td>
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<td>13:00 - 14:30 Session 19: Industry Corner - 2</td>
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<tr>
<td>13:00 - 14:30 Session 20: Hot Isostatic Pressing</td>
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<td>09:00 - 10:30 Session 21: High Temperature Applications</td>
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<td>09:00 - 10:30 Session 22: SIS HM: Outlook on Hard Materials</td>
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<td>09:00 - 10:30 Session 23: AM Beam Based Technologies: Nickel-Based Materials Refractory Metals KNP</td>
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<tr>
<td>09:00 - 10:30 Session 24: MIM Feedstocks</td>
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*Please note schedules are listed in CET time (Brussels, Copenhagen, Madrid, Paris)*

Interested in a particular topic?

- **Powder Production**
- **Consolidation technologies**
- **Materials**
- **Applications**
- **Tools for improving PM**
- **KNP Keynote Paper Award Presentation**
- **SIS Special Interest Seminar**
- **Campfire Meeting**
**Congress Schedule**

*Please note schedules are listed in CET time (Brussels, Copenhagen, Madrid, Paris)*

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<td>10:45 - 12:15</td>
<td>Session 25: ODS and High Entropy Alloys</td>
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<td>10:45 - 12:15</td>
<td>Session 26: <strong>SIS</strong> HM: HM Club Projects of EPMA</td>
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<td>10:45 - 12:15</td>
<td>Session 27: AM Beam Based Technologies: Related Process</td>
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<td>Session 28: PIM Materials</td>
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<td>13:00 - 14:30</td>
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<td>Session 30: Industry Corner - 3</td>
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<tr>
<td>13:00 - 14:30</td>
<td>Session 31: AM Beam Based Technologies: Process Development and Simulation</td>
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<td>13:00 - 14:30</td>
<td>Session 32: Gas Atomizer: Theory and Design</td>
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<td>Session 34: <strong>SIS</strong> P&amp;S: CO2 reduction in Press&amp;Sinter - Part 1</td>
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<tr>
<td>09:00 - 10:30</td>
<td>Session 35: AM Beam Based Technologies: Special Materials</td>
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<td>09:00 - 10:30</td>
<td>Session 36: Alternative Powder Production Processes</td>
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<td>10:45 - 12:15</td>
<td>Session 37: Alternative Hardmetals <strong>KNP</strong></td>
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<td>10:45 - 12:15</td>
<td>Session 38: <strong>SIS</strong> P&amp;S: CO2 reduction in Press&amp;Sinter - Part 2</td>
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<td>10:45 - 12:15</td>
<td>Session 39: AM Sinter based Technologies - Other Processes</td>
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<td>Session 40: Influence of Powder Process on Material Properties</td>
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<td>13:00 - 14:30</td>
<td>Session 41: AM Sinter Based Technologies: Binder Jetting <strong>KNP</strong></td>
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<td>13:00 - 14:30</td>
<td>Session 42: Industry Corner - 4</td>
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<td>13:00 - 14:30</td>
<td>Session 43: Field Assisted Sintering Technologies</td>
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<td>13:00 - 14:30</td>
<td>Session 44: Testing &amp; Evaluation</td>
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<td>Session 45: Hard metals Corrosion</td>
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<td>09:00 - 10:30</td>
<td>Session 46: <strong>SIS</strong> AM: Spare parts and Repair using AM</td>
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<td>09:00 - 10:30</td>
<td>Session 47: Design and modelling <strong>KNP</strong></td>
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<td>09:00 - 10:30</td>
<td>Session 48: Applications: Aerospace</td>
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<td>10:45 - 12:15</td>
<td>Session 49: Ferrous Materials for AM</td>
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<td>10:45 - 12:15</td>
<td>Session 50: <strong>SIS</strong> AM: Sinter Based AM</td>
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<td>10:45 - 12:15</td>
<td>Session 51: Testing &amp; Evaluation: Powder Characterisation</td>
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<td>10:45 - 12:15</td>
<td>Session 52: Applications: Energy</td>
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<tr>
<td>12:15 - 12:30</td>
<td>Closing Session</td>
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### Virtual Congress by Strand

Please note schedules are listed in CET time (Brussels, Copenhagen, Madrid, Paris)

#### Materials

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<td>Wednesday 20 October</td>
<td>09:00 - 10:30</td>
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<td>Session 13: Non-Ferrous &amp; Ferrous Materials</td>
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<td>Session 17: Magnetic and Iron based Functional Materials</td>
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<td>Thursday 21 October</td>
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<td>Friday 22 October</td>
<td>09:00 - 10:30</td>
<td>Session 45: Hard metals Corrosion</td>
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<td>Session 49: Ferrous Materials for AM</td>
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#### Consolidation technologies

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<tr>
<th>Day</th>
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<td>Monday 18 October</td>
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<td>Tuesday 19 October</td>
<td>09:00 - 10:30 Session 11: AM Beam Based Technologies: Hard Metals and Hard Materials</td>
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<td>09:00 - 10:30 Session 12: Sintering</td>
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<td>10:45 - 12:15 Session 15: AM Beam Based Technologies: Steels</td>
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<td>10:45 - 12:15 Session 16: Compaction and Application</td>
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<td>13:00 - 14:30 Session 20: Hot Isostatic Pressing</td>
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<td>09:00 - 10:30 Session 24: MIM Feedstocks</td>
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<td>10:45 - 12:15 Session 27: AM Beam Based Technologies: Related Process</td>
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<td>10:45 - 12:15 Session 28: PIM Materials</td>
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<td>13:00 - 14:30 Session 31: AM Beam Based Technologies: Process Development and Simulation</td>
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<td>10:45 - 12:15 Session 39: AM Sinter based Technologies - Other Processes</td>
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<td>13:00 - 14:30 Session 41: AM Sinter Based Technologies: Binder Jetting</td>
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<td>13:00 - 14:30 Session 43: Field Assisted Sintering Technologies</td>
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#### Powder Production

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<td>10:45 - 12:15 Session 38: Influence of Powder Process on Material Properties</td>
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#### Applications

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<td>Friday 22 October</td>
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<td>10:45 - 12:15 Session 52: Applications: Energy</td>
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<td>Friday 22 October</td>
<td>13:00 - 14:30 Session 44: Testing &amp; Evaluation</td>
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<td>09:00 - 10:30 Session 47: Design and modellling</td>
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<td>10:45 - 12:15 Session 51: Testing &amp; Evaluation: Powder Characterisation</td>
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### Industry Corner

**Monday 18 October**
- 13:30 - 15:00: Session 7: Industry Corner - 1

**Tuesday 19 October**
- 13:00 - 14:30: Session 19: Industry Corner - 2

**Wednesday 20 October**
- 13:00 - 14:30: Session 30: Industry Corner - 3

**Thursday 21 October**
- 13:00 - 14:30: Session 42: Industry Corner - 4

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### Special Interest Seminars

**Monday 18 October**
- 11:15 - 12:45: Session 2: SIS HIP: Optimization of PM parts using HIP
- 13:30 - 15:00: Session 6: SIS HIP: Key Industrial Applications of HIP

**Tuesday 19 October**
- 09:00 - 10:30: Session 10: SIS FM: Advances and Challenges for Hard Magnets
- 13:00 - 14:30: Session 18: SIS MIM: Sustainability of MIM

**Wednesday 20 October**
- 09:00 - 10:30: Session 22: SIS HM: Outlook on Hard Materials
- 10:45 - 12:15: Session 26: SIS HM Club Projects of EPMA

**Thursday 21 October**
- 09:00 - 10:30: Session 34: SIS P&S: CO2 reduction in Press&Sink - Part 1
- 10:45 - 12:15: Session 38: SIS P&S: CO2 reduction in Press&Sink - Part 2

**Friday 22 October**
- 09:00 - 10:30: Session 46: SIS AM: Spare parts and Repair using AM
- 10:45 - 12:15: Session 50: SIS AM: Sinter Based AM
EPMA Keynote Paper Award 2021

Keynote papers receive an extended oral presentation slot in the programme and will go on to be published in the journal Powder Metallurgy who sponsor the Award.

The EPMA Keynote Papers for Euro PM2021 are:

**Monday 18 October**

Mr Scholzen Philipp  
Laboratory for Machine Tools and Production Engineering (WZL) of RWTH Aachen University, Germany  

**Influence Of Heat Treatment And Densification On The Load Capacity Of Sintered Gears**

Time: 11:15 - 12:45 (Session 4: Applications – Automotive )

Abstract: The Powder Metallurgical manufacturing of gears offers a promising opportunity in terms of reducing the noise emission and increasing the power density. Sintered gears weigh less than conventional gears and potentially have a better noise-vibration-harshness behavior, due to the remaining porosity. However, the potential of sintered gears for highly loaded applications is not fully utilized yet. Six variants of surface densified and case-hardened sintered gears from Astaloy Mo85 are tested to analyze the impact of the densification and case hardening depths on both the tooth root and flank load bearing capacities. Experimental investigations including metallography and computer tomography are carried out to characterize the microstructure. Furthermore, a simulation model is developed to quantitatively describe the residual stress and hardness profiles after the heat treatment. The load bearing capacity was improved by increasing the densification and case hardening depths, where the effect of the case hardening was identified to be predominant.

**Tuesday 19 October**

Dipl-Ing Xu Peng  
Helmholtz-Zentrum Geesthacht, Germany  

**Effects Of Processing Defects On Damage Tolerance Of Sintered Beta Titanium Alloys Under Static And Dynamic Loading**

Time: 10:45 - 12:15 (Session 13: Non Ferrous & Ferrous Materials )

Abstract: (Metastable) β titanium alloys are key materials in lightweight and biomedical applications, due to the combination of excellent mechanical properties and paramount biocompatibility. Unfortunately, binder-based sintering techniques like MIM (Metal-Injection-Molding), Binder Jetting or Fused Filament Fabrication, normally introduce three major processing defects in the as-sintered Ti-parts: i) residual porosity, ii) high impurity level and iii) coarse-grained structure. The previous studies revealed that these defects invariably tend to be even more severe in β titanium alloys than in Ti-6Al-4V fabricated by powder metallurgy route. In the first part of this article, these processing-related defects and their likely origins in sintered β titanium alloys are reviewed. In the second part, the effects of these defects on fracture mechanisms of sintered β titanium alloys under static or dynamic loading are analyzed. Based on the analyses, strategic technical improvements in the processing to improve the reliability of sintered β titanium alloys products are proposed.
Wednesday 20 October

Ing Lacoste Luc
Mines ParisTech - Centre des matériaux - PSL
University - AddUp - Additive Factory Hub (AFH), France

Microstructure Control Of Additively Manufactured IN718 By L-PBF Process

Time: 09:00 - 10:30 (Session 23: AM Beam Based Technologies: Nickel-Based Materials|Refractory Metals)

Abstract: Additively manufactured (AM) parts typically exhibit large columnar grains and preferential crystallographic texture. While such microstructure can have beneficial effects, for instance on creep properties, the resulting mechanical anisotropy remains a key issue for most applications of AM critical parts. The link between solidification conditions and molten pool morphology of Inconel 718 manufactured with laser powder bed fusion (L-PBF) have been investigated in order to tailor the microstructural features of parts with respect to their applications. Thanks to process optimization, it is possible to reduce the texture index by a factor 10 and the grain size from millimeter-scale to 5 times smaller than layer thickness. Furthermore, it is possible to obtain grain aspect ratio and circularity comparable to a forged equiaxed material. Those achievements pave the way to produce fully isotropic and/or controlled anisotropic parts by L-PBF process.

Thursday 21 October

Dipl-Ing Berger Christian
Fraunhofer IKTS, Germany

Binder-Jetting Of TiCN-based Cermets

Time: 13:00 - 14:30 (Session 41: AM Sinter Based Technologies: Binder Jetting)

Abstract: Additive Manufacturing is experiencing an upswing in many sectors of industry for a broad variety of materials. Processes are mainly developed for polymers and metals. For ceramics, hardmetals and especially cermets there are only a few additive processes suitable. The powder-based technique Binder-Jetting is one of these suitable processes with high productivity and relatively low green density. Within this study TiCN-based cermets are printed by Binder-Jetting for the first time. The complexity of influences of the morphology and composition of cermet powders are discussed in regard to bulk density and material properties of printed and sintered parts. Studied TiCN-based cermet compositions represent different Ni and Mo2C binder contents. Main points of this investigation are further the adjustment of ratio of the raw materials for good sintering behaviour and their influence on the microstructures and as a function of varied sintering temperatures.

Dr Ing Pötschke Johannes
Fraunhofer IKTS, Germany

High Entropy Based Hardmetals

Time: 10:45 - 12:15 (Session 37: Alternative Hardmetals)

Abstract: Hardmetals, cemented carbides or cermets are made conventionally from single carbide hard phases like WC, TiC or TiCN. Especially in cermets also more complex hard phases such as (Ti,Nb,Ta)C exist. Furthermore, metal binders used are commonly single metal elements like Co or Ni as well as alloyed mixtures of them with other elements. Within this work, high entropy based hard phases like (Ta,Nb,Ti,V,W)C and high entropy metal binder phases were studied separately as well as together in novel double high entropy based hardmetals. The microstructural, magnetic, and mechanical properties are discussed and are compared to conventional WC-Co based hardmetals as well as to TiCN-CoNi based cermets. XRD results showed that it is possible to retain the high entropy metal phase as well as the high entropy hard phase after sintering.
A Finite Element Based Model Of The Influence Of Density On PM Mechanical Properties

Dr. Andersson Michael
Höganäs AB, Sweden

Time: 09:00 - 10:30 (Session 47: Design and modelling)

Abstract: The finite element method is a powerful tool to, for instance, calculate stresses and strains in components. But it can also be used as a tool for material design. For PM steels the porosity has a strong impact on the strength of the materials. Therefore it's important to understand the connection between porosity and mechanical properties to utilize the materials in the most efficient way. In this paper it's investigated how finite element simulations can be used to model the tensile test curve of a PM steel, and estimate properties at different densities. A metallographic investigation of the pore- and micro structures of the material is combined with a model of the strain hardening of the matrix material into a finite element model. The tensile curves, as a function of density, are then simulated using the computer model, and finally compared with experimental data.
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www.pm-review.com
**Monday 18 October**

**Session 1**
Cermets and Applications

**SESSION CHAIRS**
Dr Siavash Momeni (Hilti AG, Liechtenstein)

**ORAL PRESENTATIONS**

- **Influence Of Cu And Al Addition On The Properties Of Ti(C,N)-Co|Ni-based Cermets**
  Lengauer, W (Vienna University of Technology, Austria); Maschke, J; Biagi, A; Fürst, M (Vienna University of Technology, Austria)

- **Solid State And Liquid Phase Sintered Mo2C, WC, TiC And TiC5N5 Modified NbC-Ni Cermets.**
  Anwer, Z (KU Leuven, Belgium); Vleugels, J; Huang, S (KU Leuven, Belgium)

- **Femtosecond Laser Processing Of Hardmetals**
  Carmona, E (CEIT-BRTA, Spain); Pan Cabo, A; Lozada Cabezas, L; Sanchez Moreno, J-M (CEIT-BRTA, Spain)

- **Microstructure Evolution Of Cu|Ni Infiltrated NbC-WC Binderless Cermets**
  Huang, J (KU Leuven, Belgium); Huang, S; Lauwers, B; Qian, J; Vleugels, (KU Leuven, Belgium); Zhou, P (Hunan University of Science and Technology, China)

**POSTER PRESENTATIONS**

- **Thermal Residual Micro-stresses Characterizations In NbC-Ni Cemented Carbides**
  Lavigne, O (Hyperion Materials and Technologies, Spain); Luzin, V (Australian Nuclear Science and Technology Organisation, Australia)

- **Heat Treatment And Characterization Of Lithography-based Additive Manufactured WC-Co Green Bodies**
  Rieger, T (Aalen University, Germany); Schubert, T; Schurr, J; Schwenkel, M; Bernthaler, T; Schneider, G (Aalen University, Germany); Rieger, T (Karlsruhe Institute of Technology, Germany)

**Session 2**
SIS HIP: Optimization of PM parts using HIP

**SESSION CHAIRS**
Dr Anke Kaletsch (RWTH Aachen University, Germany)
Mr James Shipley (Quintus Technologies AB, Sweden)

**ORAL PRESENTATIONS**

- **The CALHIPSO project: towards a larger use of HIP technology in France**
  Bernard, F (ICB - UMR 6303 CNRS / UBFC, France); Rigal, E; Emonot, P (CEA Liten, France); Chateau-Cornu, J-P (ICB - UMR 6303 CNRS / UBFC, France); Genoves, T (Framatome, France); Bernacki, M (Mines Paris Tech - UMR 7635 CNRS / PSL, France)

- **Hot Isostatic Pressing in Additive Manufacturing – a costly necessity or a possibility to add value?**
  Herzog, D (Hamburg University of Technology, Institute of Laser and System Technologies, Germany); Bossen, B; Bartsch, K; (Hamburg University of Technology, Institute of Laser and System Technologies, Germany)

**Session 3**
AM Sinter Based Technologies: Extrusion-Based Methods in AM

**SESSION CHAIRS**
Prof Dr Ana Senos (Aveiro University, Portugal)

**ORAL PRESENTATIONS**

- **Experimental Investigations Of Extrusion 3D Printing And Sintering Of Copper MIM Feedstock**
  Missiaen, J-M (University of Grenoble Alpes, France); Singh, G; Bouvard, D; Chaix, J (University of Grenoble Alpes, France)

- **A Comparative Study Of Mechanical Properties For MIM Standard 17-4PH Samples Manufactured Via Binder Jetting And Material Extrusion**
  Masurtschak, S (LORTEK S.COOP, Spain); Iriostaza, U; San Sebastian Ormazabal, M (LORTEK S.COOP, Spain); Andres, U (MIM TECH ALFA S.L., Spain); Rodríguez Gutiérrez, P (EIPC EIBAR PRECISION CASTING, S.L., Spain)

- **Mechanical Properties Of 3D Printed MAX Phases**
  Tsipas, S (Universidad Carlos III de Madrid, Spain); Tabares, E; Cifuentes, S-C; Jimenez-Morales, A; Mazón-Ortíz, G (Universidad Carlos III de Madrid, Spain); Kitzmantel, M; Neubauer, E (RHP Technology GmbH, Austria)
Session 4
Applications: Automotive

SESSION CHAIRS

Dr José García (Sandvik Machining Solutions, Sweden)
Prof Alberto Molinari (Trento University, Italy)

ORAL PRESENTATIONS

KNP - Influence Of Heat Treatment And Densification On The Load Capacity Of Sintered Gears
Scholzen, P (Laboratory for Machine Tools and Production Engineering (WZL) of RWTH Aachen University, Germany); Rajaei, A; Hallstedt, B; Broeckmann, C (Chair and Institute for Materials Applications in Mechanical Engineering (IWM) of RWTH Aachen University, Germany); Brimmers, J; Bergs, T (Laboratory for Machine Tools and Production Engineering (WZL) of RWTH Aachen University, Germany)

FAST STEP 3: Field Assisted Sintering Technology For Swarf Titanium To Engine Parts In 3 Steps
Weston, N (The University of Sheffield, United Kingdom); Jackson, M (The University of Sheffield, United Kingdom); Holden, C (Northern Automotive Alliance Ltd, United Kingdom); Ingall, D (Transition International Ltd, United Kingdom); Lunn, D (W.H. Tildesley Ltd, United Kingdom); Williams, (Force Technology Ltd, United Kingdom); Balderson, J (Bentley Motors Ltd, United Kingdom)

Approach To Achieve Improved Elongation Combined With Sufficient Hardness, Tensile-And Fatigue Strength Utilizing Belt Furnace Sintering Conditions At 1120°C
Schneider, R (Höganäs GmbH, Germany); Ljung, K (Höganäs Sweden AB, Sweden); Szabo, C (Höganäs GmbH, Germany)

Hybrid-Additive Manufacturing Of Press Tools With Laser Metal Deposition Using Buffer Layers To Reduce Crack Issues
Belitz, S (Mercedes-Benz AG, Germany); Scheider, D (Mercedes-Benz AG, Germany); Zeidler, H (Technische Universität Bergakademie Freiberg, Germany)

Session 5
Materials for Press & Sinter

SESSION CHAIRS

Prof Ilaria Cristofolini (Trento University, Italy)
Prof Christoph Broeckmann (RWTH Aachen IWM, Germany)

ORAL PRESENTATIONS

The Complete High Cycle Fatigue Response Of Case-hardened Astaloy CrA + 1 % Cu + 0.2 % C
Schneider, M (GKN Sinter Metals Engineering GmbH, Germany)

Benchmarking Of Tooth Root Bending Fatigue Strength Of Different P|M Material Variants Which Have Been Subjected To Various Heat Treatment Processes.
Szabo, C (Höganäs GmbH, Germany); Andersson, O; Andersson, M (Höganäs AB, Sweden)

Sintering Of PM Steels With High Mn Content -- Using The Masteralloy Route
Danninger, H (Technische Universität Wien, Austria); Prokofyev, M; Gierl-Mayer, C (Technische Universität Wien, Austria); Hellein, R; Müller, A (Mina Sinter Austria GmbH, Austria)

Carbon As Key Element For The Behavior Of "tailored" Liquid Phases During Sintering
Geroldinger, S (TU WIEN, Austria); De Oro Calderon, R; Gierl-Mayer, C; Danninger, H (TU WIEN, Austria)

Session 6
SIS HIP: Key Industrial Applications of HIP

SESSION CHAIRS

Dr Anke Kaletsch (RWTH Aachen University, Germany)
Mr James Shipley (Quintus Technologies AB, Sweden)

ORAL PRESENTATIONS

Advanced Technology for Large Scale (ATLAS) PM-HIP
Gandy, D (EPRI, USA); Puerta, D (Stack Metallurgical, USA)

Faster manufacturing by additive manufacturing of shelled parts followed by HIP
Du Plessis, A (Stellenbosch University, South Africa)
SESSION CHAIRS

Dr Thomas Ebel (Helmholtz-Zentrum Geesthacht, Germany)
Cristina Berges Serrano

ORAL PRESENTATIONS

Titanium Scaffolds Fabricated By Direct Ink Writing And Functionalized With Dual-action Coatings With Osteoinductive And Antibacterial Properties
Torres Garrido, D (AMES PM TECH, Spain); Maria Manero, J; Rupérez, E (polytechnic university of catalonia, Spain); Calero, J (AMES PM TECH, Spain)

Properties And Prospects For Biomedical Application Of New TiNbSn Alloys Obtained By Electrical Resistance Sintering
Vinogradova, M (Universitat Politècnica de València, Spain); Klyatskina, E; Navarro-Laboulais, J; Segovia, F; Vicente, A; Amigó, V (Universitat Politècnica de València, Spain)

Optimization Of Selective Laser Melting Process For Zirconium Lattices As Orthopaedic Implants
Crocco, B (University of Strathclyde, United Kingdom); Imbrogno, S; Attallah, M (University of Birmingham, United Kingdom); Tamimi, S; Butler, D (University of Strathclyde, United Kingdom)

Biodegradable Molybdenum As An Implant Material
Poehle, G (Fraunhofer Institute for Manufacturing Technology and Advanced Materials IFAM, Germany); Redlich, C; Quadbeck, P; Weissgaerber, T (Fraunhofer Institute for Manufacturing Technology and Advanced Materials IFAM, Germany); Schauer, A; Adams, V; Linke, A (Technische Universität Dresden, Germany)

POSTER PRESENTATIONS

Influence Of The Composition Of The Initial Charge Based On Magnesium Powder And The Technology Of Obtaining Compact Blanks Of Biodegradable Implants On The Change In Their Properties In Vitro.
Savich, V (O.V. Roman Powder Metallurgy Institute, Belarus); Tarusov, I; Taraykovich, A; Kuznechik, O (O.V. Roman Powder Metallurgy Institute, Belarus)

Study Of The Influence Of The Parameters Of The Application Process Of Spongy Titanium Powder On Ultra-High Molecular Polyethylene By Thermomechanical Methods On The Properties Of The Formed Layer
Savich, V (O.V. Roman Powder Metallurgy Institute, Belarus); Golodok, R; Taraykovich, A; Kuznechik, O (O.V. Roman Powder Metallurgy Institute, Belarus)

Tuesday 19 October

SESSION CHAIRS

Dr Bjoern Hoschke (ZCC Cutting Tools Europe GmbH, Germany)

ORAL PRESENTATIONS

Dynamic Carbon Window Modeling For The Design Of Cemented Carbides - Low Carbon Contents
Lamelas Cubero, V (Kungliga Tekniska Högskolan (KTH), Sweden); Bonvalet-Rolland, M; Borgenstam, A (Kungliga Tekniska Högskolan (KTH), Sweden); Walbrühl, M (QuesTek AB, Sweden)

Empirical Model For Room Temperature Thermal Conductivity Of WC-Co Hardmetals
Vornberger, A (Fraunhofer IKTS, Germany); Pötschke, J; Herrmann, M; Michaelis, A (Fraunhofer IKTS, Germany)

Influence Of Microstructural Assemblage Of The Substrate On The Adhesion Strenght Of Coated PcBN Grades
Gordon Pozuelo, S (Universitat Politècnica de Catalunya - UPC, Spain); Roa, J-J; Jiménez Piqué, E; Llanes, L (Universitat Politècnica de Catalunya - UPC, Spain); Rodriguez Suarez, T; Franca, L (Element Six (UK), Global Innovation Centre, Virgin Island (United Kingdom); M'saoubi, R (Seco Tools AB, R&D Materials and Technology Development, Sweden)

Metal-Diamond Materials Obtained By Electric Resistance Sintering: Microstructure, Processing And Mechanical Properties
Lagos, M (TECNALIA, Spain); Agote, I; Leizaola, I (TECNALIA, Spain); Viñuela, J; Beranoagirre, A (UPV-EHU, Spain)
Session 10
SIS FM: Advances and Challenges for Hard Magnets

SESSION CHAIRS
Dr Sebastian Boris Hein (Fraunhofer IFAM Bremen, Germany)
Dr Peter Kjeldsteen (Sintex a/s, Denmark)

ORAL PRESENTATIONS
Recent Developments for Bonded RE-Fe-B Magnets
Nimit, S (Magnequench Technology Center, Singapore); Zhongmin, C (Magnequench Technology Center, Singapore); Grieb, B; Schmersahl, K (Magnequench GmbH, Germany)

Electric current assisted sintering of NdFeB magnet materials
Prasad Mishra, T (Forschungszentrum Jülich, IEK-1, Germany); Leich, L; Weber, S; Röttger, A (Institut für Werkstoffe, Germany); Krengel, M (Wilo SE, Germany); Bram, M (Institute of Energy and Climate Research, Germany)

Advances and Challenges for Hard Magnets
Weck, C (Fraunhofer IFAM, Germany)

Session 11
AM Beam Based Technologies: Hard Metals and Hard Materials

SESSION CHAIRS
Dr Diego Manfredi (Politecnico di Torino, Italy)

ORAL PRESENTATIONS
Investigations On Processability And Material Characteristics Of Diamond-metal Composites Fabricated By Laser Powder Bed Fusion
Ferreira, M (TU Dortmund, Germany); Schnell, N; Klesczynski, S; Wegner, J; Witt, (University Duisburg-Essen, Germany); Tillmann, W (TU Dortmund, Germany)

 Influence Of Z-increment On The Build Height, Porosity And Microstructure Of Laser Deposited WC-10wt%FeCr Thin Walls
Molobi, E (University of the Witwatersrand, South Africa); Sacks, N (Stellenbosch University, South Africa); Theron, M (CSIR National Laser Centre, South Africa)

Session 12
Sintering

SESSION CHAIRS
Dr Peter Vervoort (Eisenmann Thermal Solutions, Germany)

ORAL PRESENTATIONS
Powder Is The Future Of Metallurgy
Honnart, A (METALVALUE LTD, United Kingdom)

Hojati, M (Institute of Chemical Technologies and Analytics| Vienna University of Technology, Austria); Gierl-Mayer, C; Danninger, H (Institute of Chemical Technologies and Analytics| Vienna University of Technology, Austria)

High Temperature Sintering Of Low Alloved Steels: Effect On Mechanical Properties And On The Dimensional And Geometrical Precision
Molinari, A (University of Trento, Italy); Toledo Dos Santos, D; Cristofolini, I (University of Trento, Italy); Arnhold, V; Kruzanov, V (Powder Metallurgy Consulting, Germany); Baumgartner, F (Schunk Sintermetalltechnik, Germany); Creutziger, M (ONEJOON GmbH, Germany); Dougan, M-J (Ames, Spain); Hellein, R (Miba Sinter Group, Austria); Larsson, C (Höganäs AB, Sweden); Lorenzon, I (Pometon SpA, Italy); Schneider, M (GKN SinterMetals, Germany); Weber H (Riedhammer GmbH, Germany); Wimbert, L (GKN Hoeganaes Corporation Europe, Germany)

How Particle Size And Green Density Affect The Anisothermal And Isothermal Shrinkage Of Uniaxially Cold Compacted AISI 316L
Baselli, S (University of Trento, Italy); Molinari, A (University of Trento, Italy)

POSTER PRESENTATIONS
Effect Of Sintering Temperature On Microstructure And Physical Properties Of Differently Compacted Carbon And Mo Alloved Steels
Hojati, M (TU Wien | Chemical Technologies and Analytics, Austria); Gierl-Mayer, C; Danninger, H (TU Wien | Chemical Technologies and Analytics, Austria)
**Session 13**  
Non-Ferrous & Ferrous Materials

**SESSION CHAIRS**
Prof Elena Gordo *(University Carlos III of Madrid, Spain)*

**ORAL PRESENTATIONS**

**KNP - Effects Of Processing Defects On Damage Tolerance Of Sintered Beta Titanium Alloys Under Static And Dynamic Loading**  
Xu, P (Helmholtz-Zentrum Geesthacht, Germany); Ebel, T; Pyczak, F (Helmholtz-Zentrum Geesthacht, Germany)

**Comparison Of Two Different Methods To Manufacture Pure Copper By Laser-powder Bed Fusion (L-PBF)**  
Baffie, T (CEA-LITEN, Univ. Grenoble-Alpes, France); De Terris, T; Ribiere, C (CEA-LITEN, Univ. Grenoble-Alpes, France)

**Sintered Hadfield Steel Containing Graphite Nodules In Its Volume**  
Ramos Filho, A-I (Federal University of Santa Catarina, Brazil); Schroeder, R; Oliveira Neves, G; Hammes, G; Binder, C; Nelmo Klein, A (Federal University of Santa Catarina, Brazil)

**Processability And Mechanical Properties Analysis Of Dual Phase Low Alloy Steel Powder (DP 600) Produced On Multi-laser Powder Bed Fusion Systems**  
Zhu, D (GKN Sinter Metals Engineering GmbH, Germany); Höges, S; Blümer, S (GKN Sinter Metals Engineering GmbH, Germany); Schade, C; Horvay, K (Hoeganaes Corporation, USA)

**POSTER PRESENTATIONS**

**Structure And Properties Of Hot-Deformed Chromium-Vanadium Powder White Cast Irons With Microadditives Of Alloying Elements**  
Dorofeyev, V (Platov South-Russian State Polytechnic University (NPI), Russia); Swiridova, A; Berezhnoi, Y; Bessarabov, E (Platov South-Russian State Polytechnic University (NPI), Russia); Swiridova, S (Derzhavin Tambov State University, Russia); Vodolazhenko (MIREA - Russian Technological University, Russia); Kochkarova, K (North Caucasian State Academy, Russia)

**Session 14**  
SIS FM: Functional Materials for Thermal Management

**SESSION CHAIRS**
Dr Sebastian Boris Hein *(Fraunhofer IFAM Bremen, Germany)*  
Dr Peter Kjeldsteen *(Sintex a/s, Denmark)*

**ORAL PRESENTATIONS**

**Thermal Management Solutions with Advanced Composite Materials and Additive Manufacturing**  
Weissgaerber, T (Fraunhofer IFAM Dresden, Germany); Hutsch, T; Studnitzky, T; Schott, A; Andersen, O (Fraunhofer IFAM Dresden, Germany)

**Solid state thermal control devices and circuits**  
Kitanovski, A (University of Ljubljana, Slovenia); Klinar, K; Vozel, K; Petelin, N (University of Ljubljana, Slovenia)

**Adding energy harvesting into thermal management – a win-win solution**  
Yin, H (TEGnology ApS, Denmark)

**Session 15**  
AM Beam Based Technologies: Steels

**SESSION CHAIRS**
Dr Anke Kaletsch *(RWTH Aachen University, Germany)*

**ORAL PRESENTATIONS**

**Parameter Optimization For Laser Powder Bed Fusion Of Case Hardening Steels**  
Schmitt, M (Fraunhofer IGCV, Germany); Schlick, G; Schilp, J; Reinhart, G (Fraunhofer IGCV, Germany)

**Influence Of The Powder Particle Size Distribution On The Microstructure Of Laser Powder Bed Alloyed Cold Work Tool Steel**  
Koehler, M-L (RWTH Aachen, Germany); Herzog, S; Kaletsch, A; Broeckmann, C (RWTH Aachen, Germany); Norda, M; Petzoldt, F (Fraunhofer Institute for Manufacturing Technology and Advanced Materials IFAM, Germany)

**Mechanical Evaluation Of Punching Tools Manufactured From A Cold Work Tool Steel Via Electron Beam Melting (EBM)**  
Botero, C (Mid Sweden University, Sweden); Selte, A; Maistro, J; Katsanos, D (Uddeholms AB, Sweden); Sjöström, V; Rännar, L (Mid Sweden University, Sweden)
Session 16
Compaction and Application

SESSION CHAIRS

Dr Pierre Blanchard (Welding Alloys Group, France)
Prof Herbert Danninger (Technische Universität Wien, Austria)

ORAL PRESENTATIONS

Die Wall Lubrication Vs. Bulk Lubrication: Microstructure, Mechanical Properties And Dimensional And Geometrical Precision Of Low Alloyed Steels
Molinari, A (University of Trento, Italy); Toledo Dos Santos, D; Cristofolini, I (University of Trento, Italy); Zadra, M; Girardini, L (K4Sint Srl, Italy); Bordin, S; Libardi, S (TFM Group SpA, Italy), Albionetti, P (B.U. Advanced Technologies - Sacmi Imola S.C., Italy)

Productivity And Quality Improvements Achievable Through High-performance Lubricant Compositions In Standard Powder Metallurgy Compaction
Paris, V (Rio Tinto Metal Powders, Canada); Mousavinasab, S (Rio Tinto Metal Powders, Canada); Thomas, Y (National Research Council Canada, Canada)

Influence Of Materials, Shape, And Process Variables On The Densification Equation Coefficients
Zago, M (University of Trento, Italy); Molinari, A; Cristofolini, I (University of Trento, Italy); Rambelli, A; Foschi, D (Sacmi Imola S.C., Italy)

Powder Metallurgy Fabrication And Characterization Of Ti6Al4V|xCu Alloys For Biomedical Applications
Olmos, L (UMSNH, Mexico); Chavez, J; Omar, O (Universidad de Guadalajara, DIP, Mexico); Solotro, V (Tecnológico Nacional de México|ITMorelia, Mexico); Bouvard, D (Univ. Grenoble Alpes, CNRS, France); Vergara, H (División de Estudios de Posgrado e Investigación, TecnNM|Instituto Tec)

Session 17
Magnetic and Iron based Functional Materials

SESSION CHAIRS

Dr Yoko Pittini-Yamada (Meyer Sintermetall AG, Switzerland)

ORAL PRESENTATIONS

Fundamental Study Of The Hydrogen Decrepitation Process Of Nd-Fe-B Alloys
Martin, J-M (CEIT-BRTA, Spain); Checa, B-L; Burgos, N; Sarregui, G (CEIT-BRTA, Spain)

Development Of A Lightweight, Non-magnetic Steel Powder And MIM Feedstock Made Thereof, For The Manufacture Of Components For A New Generation Of Hand-held Electronic Devices
Hermant, M (BASF SE, Germany); Davies, P; Harris, L (Sandvik Additive Manufacturing, United Kingdom); Bettini, E (Sandvik Additive Manufacturing, Sweden); Blömacher, M (BASF SE, Germany)

Session 18
SIS MIM: Sustainability of MIM

SESSION CHAIRS

Prof Frank Petzoldt (Fraunhofer IFAM Bremen, Germany)
Georg Breitenmoser (Parmaco AG, Switzerland)

ORAL PRESENTATIONS

Sustainability of Inert Gas Atomised Powders for Additive Manufacturing and MIM
Davies, P-A (Sandvik Osprey, United Kingdom)

Sustainability in MIM: A feedstock producer’s view
Staudt, T (BASF, Germany); Hermant, M-C; Wallot, J (BASF, Germany)

Sustainability of the MIM process from the perspective of a parts manufacturer
Schwarz, J (GKN Sinter Metals, Germany)
**Wednesday 20 October**

**Session 21**
High Temperature Applications

**SESSION CHAIRS**
**Dr Georg Josef Schlick** *(Fraunhofer IGCV, Germany)*

**ORAL PRESENTATIONS**

**Assessment Of New Crack Reduction Strategies For Cobalt Based Superalloys Processed By Directed Energy Deposition**
Froeliger, T. (ONERA, France); Toualbi, L; Locq, D (ONERA, France); Chauvet, E; Ferrandez, A (Poly-Shape, France); Dendievel, R (Univ. Grenoble Alpes, CNRS, Grenoble INP, SImaP, France)

**Chromium As Alloying Element In Mo Base Material-- Mechanical Behavior At High Temperatures**
Gierl-Mayer, C. (TU Wien, Austria); Stepan, T; Danninger, H (TU Wien, Austria); Caliskanoglu, O; Weinberger, T (Stirtec GmbH, Austria)

**A Comparison Of Different Approaches To Study The Porosity And Surface Defects For Electron Beam Melting**
Ghibaudo, C. (Politecnico di Torino, Italy); Rizza, G; Marchese, G; Galati, M; Iuliano, L; Ugues, ; Biamino, S (Politecnico di Torino, Italy)

**POSTER PRESENTATIONS**

**Anomalous particles (granules) in PREP-powders – III. A multiscale study of the structure evolution of PM HIP compacts of the Ni-based superalloys under hot forging and heat treatment**
Shulga, A (National Research Nuclear University MEPhI (Moscow Engineering Physics Institute), Russia)

**Modification Of Ni-Cr Powder Alloys With Rhenium For Wear-resistant Coatings**
Wrona, A (Łukasiewicz Research Network - Institute of Non-Ferrous Metals, Poland); Kustra, K; Lis, M; Wegowski, M; Dworak, J; Mazur, J (Łukasiewicz Research Network - Institute of Non-Ferrous Metals, Poland); Kalemba-Rec, I; Dymek, S (AGH University of Science and Technology, Poland)

**Session 22**
SIS HM: Outlook on Hard Materials

**SESSION CHAIRS**
**Prof Luis Miguel Llanes** *(Catalunya Univ Polytechnica, Spain)*
**Mrs Susanne Norgren** *(Sandvik, Sweden)*

**ORAL PRESENTATIONS**

**The evolving regulation of cobalt**
Blakeney, M (The Cobalt Institute, United Kingdom)

**An analysis of the major end-use applications of tungsten**
Zeiler, B (International Tungsten Industry Association, Austria)
Session 23
AM Beam Based Technologies: Nickel-Based Materials | Refractory Metals

SESSION CHAIRS
Dr Heinrich Kestler (Plansee SE, Austria)

ORAL PRESENTATIONS
KPN - Microstructure Control Of Additively Manufactured IN718 By L-PBF Process
Lacoste, L (Mines ParisTech - Centre des matériaux - PSL University - AddUp - Additive Factory Hub (AFH), France); Sakly, A; Lebel, S; Vayre, B (AddUp, France); Dépinoy, S; Colin, C (Mines ParisTech - Centre des matériaux - PSL University, France)

Optimization Of SLM Lattice Structures Of Inconel 718 For Improving The Mechanical Behavior.
Banait, S (IMDEA MATERIALS INSTITUTE, Spain); Jin, X; Perez Prado, T (IMDEA MATERIALS INSTITUTE, Spain); Campos, M (Universidad Carlos III de Madrid, Spain)

Feasibility Of Grain Refinement By Heterogeneous Nucleation In Molybdenum Processed Via Laser Powder Bed Fusion
Kaseraer, L (University of Innsbruck, Austria); Rissbacher, L; Braun, J; Leichtfried, G (University of Innsbruck, Austria); Kestler, H (Plansee SE, Austria)

Effect Of (electro)chemical Post-processing Parameters On The Surface Roughness Reduction And Support Removal Of INCO718 Produced By Selective Laser Melting.
Garcia-Blanco, M-B (Cidetec Surface Engineering, Spain); Espinosa, E (Cidetec Surface Engineering, Spain); Pazos, D (Cidetec Surface Engineering, Spain)

Session 24
MIM Feedstocks

SESSION CHAIRS
Mr Marko Maetzig (ARBURG GmbH + Co KG, Germany)

ORAL PRESENTATIONS
Unraveling The Homogeneity Of MIM Feedstock
Madkour, S (BASF SE, Germany); Hennig, I; Koban, W; Hermant, M (BASF SE, Germany)

Effect Of Backbone Selection On The Solvent Debinding Of Metal Injection Moulding Feedstocks
Kukla, C (Montanuniversität Leoben, Austria); Cano, S; Schuschnigg, S; Holzer, C; Gonzalez-Gutierrez, J (Montanuniversität Leoben, Austria)

Feedstocks For Powder Injection Molding And Material Extrusion: Description Of Flow Performance
Hausnerova, B (Tomas Bata University, Czech Republic); Filip, P (Czech Academy of Sciences, Czech Republic)

Accelerated PIM Processing By Chemical Modifications In The Binder During The Deposition Stage
Berges, C (Universidad de Castilla-La Mancha, Spain); Naranjo, J-A; Herranz, G (Universidad de Castilla-La Mancha, Spain)

Session 25
ODS and High Entropy Alloys

SESSION CHAIRS
Mr Peter Kjeldsteen (Sintex a/s, Denmark)

ORAL PRESENTATIONS
Development Of High-entropy Alloys Using Field Assisted Sintering And Gas Atomized Commodity Powders As Raw Materials
Torralba, J-M (Universidad Carlos III de Madrid, IMDEA Materials Institute, Spain); Venkatesh Kumaran, S (IMDEA Materials Institute, Spain)

Assessment Of Refractory Based High Entropy Alloys For High Temperature Tooling Applications
Neubauer, E (RHP Technology GmbH, Austria); Kovacova, Z; Kitzmantel, M (RHP Technology GmbH, Austria)

New High Entropy Alloys Compositions: From Design To Mechanical Characterization
Olmos, P (Universidad Carlos III de Madrid, Spain); Monclús, M; Molina-Aldagueria, J (IMDEA Materiales, Spain); Prieto, E (Universidad Carlos III de Madrid, Spain)

Study Of The Thermal Stability Of ODS Ferritic Stainless Steel Through In-situ Annealing Monitoring By TEM
Campos, M (Universidad Carlos III de Madrid, Spain); Meza, A; Rabanal, M-E (Universidad Carlos III de Madrid, Spain); Hernández-Mayoral, M(CIEMAT, Spain)
HYDROGEN VS. CARBON

A SURGE TOWARD LOW-OR ZERO-CARBON IRON AND STEEL PRODUCTION FOCUSES ON THE USE OF HYDROGEN

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**Session 26**
SIS HM: HM Club Projects of EPMA

**SESSION CHAIRS**

Prof Luis Miguel Llanes  *(Catalunya Univ Polyteneica, Spain)*

Mrs Susanne Norgren  *(Sandvik, Sweden)*

**ORAL PRESENTATIONS**

Euro HM Club Projects
Moseley, S  *(Hilti, Liechtenstein)*

Recent & Current Club Projects of EPMA
Roebuck, B  *(NPL, United Kingdom)*

Future Activities of Club Projects
To be announced

**Session 27**
AM Beam Based Technologies: Related Process

**SESSION CHAIRS**

Dipl.-Ing Claus Aumund-Kopp  *(Fraunhofer IFAM, Germany)*

**ORAL PRESENTATIONS**

Fabrication Of Sensor-Integrated Parts Using Cold Spray Additive Manufacturing
Kindermann, P  *(Fraunhofer IGCV, Germany)*; Binder, M; Wunderer, M  *(Fraunhofer IGCV, Germany)*; Straßer, M  *(Munich University of Applied Sciences, Germany)*

SLM Processing Of Tool Steels: Microstructure And Mechanical Properties Optimization By Thermal Treatment.
San Sebastian, M  *(LORTEK S. COOP, Spain)*; Garcianid, F; Mancisidor, A-M  *(LORTEK S. COOP, Spain)*

**Session 28**
PIM Materials

**SESSION CHAIRS**

Dr Gemma Herranz  *(Castilla La Mancha Univ, Spain)*

**ORAL PRESENTATIONS**

Enhancement Of Fatigue Properties Of MIM Ti-6Al-4V By Microstructural Refinement
CLimberg, W  *(Helmholtz-Zentrum Geesthacht, Germany)*; Fang, Z-Z; Sun, P  *(University of Utah, USA)*; Ebel, T  *(Helmholtz-Zentrum Geesthacht, Germany)*; Gerdts, F  *(Element22 GmbH, Germany)*

Superelastic Behaviour Of Low Modulus Alloy Ti-35Nb-6Ta Processed By MIM And FFF
Otte, A  *(Karlsruhe Institute of Technology, Germany)*; Limberg, W; Ebel, T; Xu, P  *(Helmholtz-Zentrum Geesthacht, Germany)*

Co-Sintering Of Cermet And Black Zirconia For Aesthetic Products
Mannschatz, A  *(Fraunhofer IKTS, Germany)*; Szokup, S; Müller-Köhn, A; Pöttschke, J; Moritz, T; Michaelis, A  *(Fraunhofer IKTS, Germany)*; Von Witzleben, M; Jégust, S  *(Inmatec Technologies GmbH, Germany)*

**Session 29**
Light Weight Materials

**SESSION CHAIRS**

Dr José Manuel Martin  *(CEIT, Spain)*

**ORAL PRESENTATIONS**

Process-Microstructure-Property-Relationship Of The Near-Alpha Ti6242S Alloy Fabricated By Laser Powder Bed Fusion
Fleißner-Rieger, C  *(Montanuniversität Leoben, Austria)*; Clemens, H; Mayer, S  *(Montanuniversität Leoben, Austria)*; Pfeifer, T  *(Pankl Racing Systems AG, Austria)*; Jörg, T  *(voestalpine BÖHLER Edelstahl GmbH & Co KG, Austria)*

Evaluation Of The Processing Capability Of Aluminium Alloy 6061 For Metal Binder Jetting
Hein, S-B  *(Fraunhofer IFAM, Germany)*; Wieland, S; Weber, D  *(Fraunhofer IFAM, Germany)*

Development Of TiN Coatings By Gas Nitriding On AM Ti-6Al-4V Open-Cell Porous Structures For PEMFC Bipolar Plates
Lozares, J-M  *(Universidad Carlos III de Madrid, Spain)*; Gordo Odériz, E; Romero Villarreal, C  *(Universidad Carlos III de Madrid, Spain)*; Ureña Alcazar, J; Blasco Puchades, J-R  *(AIDIMME, Spain)*

**POSTER PRESENTATIONS**

Study Of Al-SiC Composites Manufactured By Laser Powder Bed Fusion (L-PBF)
Manlay, M  *(CEA, France)*; Soulier, M; Flamant, C; Garandet, J; Chaffron, L  *(CEA, France)*

Structure Of Porous Materials Based On Aluminosilicate Powders And Basalt Fiber.
Savich, V  *(O.V. Roman Powder Metallurgy Institute, Belarus)*; Azarau, S; Drobysh, A; Yeutukhova, T  *(Belarusian National Technical University, Belarus)*; Fomikhina, I; Hamzeleva, T  *(O.V. Roman Powder Metallurgy Institute, Belarus)*; Piatiuskyh, Y  *(State Research and Production Powder Metallurgy Association, Belarus)*
**Session 30**
Industry Corner - To be Announced

**Session 31**
AM Beam Based Technologies: Process Development and Simulation

**SESSION CHAIRS**
Prof Jie Zhou 
(Delft Technical University, Netherlands)

**ORAL PRESENTATIONS**
Efficient Process Parameter Optimisation Procedure In Laser Powder Bed Fusion
Montero-Sistiaga, M (NLR (Netherlands Aerospace Centre), Netherlands); De Smit, M; Haagsma, R; Bennett, I (NLR (Netherlands Aerospace Centre), Netherlands)

Towards Increased Quality Of Ti-6Al-4V Medical Parts By Using Argon-Helium To Reduce Spatter Formation
Dubiez-Le Goff, S (Linde AG, Germany); Fischer, M; Volpi, G (3D MEDLAB, France); Forêt, P (Linde AG, Germany)

Laser Powder Bed Fusion Of Hot-working Tool Steel 1.3397 Processed At Elevated Temperatures
Ma, T (RISE, Sweden); Vikner, P (Aubert & Duval, France)

Analytical And Numerical Modeling Of Powder Spreading In Powder-Bed Processes For Additive Manufacturing
Soulier, M (CEA, France); Burr, A; Roux, G; Laucournet, R; Maisonuneve, J (CEA, France)

**POSTER PRESENTATIONS**
Effect Of Gas Flow Rates On Powder Stream Characteristics And Their Potential Consequences On Alloy Deposition From Coaxial Nozzles
Mouchard, A (University of Limerick, Ireland); Tanner, D; Pomeroy, M; Robinson, J (University of Limerick, Ireland); Mcaliffe, B (Lufthansa Technik Turbine Shannon, Ireland); Donovan, S (Rolls-Royce plc, United Kingdom)

**Session 32**
Gas Atomizer: Theory and Design

**SESSION CHAIRS**
Mr Peter Vikner (Aubert & Duval, France)
Dr Pierre Blanchard (Welding Alloys Group, France)

**ORAL PRESENTATIONS**
Numerical Simulation And Experimental Testing Of Different Close-Coupled Gas Atomiser Designs
Urionabarrenetxea Gomez, E (CEIT-Basque Research and Technology Alliance (BRITA), Spain); Amatriain, A; Avello, A; Martin, J-M (CEIT-Basque Research and Technology Alliance (BRITA), Spain)

Powder Production For Advanced Hot Isostatic Pressing -- Technical Features And Challenges
Cornelius, J (INTECO melting and casting technologies GmbH, Austria); Klochay, V; Ryabtsev, A; Yavtushenko, P (PJSC Ruspolymet, Russia); Holzgruber, H; Scheriau, A (INTECO melting and casting technologies GmbH, Austria)

**POSTER PRESENTATIONS**
An Investigation Of Powders Of A Heat-resistant Composite Cobalt-based Material Prepared By VIGA Method
Ilyushchanka, A (O.V. Roman Powder Metallurgy Institute, Belarus); Letsko, A; Talako, T; Reutisionak, Y; Machnev, V (O.V. Roman Powder Metallurgy Institute, Belarus); Yukhvid; Sanin, V; Andreev, S (Merzhanov Institute of Structural Macrokinetics and Materials Science, Russia)

**Thursday 21 October**

**Session 34**
SIS P&S: CO2 reduction in Press & Sinter - Part 1

**SESSION CHAIRS**
Dr Cesar Molins (AMES Group, Spain)
Dr Caroline Larsson (Höganäs AB, Sweden)

**ORAL PRESENTATIONS**
Innovation to drive net zero carbon operations in material manufacturing
Painter, N (Ricardo Energy and Environment, United Kingdom); Odeh, N (Ricardo Energy and Environment, United Kingdom)

Corporate Carbon Footprint & Product Carbon Footprint
Gutes, M (PMG Holding GmbH, Germany); Nawroth, S (PMG Holding GmbH, Germany)

The Road towards Climate Neutrality for the PM Industry from a powder production perspective
Vidarsson, H (Höganäs AB, Sweden)
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Session 36
Alternative Powder Production Processes

SESSION CHAIRS
Dr Raquel De Oro Calderon (TU Wien, Austria)
Prof Elena Gordo (University Carlos III of Madrid, Spain)

ORAL PRESENTATIONS
Spherical Iron Powder Manufactured By Hydrogen Reduction For MIM And AM Application
Walther, G (Fraunhofer Institute for Manufacturing Technology and Advanced Materials IFAM, Branch Lab Dresden, Germany); Schubert, T; Weißgärber, T (Fraunhofer Institute for Manufacturing Technology and Advanced Materials IFAM, Branch Lab Dresden, Germany); Fries, M (Fraunhofer Institute for Ceramic Technologies and Systems IKTS, Germany); Hoffmann, M (OSTEC GmbH, Germany)

Atomization Of Ti64 Alloy Using The EIGA Process: Upscaling And Process Instrumentation
Deborde, A (MetaFensch, France); Sasaki, L; Hans, S (Aubert & Duval, France); Delfosse, J (Soframet, France); Jourdan, J (IIL - Institut Jean Lamour, France); Mcdonald, N (MetaFensch, France)

Use Of Mechanical Alloying To Develop Novel Titanium-Niobium Alloy Powders Suitable For The Selective Laser Melting Process
Borgman, J (Loughborough University, United Kingdom); Wang, J; Zani, L; Conway, P; Torres-Sanchez, C (Loughborough University, United Kingdom)

POSTER PRESENTATIONS
Influence Of High-Energy Ball-Milling Treatment On The Structure Of Shs-Powders Based On Tantalum Diboride
Ilyushchanka, A (State Scientific Institution «O.V. Roman Powder Metallurgy Institute», Belarus); Talako, T; Reutisonak, Y; Letsko, A; Machnev, V (State Scientific Institution «O.V. Roman Powder Metallurgy Institute», Belarus); Prikhna, T (VBakul Institute for Superhard materials NASU UKRAINE, Ukraine)

Session 37
Alternative Hardmetals

SESSION CHAIRS
Dr Steven Moseley (Hilti Corporation, Liechtenstein)

ORAL PRESENTATIONS
KNP - High Entropy Based Hardmetals
Pötschke, J (Fraunhofer IKTS, Germany); Vornberger, A; Von Spalden, M (Fraunhofer IKTS, Germany)

Mechanical Properties Of WC-FeNiCoCr And WC-NiCoCrTiAl Based Hardmetals
Moreno, J-M (CEIT-BRTA, Spain); Soria Biurrun, T; Lozada Cabezas, L (CEIT-BRTA, Spain); Martinez Pampliega, R; Ibarretxe Lopez, F (FMD CARBIDE, Fabricación Metálicas Dueros, S.A.L., Spain)

(W,Mo)C-based Hardmetals With Ni-rich Binders
Lengauer, W (Vienna University of Technology, Austria); Hatzl, G; Fürst, M (Vienna University of Technology, Austria)

WC-based Cemented Carbides With Fe-Mn And Fe-Mn-Si Binders
De Oro Calderon, R (TU Wien, Austria); Lunzer, M (TU Wien, Austria)

Session 38
SIS P&S: CO2 reduction in Press&Sinter - Part 2

SESSION CHAIRS
Dr Cesar Molins (AMES Group, Spain)
Dr Caroline Larsson (Höganäs AB, Sweden)

ORAL PRESENTATIONS
An overview on energy efficiency of presses and latest trends for consumption optimization
Albonetti, P (SACMI Imola S.C., Italy)

Opportunities for CO2-reduction in sintering furnaces
Khartik, N-K (Cremer Thermoprozessanlagen GmbH, Germany); Weber, H; Cremer, I (Cremer Thermoprozessanlagen GmbH, Germany)

Sintering atmosphere in heat treatment furnaces - Contribution of industrial gases for reducing the carbon footprint
Bustamante Valencia, L (Air Liquide, France); Coudurier, L (Air Liquide, France); Spizzica, A (Air Liquide, Italy)

Sustainability and carbon footprint: High Temperature Sintering (HTS) of Structural Parts
Arnhold, V (PM Solutions, Germany); Molinari, A (University of Trento, Italy); Kruzhankov, V (PM Consulting, Germany)
Session 39
AM Sinter based Technologies - Other Processes

SESSION CHAIRS
Dr Christian Kukla (Montanuniversitaet Leoben, Austria)

ORAL PRESENTATIONS
Metal Part Manufacturing By A Combination Of Fused Filament Fabrication And Gel Casting
Riecker, S (Fraunhofer Institute for Manufacturing Technology and Advanced Materials IFAM, Germany); Studnitzky, T; Andersen, O; Weißgärber, T (Fraunhofer Institute for Manufacturing Technology and Advanced Materials IFAM, Germany)

Sinter-Based Additive Manufacturing Using The Innovative MoldJet Process
Teuber, R (Fraunhofer Institute for Manufacturing Technology and Advanced Materials IFAM, Germany); Andersen, O; Studnitzky, T; Weißgärber, T (Fraunhofer Institute for Manufacturing Technology and Advanced Materials IFAM, Germany)

Cold Metal Fusion: Combining The Advantages Of PM And The Potential Of AM
Staudigl, C (Headmade Materials GmbH, Germany); Fischer, C (Headmade Materials GmbH, Germany)

Adhesion Efficiency Between Shape Memory Wires Of Nitinol In Aluminum Alloy Matrix Produced By Indirect Additive Manufacturing
Cruz, F (Univ. Coimbra, Portugal); Alves, B; Gatoés, D; Freitas Rodrigues, P; Vieira, T; Ramos, S (Univ. Coimbra, Portugal)

Session 40
Influence of Powder Process on Material Properties

SESSION CHAIRS
Prof Marco Actis Grande (Politecnico di Torino, Italy)
Dr José Manuel Martin (CEIT, Spain)

ORAL PRESENTATIONS
Assessment Of Aluminium Alloy Powder Properties For Additive Manufacturing
Franceschini, A (IRT M2P, France); Bellavoine, M; Chehab, B (C-TEC, France); Deborde, A (MÉTAFÉNCH, France)

Investigations Of Air Atomized And Coarser Gas-atomized AISI12 Powders To Evaluate Cost Reduction Potentials For Additive Manufacturing Processes
Ludwig, I (Fraunhofer Research Institution for Additive Manufacturing Technologies IAPT, Germany); Kluge, M; Grube, M; Imgrund, P (Fraunhofer IAPT Additive Manufacturing Technologies, Germany); Emmelmann, C (Hamburg University of Technology - Institut für Laser- und Anlagensystemtechnik (iLAS), Germany)

Session 41
AM Sinter Based Technologies: Binder Jetting

SESSION CHAIRS
Dr Erich Neubauer (RHP-Technology GmbH, Austria)

ORAL PRESENTATIONS
Binder Jet 3D Printing Of Ti-6Al-4V Alloy For Biomedical Applications
Simchi, A (Sharif University of Technology, Iran); Petzoldt, F; Hartwig, T (Fraunhofer Institute IFAM, Germany)

Binder Jetting As Complementary Technology To Metal Injection Molding: Influence Of HIP On Microstructure And Mechanical Properties
Kaletsch, A (RWTH Aachen, Germany); Herzog, S; Broeckmann, C (RWTH Aachen, Germany); Andreeva, E; Hartwig, T (IFAM Bremen, Germany)

A Study On The Sinterability And Properties Of Binder Jet 3D Printing Bimodal INVAR36 Alloy Powder Blends
Lore, A (Tecnalia, Spain); Agote, I; Azurmendi, N (TECNALIA, Spain); Barthel, B; Aumund-Kopp, C (Fraunhofer IFAM, Germany)

Pre KNP - Binder-Jetting Of TiCN-based Cermets
Berger, C (Fraunhofer IKTS, Germany); Pöttschke, J; Fries, M; Moritz, T; Michaelis, A (Fraunhofer IKTS, Germany)

Session 42
Industry Corner

Session 43
Field Assisted Sintering Technologies

SESSION CHAIRS
Dr Iñigo Agote (TECNALIA, Spain), Dr Erich Neubauer (RHP-Technology GmbH, Austria)

ORAL PRESENTATIONS
Field Assisted Sintering Technique Spark Plasma Sintering (FAST|SPS) As Promising Method For Upcycling Of Waste Materials
Bram, M (Forschungszentrum Jülich GmbH, Germany); Jäger, S (Bergische Universität Wuppertal, Germany); Prasad Mishra, T (Forschungszentrum Jülich GmbH, Germany); Weber, S (Ruhr-Universität Bochum, Germany)
Experimental Investigation Of The Relationship Between Powder Geometry And Sintering Pressure And Pore Ratio
Aydin, S-M (EGE UNIVERSITY, Turkey); Yahsi, Y; Tekin, T; Ferik, S-R; Ipek, R (EGE UNIVERSITY, Turkey)

POSTER PRESENTATIONS

Mechanical And Micro-Structural Properties Of Mechanically Alloyed Mg22Al Sintered With Electric Field Technique
Tekin, T (EGE UNIVERSITY, Turkey); Aydin, S-M; Yahsi, Y; Ferik, S-R; Ipek, R (EGE UNIVERSITY, Turkey)

Session 44
Testing & Evaluation

SESSION CHAIRS
Prof Didier Bouvard (Univ. Grenoble Alpes, France)

ORAL PRESENTATIONS

Semi in-situ measurement of microstructural changes in PM steel during indentation
Holmberg, A (Uppsala University, Sweden); Kassman Rudolphi, Å; Wiklund, U (Uppsala University, Sweden); Andersson, M (Höganäs AB, Sweden)

New Analytic Approach For Acoustic Material Testing
Ritter, J (RTE Akustik+Prüftechnik GmbH, Germany)

Deeper Process Understanding For Metal Binder Jetting By Using X-ray CT
Sperling, P (Volume Graphics GmbH, Germany); Barthel, B (Fraunhofer Institute for Manufacturing Technology and Advanced Materials IFAM, Germany)

POSTER PRESENTATIONS

Results Of Studying Wettability Of Powder Materials In High-Viscosity Liquids
Ilyushchanka, A (State Research and Production Powder Metallurgy Association, Belarus); Kryyanos, A; Piatisuhyk, Y (State Research and Production Powder Metallurgy Association, Belarus)

Session 45
Hard metals Corrosion

SESSION CHAIRS
Dr Filipe Oliveira (Aveiro University, Portugal)

ORAL PRESENTATIONS

Corrosion Effects On Hertzian Contact Fatigue Behavior Of A WC-Co Cemented Carbide
Llanes, L (Universitat Politècnica de Catalunya, Spain); Zheng, Y (Universitat Politècnica de Catalunya, Spain); Fargas, G; Lavigne, O (Hyperion Materials and Technologies, Spain)

Corrosion Behaviour Of Ni-based Hardmetals In Aggressive Acidic Media
Pereira, P (DURIT - Metalurgia Portuguesa do Tungsténio, Lda, Portugal); Ferro Rocha, A-M; Bastos, A-C; Senos, (University of Aveiro, Portugal); Sacramento, J (DURIT - Metalurgia Portuguesa do Tungsténio, Lda, Portugal); Malheiros, L-F (Faculty of Engineering of the University of Porto, Portugal)

The Corrosion Effects On CoNi-base Hardmetals With Different Co:Ni Ratios And Additives In Simulated Service Conditions
De Gaudenzi, G-P (F.I.L.M.S. SpA - Gruppo OMCD, Italy); Garabelli, M; Tedeschi, S (F.I.L.M.S. SpA - Gruppo OMCD, Italy); Rossi, F (Università del Salento, Italy); Bozzini, B (Politecnico di Milano, Italy)

Effect Of Cr Addition On The Corrosion Behaviour Of Hardmetals With Fe-based Co-free Binders
Romero, C (Universidad Carlos III de Madrid, Spain); De Nicolás, M; Jiménez-Morales, A; Gordo, E (Universidad Carlos III de Madrid, Spain); Llanes, L-M (Universidad de Cataluna, Spain)

POSTER PRESENTATIONS

Effect Of Using Zinc Recycled Cemented Tungsten Carbide Scrap Powder On The Slurry Erosion Of WC-6wt%Co Alloys
Sacks, N (Stellenbosch University, South Africa); Mantu, M; Mokoena, L (University of the Witwatersrand, South Africa); Freemantle, C (Pilot Tools Pty Ltd, South Africa)

Session 46
SIS AM: Spare parts and Repair using AM

SESSION CHAIRS
Mrs Adeline Riou (Erasteel, France)
Dipl.-Ing Claus Aumund-Kopp (Fraunhofer IFAM, Germany)

ORAL PRESENTATIONS

Additive Manufacturing For Repair: Comparison Of Powder Bed Fusion And Solid-state Material Deposition Processes
Toulali, L (ONERA, France); Davoine, C; Thomas, M (ONERA, France); Bouilly, T; Miot, D (CNES, France)

Reproducibility of LPBF - we have investigated hundreds of samples in a Round Robin for AlSi10Mg
Schlingmann, T (EOS GmbH, Germany)

Defence Manufacturing At The Point Of Need
Stewart, C (Speed3D, Germany)
Session 47
Design and Modelling

SESSION CHAIRS
Dr Mark Dougan (AMES SA, Spain)

ORAL PRESENTATIONS

**KNP - A Finite Element Based Model Of The Influence Of Density On PM Mechanical Properties**
Andersson, M (Höganäs AB, Sweden); Schneider, M (GKN Sinter Metals Engineering GmbH, Germany)

"Design For Sintering 2" Club Project – Towards a New Methodology Describing The Anisotropy Of Dimensional Changes
Cristofolini, L (University of Trento, Italy); Molinari, A; Zago, M; Utku Uçak, O (University of Trento, Italy); Dougan M-J (AMES SA, Spain); Schneider M (GKN Sinter Metals Engineering GmbH, Germany); Pedersen, P-H (Sintex a/s, Denmark); Bolitschek, J; Voglhuber, J (MIBA Sinter Austria GmbH, Austria); Vincenzi, B (EPMA, France)

**Numerical Simulation Of Solid-state Sintering Of Copper Parts Fabricated By Extrusion 3D Printing Using MIM Feedstock**
Singh, G (University of Grenoble Alpes, France); Bouvard, D; Missiaen, J; Chaix, J (University of Grenoble Alpes, France)

**Quantitative Simulations Of Sintering Of Titanium With Diffuse Interface Methods**
Ivannikov, V (Helmholtz-Zentrum Geesthacht, Germany); Ebel, T; Willumeit-Römer, R; Cyron, C (Helmholtz-Zentrum Geesthacht, Germany); Thomsen, F (Flensburg University of Applied Sciences, Germany)

SESSION 48
Applications: Aerospace

**Study Of Nickel-chromium Super Alloys Processed With Plasma Metal Deposition To Enable Additive Manufacturing Of Large Parts**
Ariza, E (RHP Technology GmbH, Austria); Neubauer, E; Bielik, M; Meuthen, J; Kitzmantel, M (RHP Technology GmbH, Austria)

Friday 22 October

Session 49
Ferrous Materials for AM

SESSION CHAIRS
Mr Alexander Angré (Carpenter Powder Products AB, Sweden)

ORAL PRESENTATIONS

**Binder Jetting Of A Dual Phase Steel - From Powder To Part**
Schaak, C (GKN Sinter Metals Engineering GmbH, Germany); Schade, C; Horvay, K (Hoeganaes Corporation, USA); Höges, S (GKN Sinter Metals Engineering GmbH, Germany)

**Heat Treatment And Mechanical Properties Of A Novel Ultrahigh Strength Co-free Maraging Steel Fabricated By Additive Manufacturing**
Deirmina, F (Sandvik Additive Manufacturing, Sandvik Machining Solutions AB, Sweden); Bettini, E; Harlin, P; Dixit, N (Sandvik Additive Manufacturing, Sandvik Machining Solutions AB, Sweden); Lövquist, S (AB Sandvik Coromant, Sweden); Hagen, B; Magnusson, H (Swerim AB, Sweden); Holländer Pettersson, N; Lindwall, G (KTH Royal Institute of Technology, Sweden)

**Influence Of Powder Properties On The Mixing Behavior Of Metal Powders In LPBF**
Norda, M (Fraunhofer IFAM, Germany); Köhler, M-L; Herzog, S; Broeckmann, C (IWM Aachen, Germany); Petzoldt, F (Fraunhofer IFAM, Germany)

**Preliminary Processability Evaluation Of H13 Steel By Electron Beam Melting**
Ghibaudo, C (Politecnico di Torino, Italy); Saboori, A; Marchese, G; Gobber, F; Biamino, S; Ugues. (Politecnico di Torino, Italy)
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Session 50
SIS AM: Sinter Based AM

SESSION CHAIRS
Mrs Adeline Riou (Erasteel, France)
Dipl.-Ing Claus Aumund-Kopp (Fraunhofer IFAM, Germany)

ORAL PRESENTATIONS
Comparison of Laser Powder Bed Fusion, Binder Jet & MIM for Stainless Steel alloys
Davies, P (Sandvik Additive Manufacturing, United Kingdom); Harris, L (Sandvik Additive Manufacturing, United Kingdom); Matilainen, V-P; Bostrom, M; Amnebrink, M (Sandvik Additive Manufacturing, Sweden)

Market Dynamics of Binder Jetting and Metal FDM
Schmidt-Lehr, M (AMPower, Germany)

Session 51
Testing & Evaluation: Powder Characterisation

SESSION CHAIRS
Dr Ken Mingard (NPL - National Physical Laboratory, United Kingdom)

ORAL PRESENTATIONS
Powder Reuse Assessment Through Advanced Characterization Techniques For Additive Manufacturing Applications
Carrozza, A (Politecnico di Torino, Italy); Virgillito, E; Aversa, A; Manfredi, D; Bondiol, I; Fino, P; Lombardi, M; (Politecnico di Torino, Italy)

Batch To Batch Differentiation For Quality Control In Additive Manufacturing
Neveu, A (GranuTools, Belgium); Rigo, O (Sirris, Belgium); Lumay, G (University of Liège, Belgium); Francqui, F (GranuTools, Belgium)

Session 52
Applications: Energy

SESSION CHAIRS
Dr Riccardo Casati (Politecnico di Milano, Italy)
Dr Raquel De Oro Calderon (TU Wien, Austria)

ORAL PRESENTATIONS
Characterization Of Alloy 600 Heat Exchanger-reactor Mock-ups Obtained By Laser Powder Bed Fusion (L-PBF) Process
Baffie, T (CEA-LITEN, France); Glioriod, D; Anxionnaz-Minvielle, Z; Gaillard, G; Ribiere, C (CEA-LITEN, France)

Exploring Custom Designs Of MIM Components To Optimise Large Scale Production Of SOFC Interconnectors
Herranz, G (Universidad de Castilla La Mancha, Spain); Gallego, A; Delfa, A; Berges, C; Naranjo, J-A; Antón, G (Universidad de Castilla La Mancha, Spain); Andújar, R; Campana, R (Centro Nacional del Hidrógeno- CNH2, Spain)

Lithography-based Copper Manufacturing And Debinding|Sintering
Resch, A (CEA-Liten, France); Roumanie, M (CEA-Liten, France); Crouxte-Barghorn, C (LPIM, France)
Special Interest Seminar: Consolidation Technologies

Session 2  **Monday 18 October**

**SIS HIP: Optimization of PM parts using HIP**

**SESSION CHAIRS**

**Dr Anke Kaletsch** (RWTH Aachen University, Germany)

**Mr James Shipley** (Quintus Technologies AB, Sweden)

**PRESENTATIONS**

- **The CALHIPSO project: towards a larger use of HIP technology in France**
  Bernard, F (ICB - UMR 6303 CNRS / UBFC, France); Rigal, E; Emonot, P (CEA Liten, France); Chateau-Cornu, J-P (ICB - UMR 6303 CNRS / UBFC, France); Geneves, T (Framatome, France); Bernacki, M (Mines Paris Tech - UMR 7635 CNRS / PSL, France)

- **Hot Isostatic Pressing in Additive Manufacturing – a costly necessity or a possibility to add value?**
  Herzog, D (Hamburg University of Technology, Institute of Laser and System Technologies, Germany); Bossen, B; Bartsch, K; (Hamburg University of Technology, Institute of Laser and System Technologies, Germany)

Session 6  **Monday 18 October**

**SIS HIP: Key Industrial Applications of HIP**

**SESSION CHAIRS**

**Dr Anke Kaletsch** (RWTH Aachen University, Germany)

**Mr James Shipley** (Quintus Technologies AB, Sweden)

**PRESENTATIONS**

- **Advanced Technology for Large Scale (ATLAS) PM-HIP**
  Gandy, D (EPRI, USA); Puerta, D (Stack Metallurgical, USA)

- **Faster manufacturing by additive manufacturing of shelled parts followed by HIP**
  Du Piessis, A (Stellenbosch University, South Africa)
**Special Interest Seminar: Materials**

**Session 10  Tuesday 19 October**

**SIS FM: Advances and Challenges for Hard Magnets**

**SESSION CHAIRS**

**Dr Sebastian Boris Hein** (Fraunhofer IFAM, Germany)

**Mr Peter Kjeldsteen** (Sintex a/s, Denmark)

**PRESENTATIONS**

**Recent Developments for Bonded RE-Fe-B Magnets**

Nimit, S (Magnequench Technology Center, Singapore); Zhongmin, C (Magnequench Technology Center, Singapore);
Grieb, B; Schmersahl, K (Magnequench GmbH, Germany)

**Electric current assisted sintering of NdFeB magnet materials**

Prasad Mishra, T (Forschungszentrum Jülich, IEK-1, Germany); Leich, L; Weber, S; Röttger, A (Institut für Werkstoffe,
Germany); Krengel, M (Wilo SE, Germany); Bram, M (Institute of Energy and Climate Research, Germany)

**Advances and Challenges for Hard Magnets**

Weck, C (Fraunhofer IFAM, Germany)

**Session 14  Tuesday 19 October**

**SIS FM: Functional Materials for Thermal Management**

**SESSION CHAIRS**

**Dr Sebastian Boris Hein** (Fraunhofer IFAM, Germany)

**Mr Peter Kjeldsteen** (Sintex a/s, Denmark)

**PRESENTATIONS**

**Thermal Management Solutions with Advanced Composite Materials and Additive Manufacturing**

Weissgaerber, T (Fraunhofer IFAM Dresden, Germany); Hutsch, T; Studnitzky, T; Klöden, B; Andersen, O (Fraunhofer
IFAM Dresden, Germany)

**Solid state thermal control devices and circuits**

Kitanovski, A (University of Ljubljana, Slovenia); Klinar, K; Vozel, K; Petelin, N (University of Ljubljana, Slovenia)

**Adding energy harvesting into thermal management – a win-win solution**

Yin, H (TEGnology ApS, Denmark)
**Special Interest Seminar: Consolidation Technologies**

**Session 18  Tuesday 19 October**

**SIS MIM: Sustainability of MIM**

**SESSION CHAIRS**
- Prof Frank Petzoldt (Fraunhofer IFAM, Germany)
- Mr Georg Breitenmoser (Parmaco Metal Injection Molding AG, Switzerland)

**PRESENTATIONS**

- **Sustainability of Inert Gas Atomised Powders for Additive Manufacturing and MIM**
  Davies, P-A (Sandvik Osprey, United Kingdom)

- **Sustainability in MIM: A feedstock producer’s view**
  Staudt, T (BASF, Germany); Hermant, M-C; Wallot, J (BASF, Germany)

- **Sustainability of the MIM process from the perspective of a parts manufacturer**
  Schwarz, J (GKN Sinter Metals, Germany)

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**Special Interest Seminar: Materials**

**Session 22  Wednesday 20 October**

**SIS HM: Outlook on Hard Materials**

**SESSION CHAIRS**
- Prof Luis Miguel Llanes (Catalunya Univ Polytecnica, Spain)
- Mrs Susanne Norgren (Sandvik, Sweden)

**PRESENTATIONS**

- **The evolving regulation of cobalt**
  Blakeney, M (The Cobalt Institute, United Kingdom)

- **An analysis of the major end-use applications of tungsten**
  Zeiler, B (International Tungsten Industry Association, Austria)
Special Interest Seminar: Materials

Session 26  Wednesday 20 October  
SIS HM: HM Club Projects of EPMA

SESSION CHAIRS
Prof Luis Miguel Llanes (Catalunya Univ Polytecnica, Spain)  
Mrs Susanne Norgren (Sandvik, Sweden)

PRESENTATIONS

Euro HM Club Projects  
Moseley, S (Hilti, Liechtenstein)

Recent & Current Club Projects of EPMA (Micromech II, Simucrack IV, Kinetic II)  
To be announced

Future Activities of Club Projects  
To be announced

Special Interest Seminar: Consolidation Technologies

Session 34  Thursday 21 October  
SIS P&S: CO2 reduction in Press&Sinter - Part 1

SESSION CHAIRS
Dr Cesar Molins (AMES SA, Spain)  
Mrs Caroline Larsson (Höganäs AB, Sweden)

PRESENTATIONS

Innovation to drive net zero carbon operations in material manufacturing  
Painter, N (Ricardo Energy and Environment, United Kingdom)

Corporate Carbon Footprint & Product Carbon Footprint  
Gutes, M (PMG Holding GmbH, Germany); Nawroth, S (PMG Holding GmbH, Germany)

The Road towards Climate Neutrality for the PM Industry from a powder production perspective  
Vidarsson, H (Höganäs AB, Sweden)
Special Interest Seminar: Consolidation Technologies

Session 38  Thursday 21 October  Time: 10:45 – 12:15
SIS P&S: CO2 reduction in Press&Sinter - Part 2

SESSION CHAIRS
Dr Cesar Molins (AMES SA, Spain)
Mrs Caroline Larsson (Höganäs AB, Sweden)

PRESENTATIONS
An overview on energy efficiency of presses and latest trends for consumption optimization
Albonetti, P (SACMI Imola S.C., Italy)

Opportunities for CO2-reduction in sintering furnaces
Khartik, N-K (Cremer Thermoprozessanlagen GmbH, Germany); Weber, H; Cremer, I (Cremer Thermoprozessanlagen GmbH, Germany)

Sintering atmosphere in heat treatment furnaces - Contribution of industrial gases for reducing the carbon footprint
Bustamante Valencia, L (Air Liquide, France); Coudurier, L (Air Liquide, France); Spizzica, A (Air Liquide, Italy)

Sustainability and carbon footprint: High Temperature Sintering (HTS) of Structural Parts
Arnhold, V (PM Solutions, Germany); Molinari, A (University of Trento, Italy); Kruzhanov, V (PM Consulting, Germany)

Special Interest Seminar: Applications

Session 46  Friday 22 October  Time: 09:00 – 10:30
SIS AM: Spare parts and Repair using AM

SESSION CHAIRS
Mrs Adeline Riou (Erasteel, France)
Dipl.-Ing Claus Aumund-Kopp (Fraunhofer IFAM, Germany)

PRESENTATIONS
Additive Manufacturing For Repair: Comparison Of Power Bed Fusion And Solid-state Material Deposition Processes
Toualbi, L (ONERA, France); Davoine, C; Thomas, M (ONERA, France); Bouilly, T; Miot, D (CNES, France)

Reproducibility of LPBF - we have investigated hundreds of samples in a Round Robin for AlSi10Mg
Schlingmann, T (EOS, Germany)

Defence Manufacturing At The Point Of Need
Stewart, C (Speed3D, Germany)
Session 50  **Friday 22 October**

**SIS AM: Sinter Based AM**

**SESSION CHAIRS**
- Mrs Adeline Riou  (Erasteel, France)
- Dipl.-Ing Claus Aumund-Kopp  (Fraunhofer IFAM, Germany)

**PRESENTATIONS**

- **Comparison of Laser Powder Bed Fusion, Binder Jet & MIM for Stainless Steel alloys**
  - Davies, P  (Sandvik Additive Manufacturing, United Kingdom)
  - Harris, L  (Sandvik Additive Manufacturing, United Kingdom)
  - Matilainen, V-P
  - Bostrom, M
  - Amnebrink, M  (Sandvik Additive Manufacturing, Sweden)

- **Market Analysis of Metal Binder Jetting**
  - Schmidt-Lehr, M  (AMPower, Germany)
FIRST ANNOUNCEMENT

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9 - 13 October 2022
LYON, FRANCE

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www.mdpi.com/journal/metals

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www.pim-international.com

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Professional magazine that informs about materials, equipment and manufacturing techniques for the industrial sector.

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www.modernmetals.com

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PM Review is the leading global media resource for the design, production and application of press and sintered Powder Metallurgy components, as well as HIP/CIP and powder forging. This includes ferrous and non-ferrous components, hard materials, PM high alloy steels, superalloys, diamond tools and sintered magnets. PM Review also focuses on metal powder production for end-use areas, including Additive Manufacturing. Published quarterly in both digital and print formats it supported by a content rich website, weekly e-newsletter and regular social media campaigns that promote PM as a progressive and dynamic metal forming technology.

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General Information

- Registration and Fees
- General Information
## Registration Fees

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<tr>
<th>Attendees type</th>
<th>Delegates</th>
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<th>Exhibition access</th>
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General Information

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Global Powder Metallurgy Property Database

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The Global Powder Metallurgy Property Database – a special online resource

The Global Powder Metallurgy Database (GPMD) was created in response to the absence of a readily accessible source of design data which was acting as a significant impediment to the wider application of PM products. The database was the result of a global collaboration between the three major regional trade associations: EPMA (Europe), MPIF (North America) and JPMA (Japan). Since its launch in 2004 the content has been steadily increased to a total of nearly 4000 lines of high quality data.

The GPMD provides physical, mechanical and fatigue data for a range of commercially available PM materials. Originally covering the mechanical and physical properties of PM Steels and Stainless Steels from 6.4 gm/cc upwards, Powder Forged Steels, non ferrous materials and bearing alloys over one thousand new lines of data have been added since the launch. These now additionally cover ferrous and non ferrous MIM materials, fatigue endurance limits and SN curves.

A well tested system of data collection and validation means that the maximum amount of technical information can be displayed without compromising the source and confidentiality of donating organisations. Current areas to be further developed include expanding the available MIM data, obtaining and verifying data from the PM HIP sector and additional data for fatigue properties. With over 9000 registered users from all parts of the world the database provides a significant resource to a very wide range of designers and engineers who may not be familiar with PM technology.

The free to access database allows detailed searches on physical and mechanical properties to be made and results downloaded as either spreadsheets or into well-known FEA packages such as Abacus or MSC. The associated website at www.pmdatabase.com also provides background data on the PM process and designing for PM. Users can also view a list of contributing PM parts makers with contact details. For more first class data please visit:

www.pmdatabase.com

Visit the website for more information on:
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• How to access it
• How it works
Thermal Process Equipment for PM Applications

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Whether for **MIM**, **CIM** or **AM**, we design, construct and deliver thermal plants to suit specific thermal applications.

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