



# 19 | PLANSEE SEMINAR 2017

International Conference on  
Refractory Metals and Hard Materials

Reutte/Austria  
29 May – 2 June, 2017

Final Programme

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## Welcome to the 19<sup>th</sup> Plansee Seminar!

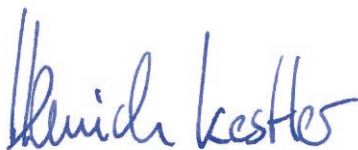
I am greatly honored by the many contributions we received in response to our call for papers. The large number of 216 contributions clearly emphasizes your continued interest in the science and technology of refractory metals and hard materials, more than sixty years after the first Plansee Seminar was held in 1952.

The presentations of the 19th Plansee Seminar, both, lectures and posters, cover all aspects of refractory metals and hard materials. Starting with global overviews of markets and R&D trends, they address all disciplines of our industry: from innovations in powder production to processing, materials and their applications, from modeling and characterization to recycling as well as new manufacturing technologies like cold gas spraying and additive manufacturing.

We are very much looking forward to this Seminar as a platform of scientific and technological exchange as well as a lively meeting-place to establish and foster contacts and relationships in the refractory metals and hard materials community.

I am grateful for your continued interest and commitment to this conference and encourage you to bring in your expertise, be it by presenting a paper or by participating in the discussions.

Let me wish you an enriching seminar week in an inspiring atmosphere!



Heinrich Kestler  
Secretary of the Plansee Seminar

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# Programme Overview

Sunday, 28 May	Monday, 29 May	Tuesday, 30 May
	08:00 Registration	08:30 Hard Materials Materials 1
	08:30 Musical Welcome	10:00 Break
	09:30 Opening Ceremony	10:30 Hard Materials Materials 2
	10:00 Opening Session	12:10 Lunch Break
	12:00 Lunch Break	14:00 Refractory Metals Materials 1
14:00 Registration	14:00 Hard Materials Applications	14:00 Special Interest Seminar Hard Materials Micromechanics
	15:40 Break	15:40 Break
	16:10 Refractory Metals Applications	16:10 Refractory Metals Materials 2
	17:40 End of Session	16:10 Special Interest Seminar Hard Materials Mechanical Properties
		17:50 End of Session
		18:00 Poster Evening

# Programme Overview

Wednesday, 31 May	Thursday, 1 June	Friday, 2 June
08:30 Refractory Metals Materials 3	08:30 Refractory Metals Additive Manufacturing	08:30 Hard Materials Modeling
10:10 Break	08:30 Special Interest Seminar Hard Materials CVD	10:10 Break
10:40 Refractory Metals Characterization	10:10 Break	10:40 Refractory Metals Simulation
12:20 Lunch Break	10:40 Refractory Metals Processing	12:10 Farewell Address
14:00 Hard Materials Characterization	10:50 Special Interest Seminar Hard Materials PVD	12:50 End of Seminar
15:40 Break	12:20 Lunch Break	
16:10 Recycling and Tungsten Chemistry	14:00 Hard Materials Coating	
17:50 End of Session	15:40 Break	
	16:10 Hard Materials Processes	
	17:50 End of Session	
	19:30 Conference Dinner	

# Oral Sessions

## Monday, 29 May, 08:30 – 10:00 Opening Ceremony

08:30	<b>Musical Welcome</b>	Plansee Werksmusik
09:30	<b>Allegro from Serenade No. 13 W. A. Mozart</b>	Chamber Orchestra Reutte Conductor: Tobias Lämmle
	<b>Opening Address</b>	Karlheinz Wex Member of the Executive Board, Plansee Holding AG
	<b>Capriol Suite P. Warlock</b>	Chamber Orchestra Reutte
	<b>Welcome Address</b>	Lorenz S. Sigl Chairman of the Seminar
	<b>Concerto Grosso No. 1 E. Bloch</b>	Chamber Orchestra Reutte

## Monday, 29 May, 10:00 – 12:00 Opening Session

Chair: Sigl L.S., Plansee SE, Austria  
Kestler H., Plansee SE, Austria  
Location: Walter Schwarzkopf Hall, WSH

10:00	<b>OS 1</b>	<b>Alice and the elements of innovation</b> Raynor M.E.* *Monitor Deloitte, USA
10:40	<b>OS 2</b>	<b>Basic development in refractory metal markets</b> Lausecker U.* *Plansee SE, Austria
11:20	<b>OS 3</b>	<b>Global trends in hard materials</b> Gey C.*, Bitler J.*, Banerjee D.*, Goldsmith J.*, Kohlscheen J.*, Wolf M.* *Kennametal Inc., USA
12:00 – 14:00		<b>Lunch Break</b>

## Monday, 29 May, 14:30 – 15:40 Hard Materials – Applications

Chair: Schleinhofer U., CERATIZIT Austria GmbH, Austria  
Norgren S., Sandvik & Uppsala University, Sweden  
Location: Walter Schwarzkopf Hall, WSH

14:00	<b>HM 1</b>	<b>HPC-Milling of WC-Co cemented carbides with PCD</b> <u>Hintze W.*</u> , Steinbach S.*, Hertel C.*, Kähler F.* *Hamburg University of Technology, Germany
14:20	<b>HM 2</b>	<b>Investigation of wear resistance of coated PcBN turning tools for hard machining</b> Uhlmann E.*, <u>Riemer H.*</u> , Schröter D.*, Henze S.*, Sammler F.*, Frank H.** *Technical University of Berlin, Germany **GFE - society of production engineering Schmalkalden, Germany



# Oral Sessions

- 14:40    HM 3    **Coatings and tool materials for efficient gear manufacturing**  
Eriksson A.\*, Arndt M.\*  
\*Oerlikon Surface Solutions AG, Liechtenstein
- 15:00    HM 4    **Interaction between cemented carbide and Ti6Al4V alloy in cryogenic machining**  
Lattemann M.\*, Coronel E.\*, Garcia J.\*, Sadik I.\*  
\*Sandvik Coromant, Sweden
- 15:20    HM 5    **Characterization of the corrosion behaviour of cemented tungsten carbides in chloride containing solutions at elevated temperatures**  
Kube R.\*, Sarmiento Klapper H.\*, Stevens J.\*  
\*Baker Hughes, Germany
- 15:40 – 16:10    **Break**

## Monday, 29 May, 16:10 – 17:40 Refractory Metals – Applications

Chair:        Leichtfried Gerhard, Universität Innsbruck, Austria  
              Knabl Wolfram, Plansee SE, Austria

Location:    Walter Schwarzkopf Hall, WSH

- 16:10    RM 1    **Applications of refractory metals in medical imaging systems**  
Fritzler S.\*, Bernhardt J.\*  
\*Siemens Healthcare GmbH, Germany
- 16:40    RM 2    **Carbon doping - A key for the substitute of thoriated tungsten**  
Traxler H.\*, Wesemann I.\*, Knabl W.\*, Nilius M.\*\*, Morkel M.\*\*\*, Höbing T.\*\*\*, Mentel J.\*\*\*, Awakowicz P.\*\*\*  
\*Plansee SE, Austria  
\*\*Osram GmbH, Germany  
\*\*\*Ruhr-Universität-Bochum, Germany
- 17:00    RM 3    **Optimization of CuCr contact materials for vacuum interrupters**  
Hauf U.\*, Feilbach A.\*\*\*, Böning M.\*\*\*, Hinrichsen V.\*\*\*, Müller F.E.H.\*\*\*, Heilmaier M.\*  
\*Karlsruhe Institute of Technology, Germany  
\*\*Technical University of Darmstadt, Germany  
\*\*\*Plansee Powertech AG, Switzerland
- 7:20    RM 4    **Development of bio-compatible refractory Ti/Nb/(Ta) alloys for application in patient-specific orthopaedic implants**  
Weinmann M.\*, Schnitter C.\*, Stenzel M.\*, Markhoff J.\*\*\*, Schulze C.\*\*, Bader R.\*\*  
\*H.C. Starck Tantalum and Niobium GmbH, Germany  
\*\*University of Rostock, Germany
- 17:40    **End of sessions**

# Oral Sessions

## Tuesday, 30 May, 08:30 – 10:00 Hard Materials – Materials 1

Chair: Prakash Leo, WTP Materials Engineering, Germany  
Magin Michael, CERATIZIT Luxembourg S.à.r.l., Luxembourg  
Location: Walter Schwarzkopf Hall, WSH

- 08:30 HM 6 **Novel industrial hardmetals for mining, construction and wear applications**  
Konyashin L.\*, Ries B.\*\*, Hlawatschek S.\*\*, Hinners H.\*\*  
\*Element Six GmbH, Germany; National University of Science and Technology MISIS, Russia  
\*\*Element Six GmbH, Germany
- 09:00 HM 7 **Ultra-fine grained cemented carbide by the addition of fine Ti(C,N) particles**  
Matsubara H.\*, Takada M.\*  
\*Tohoku University, Japan
- 09:20 HM 8 **Grain growth inhibition of hardmetals during initial heat-up**  
Pötschke J.\*, Gestrich T.\*, Richter V.\*  
\*Fraunhofer Institute for Ceramic Technologies and Systems IKTS, Germany
- 09:40 HM 9 **On gradient formation in alternative binder cemented carbides**  
Norgren S.\*, Garcia J.\*  
\*Sandvik Coromant, Sweden
- 10:00 – 10:30 **Break**

## Tuesday, 30 May, 10:30 – 12:10 Hard Materials – Materials 2

Chair: Vleugels Jozef, Katholieke Universiteit Leuven, Belgium  
Bose Animesh, Desktop Metal, USA  
Location: Walter Schwarzkopf Hall, WSH

- 10:30 HM 10 **Metastable phase at WC/Co interface in cemented carbides containing grain growth inhibitor**  
Liu X.\*, Song X.\*, Wang H.\*, Hou C.\*, Liu X.\*  
\*Beijing University of Technology, China
- 10:50 HM 11 **Effect of the chromium and carbon contents on the sintering behaviour of TiCN-WC-Ni-Cr<sub>3</sub>C<sub>2</sub> powder mixtures**  
Sánchez-Moreno J.M.\*, Lopez Ezquerro B.\*, Ibarreta Lopez F.\*\*, Martinez Pampliega R.\*\*  
\*Ceit-IK4, Spain  
\*\*FMD CARBIDE, Spain
- 11:10 HM 12 **Effects of doping WC-Co hardmetals with Mo and Mo<sub>2</sub>C**  
Jewett T.\*  
\*Global Tungsten & Powders Corp., USA
- 11:30 HM 13 **NbC grain growth control and mechanical properties of Ni bonded NbC cermets prepared by vacuum liquid phase sintering**  
Huang S.\*, Vleugels J.\*, Mohrbacher H.\*, Woydt M.\*\*  
\*Katholieke Universiteit Leuven, Belgium  
\*\*Federal Institute for Materials Research and Testing, Germany
- 11:50 HM 14 **High entropy alloy binders in gradient sintered hardmetal**  
Linder D.\*, Holmström E.\*\*, Norgren S.\*\*  
\*KTH Royal Institute of Technology, Sweden  
\*\*Sandvik Coromant, Sweden
- 12:10 – 14:00 **Lunch Break**

# Oral Sessions

## Tuesday, 30 May, 14:00 – 15:40 Refractory Metals – Materials 1

Chair: Song Xiaoyan, Beijing University of Technology, China

Johnson John L., Elmet Technologies LLC, USA

Location: Walter Schwarzkopf Hall, WSH

- 14:00 RM 5 Physical metallurgy of the molybdenum base alloy MHC**  
Lang D.\*, Schatte J.\*, Knabl W.\*, Clemens H.\*\*  
\*Plansee SE, Austria  
\*\*University of Leoben, Austria
- 14:20 RM 6 Particle-stimulated nucleation of recrystallization in hot-pressed molybdenum-based MZ-17 alloy**  
Silva E.Z.\*, Kestler H.\*\*, Sandim H.\*  
\*University of São Paulo, Brazil  
\*\*Plansee SE, Austria
- 14:40 RM 7 Phase transformations in HfNbTiVZr high-entropy alloys during annealing**  
Karlsson D.\*, Fritze S.\*, Berastegui P.\*, Sahlberg M.\*, Lewin E.\*, Jansson U.\*  
\*Uppsala University, Sweden
- 15:00 RM 8 Nanolaminated ternary carbide (MAX phase) materials for high temperature applications**  
Lapauw T.\*, Swarnakar A.K.\*\*, Lambrinou K.\*\*, Tunca B.\*, Vleugels J.\*\*  
\*Katholieke Universiteit Leuven - SCK CEN, Belgium  
\*\*Katholieke Universiteit Leuven, Belgium  
\*\*\*SCK CEN, Belgium
- 15:20 RM 9 Ductilisation of tungsten (W) through cold-rolling**  
Reiser J.\*, Hoffmann J.\*, Jäntsch U.\*, Klimenkov M.\*, Bonk S.\*, Bonnekoh C.\*, Pippan R.\*\*, Hoffmann A.\*\*\*, Rieth M.\*  
\*Karlsruhe Institute of Technology, Germany  
\*\*University of Leoben, Austria  
\*\*\*Plansee SE, Austria
- 15:40 – 16:10 Break**

## Tuesday, 30 May, 14:00 – 15:40 Special Interest Session: Hard Materials – Micromechanics

Chair: Broeckmann Christoph, RWTH Aachen, Germany

Sigl Lorenz S., Plansee SE, Austria

Location: Lecture Hall

- 14:00 HM 35 Assessing WC-WC interfaces in WC-Co hardmetals through micro-beam testing**  
Elizalde M.B.\*, Ocaña I.\*, Alkorta J.\*, Sánchez-Moreno J.M.\*  
\*Ceit-IK4 and University of Navarra, Spain
- 14:20 HM 36 Revealing mechanisms of abrasion in WC/Co hardmetals by in situ scratch testing**  
Gee M.\*, Nunn J.\*, Mingard K.\*, Roebuck B.\*, Jones H.\*  
\*National Physical Laboratory, United Kingdom
- 14:40 HM 37 Small scale mechanical response of WC-Co cemented carbides**  
Roa J.J.\*, Jiménez-Piqué E.\*, Sandoval D.\*, Tarrago J.M.\*, Fair J.\*\*, Tarres E.\*\*, Llanes L.\*  
\*Universitat Politècnica de Catalunya, Spain  
\*\*Sandvik Hyperion, United Kingdom

# Oral Sessions

- 15:00    **HM 38**    **Annealing effect on the fracture toughness of CrN/TiN superlattices**  
Hahn R.\*, Bartosik M.\*, Arndt M.\*\*\*, Polcik P\*\*\*\*, Mayrhofer P.H.\*  
\*CDL-AOS at Technical University of Vienna, Austria  
\*\*Oerlikon Surface Solutions AG, Liechtenstein  
\*\*\*Plansee Composite Materials GmbH, Germany
- 15:20    **HM 39**    **Investigations of micro-mechanical properties of Ti(C,N) and Zr(C,N) coatings**  
El Azhari I.\*, Zamanzade M.\*, Garcia J.\*\*, Soldera F.\*, Motz C.\*, Mücklich F.\*  
\*Saarland University, Germany  
\*\*Sandvik Coromant, Sweden
- 15:40 – 16:10    **Break**

## Tuesday, 30 May, 16:10 – 17:50 Refractory Metals – Materials 2

Chair:        Heilmairer Martin, Karlsruhe Institut of Technology, Germany  
              Granzer Thomas, Plansee Composite Materials GmbH, Germany  
Location:    Walter Schwarzkopf Hall, WSH

- 16:10    **RM 10**    **Environmental resistant Mo-Si-B based coatings**  
Perepezko J.H.\*, Sossaman T.A.\*, Taylor M.\*  
\*The University of Wisconsin-Madison, USA
- 16:30    **RM 11**    **Influence of B content on microstructure and properties of fine-grained lanthanum oxide-doped Mo-Si-B alloys**  
Li R.\*, Li B.\*\*, Ren S.\*, Zhang G.\*, Liu D.\*\*\*, Sun Y.\*\*\*  
\*Xi'an University of Technology, China  
\*\*Northwest Institute for Non-ferrous Metal Research, China  
\*\*\*Jinduicheng Molybdenum Co., Ltd., China
- 16:50    **RM 12**    **Microstructural analysis and high temperature creep testing of Mo-9Si-8B-xAl-yGe alloys**  
Kellner P.\*, Rainer V.\*, Uwe G.\*  
\*University Bayreuth, Germany
- 17:10    **RM 14**    **Ti-Al-N/Mo-Si-B multilayers: An architectural design for high temperature oxidation resistant hard coatings**  
Riedl H.\*, Aschauer E.\*, Koller C.M.\*\*\*, Polcik P.\*\*\*, Arndt M.\*\*\*\*, Mayrhofer P.H.\*\*  
\*CDL-AOS at Technical University of Vienna, Austria  
\*\*Technical University of Vienna, Austria  
\*\*\*Plansee Composite Materials GmbH, Germany  
\*\*\*\*Oerlikon Surface Solutions AG, Liechtenstein
- 17:30    **RM 13**    **Effect of the addition of Nb on mechanical properties in Mo-Si-B alloy**  
Kim Y.D.\*, Byun J.M.\*, Bang S.-R.\*, Choi W.J.\*  
\*Hanyang University, South Korea
- 17:50    **End of sessions**

# Oral Sessions

## Tuesday, 30 May, 16:10 – 17:50 Special Interest Session: Hard Materials – Mechanical Properties

Chair: Fang Zhigang Zak, University of Utah, USA  
Gee Mark, National Physical Laboratory, United Kingdom  
Location: Lecture Hall

- 16:10 HM 40 **Strength and reliability of WC-Co cemented carbides: Understanding microstructural effects on the basis of R-curve behavior and fractography**  
Tarragó J.\*, Coureaux D.\*\*, Torres Y.\*\*\*, Jiménez-Piqué E.\*\*, Schneider L.\*\*\*\*, Fair J.\*\*\*\*, Llanes L.\*\*  
\*Sandvik Mining and Construction Tools AB, Sweden  
\*\*Universitat Politècnica de Catalunya, Spain  
\*\*\*Universidad de Sevilla, Spain  
\*\*\*\*Sandvik Hyperion, United Kingdom
- 16:30 HM 41 **Mechanisms of plastic deformation in WC-Co and WC-Ni-Fe turning inserts**  
Toller L.\*, Norgren S.\*\*  
\*Uppsala University, Sweden  
\*\*Sandvik Coromant, Uppsala University, Sweden
- 16:50 HM 42 **Strengthening effects and plastic accommodation in ultrafine and nanocrystalline cemented carbides**  
Song X.\*, Liu X.\*, Feng Q.\*, Wang H.\*, Liu X.\*  
\*Beijing University of Technology, China
- 17:10 HM 43 **Cyclic plastic deformation behaviour of WC-Co hard metals at elevated temperatures**  
Tritremmel C.\*, Klünsner T.\*, Sartory B.\*, Czettel C.\*\*, Marsoner S.\*  
\*Materials Center Leoben Forschung GmbH, Austria  
\*\*CERATIZIT Austria GmbH, Austria
- 17:30 HM 44 **Design of coated cemented carbides with improved comb crack resistance**  
Garcia J.\*, Moreno M.F.\*\*, Östby J.\*, Persson J.\*, Pinto H.\*\*  
\*Sandvik Coromant, Sweden  
\*\*University of São Paulo, Brazil
- 17:50 End of sessions

# Oral Sessions

## Wednesday, 31 May, 08:30 – 10:10 Refractory Metals – Materials 3

Chair: Perepezko John H., The University of Wisconsin-Madison, USA

Cury Rafael, PLANSEE Tungsten Alloys, France

Location: Walter Schwarzkopf Hall, WSH

- 08:30 RM 15 **Toward a smart molybdenum technology: Next generation superconducting wires**  
Seeber B.\*  
\*scMetrology SARL, Switzerland
- 08:50 RM 16 **Niobium alloys for the chemical process industry**  
Aimone P.\*, Yang M.\*  
\*H.C. Starck, Inc., USA
- 09:10 RM 17 **Microstructure development of chromium-rich Cr-Si-Ge alloys**  
Ulrich A.S.\*, Soleimani Dorcheh A.\*, Galetz M.C.\*  
\*DECHEMA-Forschungsinstitut, Germany
- 09:30 RM 18 **Self-passivating tungsten alloys of the system W-Cr-Y for high temperature applications**  
García-Rosales C.\*, Calvo A.\*, Schlüter K.\*\*, Neu R.\*\*, Pintsuk G.\*\*\*, Tejado E.\*\*\*\*, Pastor J.Y.\*\*\*\*, Ordás N.\*, Iturriza I.\*  
\*Ceit-IK4, Spain  
\*\*Max-Planck-Institut für Plasmaphysik, Germany  
\*\*\*Forschungszentrum Jülich GmbH, Germany  
\*\*\*\*Polytechnic University of Madrid, Spain
- 09:50 RM 19 **Development of advanced W-based alloy tool for FSW of austenitic stainless steel**  
Tsuji A.\*, Sato Y.S.\*\*\*, Kokawa H.\*\*\*, Susukida S.\*\*\*, Moriguchi H.\*\*\*, Shibata A.\*\*\*, Tomohiro T.\*, Akihiko I.\*  
\*Allied Materials, Japan  
\*\*Tohoku University, Japan  
\*\*\*Nippon ITF, Japan
- 10:10 Break

## Wednesday, 31 May, 10:40 – 12:20 Refractory Metals – Characterization

Chair: Clemens Helmut, Montanuniversität Leoben, Austria

Hoose André, Plansee SE, Austria

Location: Walter Schwarzkopf Hall, WSH

- 10:40 RM 20 **A method for measuring the high temperature emissivity of refractory metal surfaces**  
Mayr-Schmölzer B.\*, Wesemann I.\*, Tröber R.\*, O'Sullivan M.\*, Kestler H.\*, Sigl L.S.\*  
\*Plansee SE, Austria
- 11:00 RM 21 **Interaction of precipitation, recovery and recrystallization in the Mo-Hf-C alloy MHC studied by multipass compression tests**  
Siller M.\*, Lang D.\*\*\*, Schatte J.\*\*\*, Knabl W.\*\*\*, Clemens H.\*\*, Maier-Kiener V.\*  
\*University of Leoben, Austria  
\*\*Plansee SE, Austria
- 11:20 RM 22 **Microstructure and mechanical properties of large tungsten component for radiation shielding**  
Liu C.\*, Jiang X.\*, Song J.\*, Yu Y.\*  
\*Xiamen Tungsten Co. Ltd., China

# Oral Sessions

- 11:40 RM 23 **Characterization of neutron irradiated tungsten by transmission electron microscopy**  
Klimenkov M., Jäntschi U.\*, Rieth M.\*, Armstrong D.\*\*, Gibson J.\*\*, Roberts S.G.\*\*  
\*Karlsruhe Institute of Technology, Germany  
\*\*University of Oxford, United Kingdom
- 12:00 RM 24 **Recrystallization and composition dependent thermal fatigue response of different tungsten grades**  
Pintsuk G., Antusch S.\*\*, Weingärtner T.\*\*, Wirtz M.\*  
\*Forschungszentrum Jülich GmbH, Germany  
\*\*Karlsruhe Institute of Technology, Germany
- 12:20 – 14:00 Lunch Break

## Wednesday, 31 May, 14:00 – 15:40 Hard Materials – Characterization

Chair: Llanes Luis, Universitat Politècnica de Catalunya, Spain

Tkadletz Michael, Montanuniversität Leoben, Austria

Location: Walter Schwarzkopf Hall, WSH

- 14:00 HM 15 **Visualisation and measurement of hardmetal microstructures in 3D**  
Mingard K., Roebuck B.\*, Jones H.\*, Stewart M.\*, Cox D.\*, Gee M.\*  
\*National Physical Laboratory, United Kingdom
- 14:20 HM 16 **Influence of sintering parameters on micro-scale mechanical and tribological behavior of niobium carbides**  
Fukumasu N.K.\*, Tertuliano A.J.\*, Bernardes C.F.\*, Seriacopi V.\*, Souza R.M.\*,  
Machado I.E.\*  
\*University of São Paulo, Brazil
- 14:40 HM 17 **High resolution STEM investigation of interface layers in cemented carbides**  
Meingast A.\*, Coronel E., Blomqvist A.\*, Norgren S.\*, Wahnström G.\*\*, Lattemann M.\*  
\*Sandvik Coromant, Sweden  
\*\*Chalmers University of Technology, Sweden
- 15:00 HM 18 **Influence of microstructure on the thermal conductivity of cemented carbides**  
Ono A., Okada K.\*, Homma H.\*, Nakanishi Y.\*  
\*Mitsubishi Materials Corporation, Japan
- 15:20 HM 19 **Thermophysical properties of Co-free WC-FeCr hardmetals**  
Humphry-Baker S.A., Marshall J.M.\*\*, Smith D.W. G.\*\*\*, Lee W.E.\*  
\*Imperial College London, United Kingdom  
\*\*Sandvik Hyperion, United Kingdom  
\*\*\*Tokamak Energy, United Kingdom
- 15:40 – 16:10 Break

# Oral Sessions

## Wednesday, 31 May, 16:10 – 17:30 Recycling and Tungsten Chemistry

Chair: Trasarros Juan R.L., Global Tungsten & Powders Corp., USA

Antrekowitsch Helmut, University of Leoben, Austria

Location: Walter Schwarzkopf Hall, WSH

- 16:10 RC 1 Zinc-reclaim of refractory materials: mechanisms and limitations**  
Weissensteiner C.M.\*, Mühlbauer G.\*\*, Qvick J.\*\*\*, Schubert W.-D.\*, Edtmaier C.\*  
\*Vienna University of Technology, Austria  
\*\*Wolfram Bergbau und Hütten AG, Austria  
\*\*\*Seco Tools AB, Sweden
- 16:30 RC 2 Effect of powder particle size distribution on the properties of submicron hard metal made of WC-Co zinc reclaim powders**  
Karhuma T.\*, Laamanen T.\*, Oinonen J.\*, Kurkela M.\*, Jewett T.\*\*, Trasarros J.R.L.\*\*  
\*Tikomet Oy, Finland  
\*\*Global Tungsten & Powders Corp., USA
- 16:50 RC 3 Leaching kinetics for semi-direct recycling of drill bits**  
Kerschbaumer C.\*, Luidold S.\*, Wolfe T.\*\*, Smith A.\*\*  
\*University of Leoben, Austria  
\*\*Global Tungsten & Powders Corp., USA
- 17:10 RC 4 Formation, stability and application of tungstates, tungsten oxides and tungsten bronzes**  
Szilágyi I.M.\*  
\*Budapest University of Technology and Economics, Hungary
- 17:30 End of sessions**



# Oral Sessions

## Thursday, 1 June, 08:30 – 10:10 Refractory Metals – Additive Manufacturing

Chair: Kieback Bernd, Fraunhofer IFAM /TU Dresden, Germany

Kestler Heinrich, Plansee SE, Austria

Location: Walter Schwarzkopf Hall, WSH

- 08:30 RM 25 Selective laser melting of tungsten and tungsten alloys**  
Ivekovic A.\*, Omidvari N.\*, Vrancken B.\*, Lietaert K.\*\*, Thijs L.\*\*, Vanmeensel K.\*, Vleugels J.\*, Kruth J.-P.\*  
\*Katholieke Universiteit Leuven, Belgium  
\*\*3D Systems, Belgium
- 08:50 RM 26 Fundamental analysis of the influence of powder characteristics in selective laser melting of molybdenum based on a multi-physical simulation model**  
Leitz K.-H.\*, Grohs C.\*, Singer P.\*, Tabernig B.\*, Plankensteiner A.\*, Kestler H.\*, Sigl L.S.\*  
\*Plansee SE, Austria
- 09:10 RM 27 Comparison of LCAC and PM Mo deposited using Sciaky EBAM**  
Stawowy M.\*  
\*H.C. Starck, Inc., USA
- 09:30 RM 28 Wire + Arc additive manufacturing: Towards a new way of producing large-scale refractory metals component**  
Marinelli G.\*, Martina F.\*, Ganguly S.\*, Williams S.\*  
\*Cranfield University, United Kingdom
- 09:50 RM 29 Cold spray of tungsten powders above and below the DBTT**  
Smid J.\*, Schreiber J.\*, Eden T.\*  
\*Penn State University, USA
- 10:10 – 10:40 Break**

## Thursday, 1 June, 08:30 – 10:20 Special Interest Session: Hard Materials – Chemical Vapor Deposition

Chair: Winkler Jörg, Plansee SE, Austria

Holzschuh Helga, SuCoTec AG, Switzerland

Location: Lecture Hall

- 08:30 HM 45 CVD TiAlN – Development and challenges for use in mass production**  
Czettl C.\*, Schleinkofer U.\*, Schedle F.\*, Wolf C.\*, Lechleitner M.\*, Holzschuh H.\*\*\*, Bürgin W.\*\*  
\*CERATIZIT Austria GmbH, Austria  
\*\*Sucotec AG, Switzerland
- 09:00 HM 46 Self-organized TiAlN HR-CVD coatings with functionalized nanolamellar microstructures**  
Pitonak R.\*, Köpf A.\*, Lessiak M.\*, Keckes J.\*\*\*, Todt J.\*\*\*, Zalesak J.\*\*\*, Meindhumer M.\*\*\*, Weißenbacher R.\*  
\*BOEHLERIT GmbH & Co KG, Austria  
\*\*University of Leoben, Austria

# Oral Sessions

- 09:20 HM 47 CVD TiAlN technology - Coating properties and applications  
Vogiatzis S.\*, Papageorgiou V.\*, Strakov H.\*, Auger M.\*  
\*IHI Ionbond AG, Switzerland
- 09:40 HM 48 Influence of the Al content on mechanical properties of CVD aluminum titanium nitride coatings  
Ishigaki T.\*, Tatsuoka S.\*, Sato K.\*, Yanagisawa K.\*, Yamaguchi K.\*, Nishida S.\*  
\*Mitsubishi Materials Corporation, Japan
- 10:00 HM 49 Thermal stability of Al-rich c-AlxTi1-xN coatings prepared by LP-CVD  
Paseuth A.\*, Miura A.\*\*\*, Tadanaga K.\*\*\*, Yamagata K.\*  
\*Sumitomo Electric Hardmetal Corp., Japan  
\*\*Hokkaido University, Japan
- 10:20 – 10:50 Break

## Thursday, 1 June, 10:40 – 12:20 Refractory Metals – Processing

Chair: Tabernig Bernhard, Plansee SE, Austria  
Leichtfried Gerhard, Universität Innsbruck, Austria  
Location: Walter Schwarzkopf Hall, WSH

- 10:40 RM 30 How gravity influences accuracy in liquid phase sintering  
German R.\*, Olevsky E.\*  
\*San Diego State University, USA
- 11:00 RM 31 Coarsening, densification, and grain growth during sintering of nanosized tungsten powder  
Fang Z.\*, Ren C.\*, Koopman M.\*, Wang H.\*\*  
\*University of Utah, USA  
\*\*Kennametal Inc., USA
- 11:20 RM 33 Development of tungsten components for langmuir probes in ITER by metal injection molding  
Jiang X.\*, Wang W.\*, Song J.\*, Yu Y.\*, Lian Y.\*\*\*, Zhao W.\*\*\*, Zhong G.\*\*\*, Liu X.\*\*  
\*Xiamen Tungsten Co., Ltd., China  
\*\*Southwestern Institute of Physics, China
- 11:40 RM 34 Development and industrialization of a tungsten heavy metal feedstock for metal injection molding based on BASF's CATAMOLD™ technology  
Loeber O.\*, Bloemacher M.\*, Fleischmann S.\*, Wallot J.\*  
\*BASF SE, Germany
- 12:00 RM 85 Traditional and additive manufacturing of a new tungsten heavy alloy alternative  
Bose A.\*, Schuh C.A.\*\*\*, Tobia J.C.\*, Tuncer, N.\*, Mykulowycz N.M.\*, Preston A.\*, Barbatí A.C.\*\*\*, Kernan B.\*, Gibson M.A.\*, Krause D.\*, Brzezinski T.\*, Schroers J.\*\*\*, Fulop R.\*, Myerberg J.S.\*, Sowerbutts M.\*, Chiang Y.-M.\*\*\*, Hart A.J.\*\*\*, Sachs E.M.\*\*\*, Lomeli E.E.\*\*\*\*, Lund A.C.\*\*\*\*  
\*Desktop Metal, Inc., USA  
\*\*Desktop Metal, Inc., Massachusetts Institute of Technology, USA  
\*\*\*Desktop Metal, Inc., Yale University, USA  
\*\*\*\*Veloxint Corporation, USA
- 12:20 – 14:00 Lunch Break

# Oral Sessions

## Thursday, 1 June, 10:50 – 12:10 Special Interest Session: Hard Materials – Physical Vapor Deposition

Chair: Mayrhofer Paul, TU Wien, Austria  
Czettl Christoph, CERATIZIT Austria GmbH, Austria  
Location: Lecture Hall

- 10:50 HM 50 Cerium doping of Ti-Al-N coatings for excellent thermal stability and oxidation resistance**  
Asanuma H., Polcik P\*\*, Kolozsvári S\*\*, Klimashin F.F.\*\*\*, Riedl H.\*, Mayrhofer P.H.\*  
\*Technical University of Vienna, Austria  
\*\*Plansee Composite Materials GmbH, Austria  
\*\*\*CDL-AOS at Technical University of Vienna, Austria
- 11:10 HM 51 Thermal stability and mechanical properties of Ti-Al-B-N thin films**  
Moraes V., Bolvardi H.\*\*, Kolozsvári S.\*\*\*, Riedl H.\*\*\*\*, Mayrhofer P.H.\*\*\*\*  
\*CDL-AOS at Technical University of Vienna, Austria  
\*\*Oerlikon Balzers Surface Solutions AG, Liechtenstein  
\*\*\*Plansee Composite Materials GmbH, Germany  
\*\*\*\*Technical University of Vienna, Austria
- 11:30 HM 52 Influence of Ta-addition and layer arrangement on the structure, mechanical and thermal of TiAlN coatings**  
Yang Y.\*, Xu Y.X.\*, Chen L., Du Y.\*  
\*Central South University, China
- 11:50 HM 53 Microstructure, mechanical properties and application behavior of Cr1-xTaxN hard coatings**  
Pohler M., Schalk N\*\*, Hirn S\*\*, Terziyska V.T\*\*, Polcik P.\*\*\*, Kolozsvári S.\*\*\*, Mitterer C\*\*, Czettl C.\*  
\*CERATIZIT Austria GmbH, Austria  
\*\*University of Leoben, Austria  
\*\*\*Plansee Composite Materials GmbH, Germany
- 12:10 – 14:00 Lunch Break**

## Thursday, 1 June, 14:00 – 15:40 Hard Materials – Coating

Chair: Pitonak Reinhard, Boehlerit GmbH & Co. KG, Austria  
Polcik Peter, Plansee Composite Materials GmbH, Germany  
Location: Walter Schwarzkopf Hall, WSH

- 14:00 HM 20 Powder, target, coating - Design of dedicated interfaces**  
Ast J.\*, Döbell M\*\*, Dommann A.\*, Gindrat M.\*\*\*, Maeder X.\*, Neels A.\*, Polcik P.\*\*\*\*,  
Ramm J.\*\*\*\*\*, Rudigier H.\*\*\*\*\*, Von Allmen K.\*, Widrig B.\*\*\*\*\*  
\*Empa - Swiss Federal Laboratories for Materials Science and Technology, Switzerland  
\*\*ETH Zürich, Switzerland  
\*\*\*Oerlikon Metco AG, Switzerland  
\*\*\*\*Plansee Composite Materials GmbH, Germany  
\*\*\*\*\*Oerlikon Surface Solutions AG, Liechtenstein

# Oral Sessions

- 14:20    **HM 21**    **Microstructure characterization of TiOCN thin films by CVD**  
Liu Z.\*, Chen C.\*, Peter L.\*, Cooper R.\*, Banerjee D.\*  
\*Kennametal Inc., USA
- 14:40    **HM 22**    **Knowledge based coating design of CVD TiN-TiBN-TiB<sub>2</sub> architecture**  
Czetti C.\*, Thurner J.\*, Schleinkofer U.\*  
\*CERATIZIT Austria GmbH, Austria
- 15:00    **HM 23**    **Fracture toughness of Ti-Si-N nanocomposite thin films**  
Bartosik M.\*, Hahn R.\*\*, Arndt M.\*\*\*, Polcik P\*\*\*\*, Mayrhofer P.H.\*  
\*Technical University of Vienna, CDL-AOS at Technical University of Vienna, Austria  
\*\*CDL-AOS at Technical University of Vienna, Austria  
\*\*\*Oerlikon Surface Solutions AG, Liechtenstein  
\*\*\*\*Plansee Composite Materials GmbH, Germany
- 15:20    **HM 24**    **Wear resistance mechanisms of nanostructured WC-Co coatings**  
Wang H.\*, Song X.\*, Liu X.\*, Wang X.\*  
\*Beijing University of Technology, China
- 15:40 – 16:10    **Break**

## Thursday, 1 June, 16:10 – 17:50    Hard Material – Processes

Chair:        Sánchez-Moreno José Manuel, CEIT-Centro de Estudios e Investigaciones, Spain

Schleinkofer Uwe, CERATIZIT Austria GmbH, Austria

Location:    Walter Schwarzkopf Hall, WSH

- 16:10    **HM 25**    **Predicting flowability of powders based on the specific surface area distribution**  
Troescher N.\*, Enneti R.\*\*, Morgan R.\*\*, Trasorras J.R.L.\*\*  
\*Pennsylvania State University, USA  
\*\*Global Tungsten & Powders Corp., USA
- 16:30    **HM 26**    **Modelling die filling for powders with complex rheology: A new DEM contact-model**  
Breinlinger T.\*, Schubert R., Hashibon A.\*, Kraft T.\*  
\*Fraunhofer Institute for Mechanics of Materials IWM, Germany
- 16:50    **HM 27**    **Impact of crystal defects on the grain growth of cemented carbides**  
Weidow J.\*, Ekström E.\*\*, Kritikos M.\*\*\*, Norgren S.\*\*\*\*  
\*Chalmers University of Technology, Sweden  
\*\*Royal Institute of Technology, Sweden  
\*\*\*Sandvik Coromant, Sweden  
\*\*\*\*Sandvik, Sweden
- 17:10    **HM 28**    **Thermal behaviour of cermets and hardmetals during debinding and sintering**  
Gestrich T.\*, Kaiser A.\*, Pötschke J.\*, Meini J.\*, Höhn S.\*  
\*Fraunhofer Institute for Ceramic Technologies and Systems IKTS, Germany
- 17:30    **HM 29**    **Influence of colloidal processing route on the mechanical properties of Ti(C,N)-based cermets**  
Dios M.\*, González Z.\*\*, Ferrari B.\*\*\*, Kraveva I.\*\*\*\*, Bermejo R.\*\*\*\*\*, Alvarado P.\*, Gordo E.\*  
\*University Carlos III of Madrid, Spain  
\*\*Hispano Italiana de Revestimientos S.A., Spain  
\*\*\*CSIC, Spain  
\*\*\*\*Materials Center Leoben Forschung GmbH, Austria  
\*\*\*\*\*University of Leoben, Austria
- 17:50    **End of sessions**

# Oral Sessions

## Friday, 2 June, 08:30 – 10:10 Hard Materials – Modeling & Simulation

Chair: Peters Carsten, Hilti Corporation, Liechtenstein  
Danninger Herbert, Vienna University of Technology, Austria  
Location: Walter Schwarzkopf Hall, WSH

- 08:30 HM 30 A numerical representation of the industrial production of tungsten powders**  
Estupinan Donoso A.A.\*, Hippe F.\*\*, Peters B.\*\*\*, Useldinger R.\*\*, Wilmes A.A.R.\*\*  
\*CERATIZIT Luxembourg S.à.r.l., University of Luxembourg, Luxembourg  
\*\*CERATIZIT Luxembourg S.à.r.l., Luxembourg  
\*\*\*University of Luxembourg, Luxembourg
- 08:50 HM 31 Development of a thermodynamic database for WC based cemented carbides with Ni<sub>3</sub>Al+Co as composite binder phase**  
Wang Y.\*, Du Y.\*\*, Zhou P.\*\*\*, Chen C.\*\*, Long J.\*\*, Zhang Z.\*\*\*\*, Xu T.\*\*\*\*  
\*Shijiazhuang Tiedao University, China  
\*\*Central South University, China  
\*\*\*Hunan University of Science and Technology, China  
\*\*\*\*State Key Laboratory of Cemented Carbide, Zhuzhou, China
- 09:10 HM 32 Theory of ultra-thin film formation in Ti and Ta doped cemented carbides**  
Johansson S.\*, Wahnström G.\*  
\*Chalmers University of Technology, Sweden
- 09:30 HM 33 Computer simulation on grain growth during sintering for cemented carbides, cermets and ceramics**  
Matsubara H.\*  
\*Tohoku University, Japan
- 09:50 HM 34 ICME guided modeling of surface gradient formation in cemented carbides**  
Walbrühl M.\*, John Å.\*, Blomqvist A.\*\*, Larsson H.\*  
\*KTH Royal Institute of Technology, Sweden  
\*\*Sandvik Coromant R&D, Sweden
- 10:10 – 10:40 Break**

# Oral Sessions

## Friday, 2 June, 10:40 – 12:10 Refractory Metals – Modeling & Simulation

Chair: Smid Ivi, Pennsylvania State University, USA  
Schäfer Jonathan, Ceratizit Austria, Austria

Location: Walter Schwarzkopf Hall, WSH

- 10:40 RM 35 Numerical simulation of the entire production route of refractory metals from powder to a sintered metal part**  
Grohs C., Reinfried N.\*, Plankensteiner A.\*  
\*Plansee SE, Austria
- 11:10 RM 36 Quantifying the effect of C, O and Fe co-segregation in Mo with ab-initio simulations**  
Scheiber D., Pippan R.\*\*, Puschnig P.\*\*\*, Romaner L.\*  
\*Materials Center Leoben Forschung GmbH, Austria  
\*\*Erich Schmid Institut of Materials Science, Austria  
\*\*\*University of Graz, Austria
- 11:30 RM 37 CFDEM modelling of particle heating and acceleration in cold spraying**  
Leitz K.-H.\*, O'Sullivan M.\*, Plankensteiner A.\*, Lichtenegger T.\*\*, Pirker S.\*\*, Kestler H.\*, Sigl L.S.\*  
\*Plansee SE, Austria  
\*\*Johannes Kepler University, Linz, Austria
- 11:50 RM 79 Understanding the W-Ni system for a tungsten heavy alloy: a phase diagram approach**  
Cury R.\*  
\*Plansee Tungsten Alloys, France
- 12:10 Farewell Address**  
Kestler H.\*  
\*Secretary of the 19th Plansee Seminar, Plansee SE, Austria
- 12:50 End of Seminar**

# Poster Evening

Tuesday, 30 May, 18:00 – 22:00

Note: All posters are on display during the whole seminar.

## Poster Session Refractory Metals – Additive Manufacturing

Location: Poster Hall I

- RM 39** Effect of process parameters on the selective laser melting (SLM) of tungsten  
Enneti R.\*, Morgan R.\*, [Atre S.\\*\\*](#)  
\*Global Tungsten & Powders Corp., USA  
\*\*University of Louisville, USA
- RM 40** A novel printable stainless tool steel platform  
[Lemke H.\\*](#), Tuffile C.\*  
\*NanoSteel, USA
- RM 41** Investigation of the selective laser melting process with tungsten metal powder  
[Sidambe A.\\*](#), Fox P.\*  
\*University of Liverpool, United Kingdom
- RM 42** Multi-material manufacturing and large structures made by additive manufacturing using a blown powder process  
[Neubauer E.\\*](#), Vally L.\*, Grech D.\*, Kitzmantel M.\*  
\*RHP-Technology GmbH, Austria
- RM 44** Fused filament fabrication for the production of metal and/or ceramic parts and feedstocks therefore  
[Kukla C.\\*](#), Gonzalez-Gutierrez J.\*, Cano Cano S.\*, Burkhardt C.\*\*\*, Hampel S.\*\*\*, Moritz T.\*\*\*\*, Holzer C.\*  
\*University of Leoben, Austria  
\*\*OBE Ohnmacht & Baumgärtner GmbH & Co. KG, Germany  
\*\*\*HAGE Sondermaschinenbau GmbH & Co KG, Austria  
\*\*\*\*Fraunhofer Institute for Ceramic Technologies and Systems IKTS, Germany

## Poster Session Refractory Metals – Applications

Location: Poster Hall I

- RM 45** Effect of long shelf-time on transformations in Zr-Nb-Pt-Pd biomedical alloys  
[Gasik M.\\*](#), Hanawa T.\*\*, Nomura N.\*\*\*  
\*Aalto University School of Chemical Technology, Finland  
\*\*Tokyo Medical and Dental University, Japan  
\*\*\*Tohoku University, Japan
- RM 46** Reclaim of high value powder metallurgy refractory components using W-Re CVD  
Poquette B.\*, Huot G.\*, Poirel H.\*, [Petitjean A.\\*](#)  
\*ACERDE, France
- RM 47** Molybdenum and tungsten in sapphire crystal growth industry  
[Mark M.\\*](#), Traxler H.\*, Schiffner R.\*, Kleinpaß B.\*, Knabl W.\*  
\*Plansee SE, Austria

# Poster Evening

**RM 49 Molybdenum-copper-composites for the advanced thermal management of modern electronics**

Seiss M.\*, Mrotzek T.\*, Dreer N.\*, Knippscheer S.\*, Knabl W.\*

\*Plansee SE, Austria

**RM 82 Refractory metals for particle producing targets at CERN**

Torregrosa C.\*, Calviani M.\*, Perillo-Marcone A.\*, Lopez E.\*, Esposito R.\*, Gomez Pereira L., Perez Fontenla A.T.\*

\*CERN, Switzerland

**RM 84 Tungsten-based composites as a die material in high-pressure die-casting**

Hofer P.\*, Tucan K.-P.\*\*, Gschwandner R.\*, Schindelbacher G.\*, Schumacher P.\*

\*Österreichisches Gießerei-Institut, Austria

\*\*BMW AG Landshut, Germany

## Poster Session Refractory Metals – Characterization

Location: Poster Hall II

**RM 50 Characteristics of W nanoparticles prepared with different hydrogen reduction and ball milling conditions of WO<sub>3</sub> powders**

Kwon N.-Y.\*, Jeong Y.-K.\*\*, Oh S.-T.\*

\*Seoul National University of Science and Technology, South Korea

\*\*Pusan National University, South Korea

**RM 51 Experimental evidences of Nowotny phase incongruent melting**

Gnesin B.\*, Gnesin I.\*\*

\*Russian Academy of Science, Russia

\*\*ISSP RAS, Russia

**RM 52 Analysis of thorium and uranium in tungsten ore concentrates**

Chau C.-N.\*, Otis J.\*, Dang T.\*, Chen X.\*, Wolfe T.\*

\*GTP, USA

**RM 54 Non-destructive measurement of the tungsten content in the binder phase of tungsten heavy alloys**

Marschnigg S.\*, Gierl-Mayer C.\*, Danninger H.\*, Weirather T.\*\*, Granzer T.\*\*, Zobl P.\*\*

\*Technical University of Vienna, Austria

\*\*Plansee Composite Materials GmbH, Germany

**RM 55 High-temperature phase equilibria in the Mo–Al and Mo–Al–Ti systems**

Kriegel M.J.\*, Walnsch A.\*, Fabricznaya O.\*, Freudenberger J.\*, Leinweber A.\*

\*Technical University Bergakademie Freiberg, Germany

**RM 80 Microstructures and mechanical properties of Mo-Re alloys**

Li L.P.\*, Gao X.\*, Hu Z.\*, Liang J.\*, Lin X.\*, Xue J.\*

\*Northwest Institute for Non-ferrous Metal Research, China



# Poster Evening

## Poster Session Refractory Metals – Materials

Location: Poster Hall I

- RM 56 Molybdenum lanthanum alloy thermal stability study**  
Liu R.\*, Zhang T.\*  
\*Jinduicheng Molybdenum Co., Ltd., China
- RM 57 Effect of texture uniformity of Nb rods on performance of Nb<sub>3</sub>Sn superconductor**  
Smathers D.\*, Bhattacharyya A.\*  
\*H.C. Starck, Inc., USA
- RM 58 Microstructure and mechanical property of Nb-Ti-Al alloy extruded rod**  
Wang F.\*, Zhe X.\*\*, Bai R.\*\*, Cai X.\*\*, Xia M.\*\*, Liu H.\*\*, Li L.\*  
\*Northwest Institute for Non-ferrous Metal Research, China
- RM 59 Effect of Zr and Hf additions on microstructure and mechanical properties of multicomponent Nb-Ti-Al-Cr alloy**  
Bai R.\*, Zheng X.\*\*, Cai X.\*\*, Wang F.\*\*, Xia M.\*\*, Liu H.\*\*, Xue J.\*\*, Li L.\*  
\*Northwest Institute for Non-ferrous Metal Research, China
- RM 60 High temperature mechanical properties of composites based on the niobium-silicon system**  
Karpov M.\*, Vnukov V.\*\*, Korzhov V.\*\*, Prohorov D.\*\*, Stroganova T.\*\*, Zheltyakova I.\*\*, Gnesin B.\*\*, Gnesin I.\*\*, Svetlov I.\*\*  
\*Institute of Solid State Physics, RAS, Russia  
\*\*All-Russian Scientific Research Institute of Aviation Materials, Russia
- RM 61 Preparation of W-W<sub>2</sub>B composites from W-BN powders and W-B-N barrier properties for copper metallization**  
Ivanov E.\*, del-Rio E.\*  
\*Tosoh SMD Inc., USA
- RM 62 Ductilisation of tungsten (W) through cold-rolling: correlation of microstructure and mechanical properties in UFG-W sheets**  
Bonk S.\*, Reiser J.\*\*, Hoffmann J.\*\*, Hoffmann A.\*\*  
\*Karlsruhe Institute of Technology, Germany  
\*\*Plansee SE, Austria
- RM 63 Change of brittle to ductile transition temperature (BDTT) in highly cold deformed tungsten (W) through cold rolling**  
Bonnekoh C.\*, Reiser J.\*\*, Hoffmann J.\*\*, Bonk S.\*\*, Hoffmann A.\*\*  
\*Karlsruhe Institute of Technology, Germany  
\*\*Plansee SE, Austria
- RM 64 Tensile strength, ductility and anisotropy of commercially pure tungsten rolled plates from six suppliers**  
Sordo F.\*\*, Aldazabal J.\*\*\*, García-Rosales C.\*\*\*, Gomez A.\*\*\*, Martín Meizoso A.\*\*, Ordás N.\*\*\*, Pedrejón J.L.\*\*\*, Martínez J.L.\*\*, Gil Sevillano J.\*\*  
\*Consorcio ESS Bilbao, Spain  
\*\*Ceit-IK4 and University of Navarra, Spain

# Poster Evening

- RM 65 Application and mechanical properties of tungsten ribbon**  
Matsubara K.\*, Hijikata R.\*\*, Shiraiwa T.\*\*, Enoki M.\*\*, Yasunaga T.\*, Tokumoto K.\*  
\*Nippon Tungsten Co., Ltd., Japan  
\*\*University of Tokyo, Japan
- RM 66 Effect of molybdenum powder micro-morphology on properties of molybdenum sheet**  
An G.\*, Cao W.\*, Sun J.\*\*  
\*Jinduicheng Molybdenum Co., Ltd., China  
\*\*Xi'an Jiaotong University, China
- RM 67 Preparation and analysis on fracture behavior of molybdenum boat doped with La**  
Han Q.\*  
\*Jinduicheng Molybdenum Co., Ltd., China
- RM 68 The microstructure and mechanical properties of Mo-La<sub>2</sub>O<sub>3</sub> alloys prepared by hot pressing sintering**  
Chen X.\*, Li B.\*\*, Ren S.\*, Zhang G.\*, Sun Y.\*\*\*, Liu D.\*\*\*  
\*Xi'an University of Technology, China  
\*\*Northwest Institute for Non-ferrous Metal Research, China  
\*\*\*Jinduicheng Molybdenum Co., Ltd., China
- RM 69 Replacement of Ta elements with Ta-W elements in Nb<sub>3</sub>Sn superconductors**  
Smathers D.\*, Aimone P.\*  
\*H.C. Starck, Inc., USA
- RM 83 High-temperature compressive strength and room-temperature fracture toughness of TiC and/or ZrC-added Mo-Si-B alloys**  
Nakayama S.\*, Yoshimi K.\*  
\*Tohoku University, Japan

## Poster Session Refractory Metals – Processing

Location: Poster Hall II

- RM 70 Rotary friction welding of molybdenum components**  
Stütz M.\*, Pixner F., Wagner J.\*\*, Reheis N.\*\*, Raiser E.\*\*\*, Kestler H.\*\*, Enzinger N.\*  
\*Graz University of Technology, Austria  
\*\*Plansee SE, Austria  
\*\*\*Klaus Raiser GmbH & Co. KG, Germany
- RM 71 Sintering behavior of spherical mono-sized tungsten powder**  
Schade P.\*  
\*HTM Consulting, Germany
- RM 72 Fabrication of metallic porous structure by powder injection molding process and space holder technique**  
Cho H.\*, Park S.J.\*  
\*Pohang University of Science and Technology, South Korea
- RM 73 Tungsten fibre-reinforced tungsten composites**  
Coenen J.W.\*, Jasper B.\*, Gietl H.\*\*, Mao Y.\*, Riesch J.\*\*, Bram M.\*, Klein F., Litnovsky A.\*, Sistla S.\*\*\*, Wegener T., Broeckmann C.\*\*\*, Linsmeier C.\*, Neu R.\*\*  
\*Forschungszentrum Jülich GmbH, Germany  
\*\*Max-Planck-Institut für Plasmaphysik, Germany  
\*\*\*RWTH Aachen University, Germany

# Poster Evening

- RM 74 Processing of tungsten fiber-reinforced tungsten by hot isostatic pressing**  
Jasper B.\*<sup>1</sup>, Bram M.<sup>2</sup>, Coenen J.W.\*<sup>1</sup>, Riesch J.\*\*<sup>1</sup>, Neu R.\*\*<sup>1</sup>, Linsmeier C.\*<sup>1</sup>  
<sup>1</sup>Forschungszentrum Jülich GmbH, Germany  
<sup>2</sup>Max-Planck-Institut für Plasmaphysik, Germany
- RM 75 Rapid material development and processing of complex near-net-shaped parts by PIM**  
Antusch S.<sup>1</sup>, Hoffmann J.\*<sup>1</sup>, Klein A.\*<sup>1</sup>, Rieth M.\*<sup>1</sup>, Weingaertner T.\*<sup>1</sup>  
<sup>1</sup>Karlsruhe Institute of Technology, Germany

## Poster Session Refractory Metals – Simulation

Location: Poster Hall I

- RM 76 Numerical and experimental analysis of parametric possibilities resistance heating molybdenum thin sheet**  
Donic T.<sup>1</sup>, Frivaldský M.\*<sup>1</sup>, Martikán M.\*<sup>1</sup>  
<sup>1</sup>University of Žilina, Slovakia
- RM 77 Determination of the input parameters of the drawbead model for numerical analysis of deep drawing of molybdenum sheet**  
Baštovanský R.<sup>1</sup>, Martikán M.\*<sup>1</sup>, Brumerčík F.\*<sup>1</sup>  
<sup>1</sup>University of Žilina, Slovakia
- RM 78 Numerical analysis of the transient electro-thermal behavior of refractory metal based evaporation boats**  
Valentini B.<sup>1</sup>, Gerzokovitz S.\*<sup>1</sup>  
<sup>1</sup>Plansee SE, Austria
- RM 86 Analysis of plasma characteristics in a DC sputtering magnetron – Part I: Experimental work – Correlating molybdenum target properties and process parameters**  
Raggl S.<sup>1</sup>, Winkler J.\*\*<sup>1</sup>, Strauss G.\*\*\*<sup>1</sup>, Plankensteiner A.\*\*<sup>1</sup>, Feist C.\*\*\*\*<sup>1</sup>, Linke C.\*\*<sup>1</sup>, Eidenberger-Schober M.\*\*<sup>1</sup>, Scheier P.\*<sup>1</sup>  
<sup>1</sup>University of Innsbruck, Austria  
<sup>2</sup>Plansee SE, Austria  
<sup>3</sup>PhysTech Coating Technology GmbH, Austria  
<sup>4</sup>CENUMERICS, Austria
- RM 87 Analysis of plasma characteristics in a DC sputtering magnetron – Part II: Numerical modelling – Development of a self-consistent hybrid plasma transport model**  
Feist C.<sup>1</sup>, Plankensteiner A.\*\*<sup>1</sup>, Winkler J.\*\*<sup>1</sup>, Raggl S.\*\*\*<sup>1</sup>, Linke C.\*\*<sup>1</sup>  
<sup>1</sup>CENUMERICS, Austria  
<sup>2</sup>Plansee SE, Austria  
<sup>3</sup>University of Innsbruck, Austria

# Poster Evening

## Poster Session Hard Materials – Applications

Location: Poster Hall I

- HM 54 Irradiation of tungsten carbide hardmetals for fusion applications**  
Humphry-Baker S.A.\*, Lee W.E.\*, Kingham D.\*\*, Smith G.D.W.\*\*, Harrison R.\*\*\*, Greaves G.\*\*\*, Hinks J.A.\*\*\*, Donnelly S.E.\*\*\*  
\*Imperial College London, United Kingdom  
\*\*Tokamak Energy Ltd., United Kingdom  
\*\*\*Huddersfield University, United Kingdom
- HM 55 Investigation on corrosion and tribo-corrosion behaviour of hardmetal grades in simulated petrochemical environments**  
De Gaudenzi G.P.\*, Tedeschi S.\*, Bozzini B.\*\*  
\*F.I.L.M.S. S.p.A., Italy  
\*\*Università del Salento, Italy
- HM 56 Influence of ruthenium ion implantation on the machining performance of WC straight grade inserts**  
Mkhaliphi T.\*, Sacks N.\*  
\*University of the Witwatersrand, South Africa
- HM 57 Study of tool wear and chemical interaction during machining of Ti6Al4V**  
Kaplan B.\*, Odelros S.\*, Kritikos M.\*, Bejjani R.\*, Norgren S.\*\*  
\*Sandvik Coromant, Sweden  
\*\*Sandvik Coromant, Uppsala University, Sweden
- HM 59 The use of NbC20Ni hard materials for hot rolling applications**  
Rodrigues D.\*, Cannizza E.\*\*  
\*BRATS Sintered Filters and Metallic Powders, Brazil  
\*\*EHT – Engineering Consulting, Brazil
- HM 60 Research on end milling of AISI 304 stainless steel using TiCN based cermet mills**  
Nie H.\*, Guo X.\*, Lai J.\*, Yu Y.\*  
\*Xiamen Tungsten Co., Ltd., China
- HM 61 High efficient milling of high-strength alloys (HSA) using new PVD-coatings**  
Frank H.\*, Barthelmä F.\*, Schiffler M.\*  
\*GFE - society of production engineering Schmalkalden, Germany
- HM 62 Cemented carbides for cold forging tools**  
Kiener C.\*, Engel U.\*, Merklein M.\*, Andreas K.\*  
\*Friedrich-Alexander-Universität Erlangen-Nürnberg, Germany
- HM 63 Microstructure and wear behavior of improved NbC cermets for (BS-1452) grey cast iron machining**  
Genga R.\*, Cornish L.\*, Rokebrand P.\*, Glaser D.\*\*, Woydt M.\*\*\*, Janse van Vuuren A.\*\*\*\*, Polese C.\*  
\*University of the Witwatersrand, South Africa  
\*\*CSIR National Laser Centre, Pretoria, South Africa  
\*\*\*Federal Institute for Materials Research and Testing, Germany  
\*\*\*\*Centre for High Resolution Transmission Electron Microscopy, South Africa
- HM 64 Effect of milling parameters on the temperature in the direct carburization of tungsten trioxide by mechanical alloying**  
Stanciu V.I.\*, Vitry V.\*, Delaunois F.\*  
\*University of Mons, Belgium

# Poster Evening

## Poster Session Hard Materials – Characterization

Location: Poster Hall II

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Jones H.\*, Morrell R.\*, Roebuck B.\*, Mingard K.\*, Gee M.\*  
\*National Physical Laboratory, United Kingdom
- HM 66 Influence of surface damage and residual stress on strength of WC-Co hard metals under biaxial loading conditions**  
Harrer W.\*, Klünsner T.\*\*, Jonke M.\*\*, Supancic P., Glätzle J.\*\*\*, Barbist R.\*\*\*  
\*University of Leoben, Austria  
\*\*Materials Center Leoben Forschung GmbH, Austria  
\*\*\*CERATIZIT Austria GmbH, Austria
- HM 67 Effects of trace amount of titanium additions on microstructures and mechanical properties of medium-grained WC-8%Co cemented carbides**  
Hong H.\*, Cheng X.\*, Zhang W.\*  
\*State Key Laboratory of Cemented Carbide, China
- HM 69 Influence of two steps sintering method on the microstructure and mechanical properties of ultrafine cemented carbide**  
Liu B.\*, Mu Z.\*, Zou N.\*, Tang S.\*\*  
\*State Key Laboratory of Cemented Carbide, China  
\*\*Zhuzhou Cemented Carbide Group Co., Ltd., China
- HM 70 Micromechanical testing of CVD diamond coated WC-Co hard metals**  
Thomma P.\*, Tritremmel C., Klünsner T., Czettl C.\*\*, Mitterer C.\*\*\*  
\*Materials Center Leoben Forschung GmbH, Austria  
\*\*CERATIZIT Austria GmbH, Austria  
\*\*\*University of Leoben, Austria
- HM 71 Study on various properties in the Ti(CN)-based alloys**  
Oh S.W.\*, Ahn S.Y.\*, Kim Y.H.\*, Kim Y.E.\*, Lee D.K.\*  
\*Korloy Inc., South Korea
- HM 72 Effect of WC grain size and Cr addition on the corrosion behavior of WC-Co cemented carbides**  
Xia Y.\*, Wei X.\*, Yu H.\*  
\*Zhuzhou Cemented Carbide Group Co., Ltd., China
- HM 73 Scale effect in mechanical characterization of WC-Co composites**  
Sandoval D.\*, Rinaldi A.\*\*, Tarragó J.M.\*, Roa J.J.\*, Fair J.\*\*\*, Llanes L.\*  
\*Universitat Politècnica de Catalunya, Spain  
\*\*Italian National Agency for New Technologies, Energy and Sustainable Economic Development, Italy  
\*\*\*Sandvik Hyperion, United Kingdom
- HM 74 Indentation-induced deformation of ultracoarse grain cemented carbides**  
Liu X.\*, Zhang J.\*, Wang H.\*, Song X.\*  
\*Beijing University of Technology, China
- HM 75 Fracture toughness evaluation of high pressure high temperature sintered WC-10 wt% Co hardmetal**  
Mashhadikarimi M.\*, Umbelino Gomes U.\*, Picanço Oliveira M.\*\*, Da Silva Guimarães R.\*\*, Filgueira M.\*\*  
\*Federal University of Rio Grande do Norte, Brazil  
\*\*Northern Fluminense State University, Brazil

# Poster Evening

- HM 76 Repeatability of the tests performed on hard metal micro-samples**  
Elizalde M.R., Jiménez-Piqué E.\*\* , Jones H.\*\*\*, Ocaña I.\*, Alkorta J., Lamela V.\*\*, Llanes L.\*\*, Morrell R.\*\*\*, Roebuck B.\*\*\*, Mingard K.P.\*\*\*, Gee M.\*\*\*, Sánchez-Moreno J.M.\*\*\*\*  
\*Ceit-IK4 and University of Navarra, Spain  
\*\*Universitat Politècnica de Catalunya, Spain  
\*\*\*National Physical Laboratory, United Kingdom  
\*\*\*\*Ceit-IK4, Spain
- HM 77 Characterization of new WC-stainless steel composites**  
Fernandes C.M., Rocha A., Cardoso J.P., Bastos A.C., Soares E.\*\*, Sacramento J., Ferreira M.G.S., Senos A.M.R.\*  
\*University of Aveiro, Portugal  
\*\*DURIT - Metalurgia Portuguesa do Tungsténio Lda, Portugal
- HM 78 Comparison of the damage induced by thermal shock in hardmetals and cermets used in hot rolling applications**  
Sánchez-Moreno J.M., Lopez Ezquerro B.\*  
\*Ceit-IK4, Spain
- HM 142 Experimental measurement and thermodynamic evaluation of the miscibility gaps in MC carbides for the C-Co-Hf-Ta-Ti-W system**  
Pan Y., Du Y.\*\*, Peng Y.\*\*\*, Zhou P.\*\*\*  
\*State Key Laboratory of Powder Metallurgy, Central South University, China  
\*\*Central South University, China  
\*\*\*Hunan University of Science and Technology, China

## Poster Session Hard Materials – Coating

Location: Poster Hall I

- HM 79 Influence of Ti1-xAlxN (x=0.48, 0.58 and 0.66) insertion layers on microstructure, mechanical and thermal properties of CrAlN coating**  
Wang S.Q.\*, Liu Z.Q.\*\*, Chen L.\*\*, Xu Y.X.\*\*  
\*Zhuzhou Cemented Carbide Cutting Tools Co., Ltd., China  
\*\*Central South University, China
- HM 80 In-plane and cross-plane thermal conductivity of micro- and nanocrystalline diamond films on a substrate**  
Becker M., Buck V.\*  
\*University of Duisburg-Essen, Germany
- HM 81 Hard nitrides based on the refractory Mo and W**  
Klimashin F.F., Arndt M.\*\*, Polcik P.\*\*\*, Euchner H.\*\*\*\*, Koutná N.\*\*\*\*, Holec D.\*\*\*\*\*, Mayrhofer P.H.\*  
\*CDL-AOS at Technical University of Vienna, Austria  
\*\*Oerlikon Surface Solutions AG, Liechtenstein  
\*\*\*Plansee Composite Materials GmbH, Germany  
\*\*\*\*Technical University of Vienna, Austria  
\*\*\*\*\*University of Leoben, Austria
- HM 82 Study of WC- and Cr3C2-containing hardmetal compositions for thermal spray coatings**  
Berger L.-M., Sassatelli P.\*\*, Pötschke J., Puddu P.\*\*  
\*Fraunhofer Institute for Ceramic Technologies and Systems IKTS, Germany  
\*\*University of Modena and Reggio Emilia, Italy

# Poster Evening

- HM 83 Arc evaporated W-alloyed Ti-Al-N coatings for improved thermal stability, mechanical, and tribological properties**  
Glatz S.A., Bolvardi H.\*\*, Kolozsvári S.\*\*\*, Koller C.M.\*, Riedl H.\*, Mayrhofer P.H.\*\*\*\*  
\*CDL-AOS at Technical University of Vienna, Austria  
\*\*Oerlikon Surface Solutions AG, Liechtenstein  
\*\*\*Plansee Composite Materials GmbH, Germany  
\*\*\*\*Technical University of Vienna, Austria
- HM 85 Wear protective coatings for cutting tools applications produced by S3p™**  
Kuráпов D., Krassnitzer S.\*, Bachmann T.\*, Hagmann J.\*, Kalss W.\*, Arndt M.\*, Rudigier H.\*  
\*Oerlikon Surface Solutions AG, Liechtenstein
- HM 86 Coatings 4.0 - High rate HiPIMS coating equipment for premium cutting tools**  
Schiffers C., Leyendecker T.\*, Lemmer O.\*, Kölker W.\*  
\*CerneCon AG, Germany
- HM 87 On the phase evolution of Al-Cr-based intermetallics and oxides formed by cathodic arc evaporation**  
Dalbauer V.\*, Ramm J.\*\*, Kolozsvári S.\*\*\*, Koller C.M.\*, Mayrhofer P.H.\*\*\*\*  
\*CDL-AOS at Technical University of Vienna, Austria  
\*\*Oerlikon Surface Solutions AG, Liechtenstein  
\*\*\*Plansee Composite Materials GmbH, Germany  
\*\*\*\*Technical University of Vienna, Austria
- HM 88 Cross-sectional characterization techniques as the basis for knowledge-based design of graded CVD TiN-TiB<sub>2</sub> coatings**  
Tkadletz M., Schalk N.\*, Mitterer C.\*, Keckes J.\*, Pohler M.\*\*, Czettl C.\*\*  
\*University of Leoben, Austria  
\*\*CERATIZIT Austria GmbH, Austria
- HM 89 Straightforward measurement of thermal conductivity of hard coatings with the TDTR method**  
Winkler M., Tkadletz M.\*\*, Schalk N.\*\*, Mitterer C.\*\*, König J., Bartholomé K., Pohler M.\*\*\*, Czettl C.\*\*\*  
\*Fraunhofer Institute for Physical Measurement Techniques IPM, Germany  
\*\*University of Leoben, Austria  
\*\*\*CERATIZIT Austria GmbH, Austria
- HM 90 The effects of sputter deposition parameters on the microstructure and surface morphology of Mo-Alloy thin films**  
Jalili H., Zhang Q.\*, Rozak G.\*, Dary F.\*  
\*H.C. Starck, Inc., USA
- HM 91 Chemical composition and properties of MoAl thin films deposited by sputtering from MoAl compound targets**  
Lorenz R., O'Sullivan M.\*\*, Sprenger D.\*\*, Lang B.\*\*, Mitterer C.\*  
\*University of Leoben, Austria  
\*\*Plansee SE, Austria
- HM 92 Influence of cutting speed and workpiece material on the wear mechanisms of CVD TiCN/ $\alpha$ -Al<sub>2</sub>O<sub>3</sub> coated cutting inserts during turning**  
Gassner M., Schalk N.\*, Tkadletz M.\*, Pohler M.\*\*, Czettl C.\*\*, Mitterer C.\*  
\*University of Leoben, Austria  
\*\*CERATIZIT Austria GmbH, Austria

# Poster Evening

- HM 93 A study of the effect of CO2 content on the orientation of Al2O3 in CVD process**  
Kubo H., Kodama Y.\*, Kawaguchi M.\*, Tanibuchi T.\*  
\*Kyocera Corporation, Japan
- HM 94 Arc evaporated Ti-Al-N/Cr-Al-N multilayer coating systems for cutting applications**  
Teppernegg T., Czetti C.\*, Michotte C.\*\*, Mitterer C.\*\*\*  
\*CERATIZIT Austria GmbH, Austria  
\*\*CERATIZIT Luxembourg S.à r.l., Luxembourg  
\*\*\*University of Leoben, Austria
- HM 95 Oxidation resistant hardmetal coatings by Si-impregnation**  
Humphry-Baker S.A., Peng K.\*, Smith G.D.W.\*\*\*, Lee W.E.\*  
\*Imperial College London, United Kingdom  
\*\*Tokamak Energy Ltd., United Kingdom
- HM 96 Influence of the Ta content on microstructure, properties and thermal stability of arc evaporated Ti1 x yAlxTayN hard coatings**  
Grossmann B., Tkadletz M.\*, Schalk N.\*, Czetti C.\*\*, Pohler M.\*\*, Jamnig A.\*, Mitterer C.\*  
\*University of Leoben, Austria  
\*\*CERATIZIT Austria GmbH, Austria
- HM 97 Advanced CVD equipment**  
Strakov H., Auger M.\*, Papageorgiou V.\*, Vogiatzis S.\*  
\*IHI Ionbond AG, Switzerland
- HM 98 Innovations and applications on hard coating systems – Study of the influence of different deposition techniques on the structure of Tantalum**  
Nguyen T.L., Estoppey S.\*\*  
\*Akrom AG, Switzerland  
\*\*Estoppey-Reber SA, Switzerland

## Poster Session Hard Materials – Materials

Location: Poster Hall I

- HM 100 Preparation and properties of (W,Mo)C powders and (W,Mo)C-Co cemented carbides**  
Shi K.-h., Schwarz V., Lengauer W.\*  
\*Technical University of Vienna, Austria
- HM 102 The potential of niobium carbide (NbC) as cutting tools and for wear protection**  
Woydt M., Mohrbacher H.\*\*, Vieugels J.\*\*\*, Huang S.\*\*\*  
\*Federal Institute for Materials Research and Testing, Germany  
\*\*Niobelcon BVNA, Belgium  
\*\*\*Katholieke Universiteit Leuven, Belgium
- HM 103 Phenomena of self-assembling interfacial WC layer formation on diamond crystals during the sintering with catalyst – new horizon for diamond tools ability**  
Levashov E., Sidorenko D.\*, Loginov P.\*  
\*National University of Science and Technology, Russia
- HM 105 Cutting tools made from niobium carbide**  
Uhlmann E., Kropidłowski K., Woydt M.\*\*, Sammler F.\*  
\*Technical University of Berlin, Germany  
\*\*Federal Institute for Materials Research and Testing, Germany



# Poster Evening

- HM 106 Sintering features of WC-316L composite**  
Santos A.\*, Gomes U.\*  
\*Universidade Federal do Rio Grande do Norte, Brazil
- HM 107 Effect of initial WC grain sizes on the microstructure and properties of WC-10Ni cemented carbides**  
Zan X.\*, Shi K.\*, Liao J.\*, Min Z.\*  
\*Zigong Cemented Carbide Corp., Ltd., China
- HM 108 Preparation and microstructure of nanocrystalline powders of nonstoichiometric tantalum carbide TaC<sub>y</sub>**  
Kurlov A.\*, Gusev A.\*  
\*Institute of Solid State Chemistry, Russian Academy of Sciences, Russia
- HM 109 Effect of carbon content on the microstructure and mechanical properties of NbC-Ni based cermets**  
Huang S.\*, Vleugels J.\*, Mohrbacher H.\*, Woydt M.\*\*  
\*Katholieke Universiteit Leuven, Belgium  
\*\*Federal Institute for Materials Research and Testing, Germany
- HM 111 Processing and characterization of PM diamond beads**  
Moreira JR V.\*, Carvalho C.\*, Guimarães Z.\*, Guimarães R.\*, Oliveira M.\*, Filgueira M.\*  
\*Northern Fluminense State University, Brazil
- HM 112 Microstructure and properties of  $\gamma/\gamma'$ -strengthened composite binder in WC-Co-Ni-Al cemented carbide**  
Long J.\*, Chen F.\*\*, Zhang W.\*, Du Y.\*\*, Zhang Z.\*, Li K.\*\*, Xu T., Lu B.\*, Wei X.\*, Xia Y.\*  
\*State Key Laboratory of Cemented Carbide, China  
\*\*State Key Laboratory of Powder Metallurgy, China
- HM 113 Production of cBN/WC bilayer inserts by HPHT using an innovative Nb based binder**  
Oliveira M.\*, Barros R.\*, Guimarães R.\*, Karimi M.\*\*, Gomes U.\*\*, Filgueira M.\*  
\*Northern Fluminense State University, Brazil  
\*\*Federal University of Rio Grande do Norte, Brazil
- HM 114 A comparative study of spark plasma sintered TiC<sub>x</sub>-Ni<sub>3</sub>Ti/Ni cermets**  
Liu B.\*, Huang S.\*, Van Humbeeck J.\*, Vleugels J.\*  
\*Katholieke Universiteit Leuven, Belgium
- HM 115 Analytical microstructure characterization of advanced alloys and steels at atomic resolution**  
Albu M.\*, Haberfehlner G.\*, Kothleitner G.\*\*, Hofer F.\*\*  
\*Graz Centre of Electron Microscopy, Austria  
\*\*Graz University of Technology, Austria
- HM 116 Effects of Cr on the properties of WCoB ternary boride**  
Zhang T.\*, Yin H.\*, Qu X.\*, Zheng Q.\*\*  
\*University of Science and Technology Beijing, China  
\*\*Kennametal Inc., USA
- HM 118 Cobalt-inhibitors mixtures for cemented carbides**  
Stanciu V.I.\*, Vitry V., Delaunois F.\*  
\*University of Mons, Belgium

# Poster Evening

## Poster Session Hard Materials – Modeling & Simulation

Location: Poster Hall I

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Haglöf F.\*, Kaplan B.\*, Norgren S.\*, Blomqvist A.\*, Selleby M.\*\*

\*Sandvik Coromant, Sweden

\*\*KTH Royal Institute of Technology, Sweden

### HM 120 EBSD based FEM simulation of residual stresses in a WC 6wt.-% Co hardmetal

Kayser W.\*, Bezold A.\*, Broeckmann C.\*

\*RWTH Aachen University, Germany

### HM 121 2D simulation of gradient zone formation in cemented carbides

Salmasi A.\*, Larsson H.\*, Blomqvist A.\*\*

\*KTH Royal Institute of Technology, Sweden

\*\*Sandvik Coromant, KTH Royal Institute of Technology, Sweden

### HM 122 Alternative binder phases in cemented carbides

Gren M.\*, Wahnström G.\*

\*Chalmers University of Technology, Sweden

### HM 123 Three-dimensional modeling of the microcracks in a heterogeneous hot work tool steel

Seriapopi V.\*, Fukumasu N.K.\*, Tertuliano A.J.\*, Souza R.M.\*, Machado I.F.\*

\*University of São Paulo, Brazil

### HM 124 Modelling heat transfer in a W+C powder bed in a pusher furnace

Witting P.\*, Jewett T.\*\*

\*Harper International, USA

\*\*Global Tungsten & Powders Corp., USA

### HM 125 Real microstructure-based simulation of thermal residual stresses in cemented carbides

Zhu J.-f.\*, Zhang L.\*, Zhong Z.-Q.\*, Zhang H.-d.\*, Zhou L.\*

\*Central South University, China

### HM 126 An advanced multi-scale and multi-physics simulation framework for powder metallurgy

Peters B.\*, Estupinan A.\*, Useldinger R.\*\*\*, Hippe F.\*\*

\*Université du Luxembourg, Luxembourg

\*\*CERATIZIT Luxembourg S.à.r.l., Luxembourg

### HM 141 Thermal residual stresses in WC-Co using realistic 3D synthetic microstructures

Öhman M.\*, Ekh M.\*, Larsson F.\*, Wahnström G.\*

\*Chalmers University of Technology, Sweden

# Poster Evening

## Poster Session Hard Materials – Processes

Location: Poster Hall II

- HM 127 Optimized way to introduce a growth inhibitor in cemented carbides**  
Stanciu V.I.\*, Vitry V.\*, Delaunois F.\*  
\*University of Mons, Belgium
- HM 129 Sputter-coating of WC powders: An innovative process to attain high performance**  
Senos A.M.R.\*, Fernandes C.M.\*, Willinger M.\*\*, Vieira M.T.\*\*\*  
\*University of Aveiro, Portugal  
\*\*Fritz Haber Institute of the Max Planck Society, Germany  
\*\*\*University of Coimbra, Portugal
- HM 130 Cobalt oxide as a raw material for the production of WC-Co cemented carbides and its advantages for the pressing process**  
Pasquazzi A., Schubert W.D.\*\*, [Weißbacher R.](#), Schachinger P.\*  
\*BOEHLERIT GmbH & Co KG, Austria  
\*\*Vienna University of Technology, Austria
- HM 131 Research on production technology of cemented carbide rods with two spiral coolant holes**  
Meng X.W.\*, Wu Z.W.\*, Chu Y.D.\*\*  
\*Zhuzhou Cemented Carbide Group Co., Ltd., China  
\*\*Zhuzhou Cemented Carbide Tools Co., Ltd., China
- HM 132 Transition of W2C to WC during carburization of tungsten metal powder**  
Mühlbauer G.\*, Kremser G., Bock A., Weidow J.\*\*, Schubert W.-D.\*\*\*  
\*Wolfram Bergbau und Hütten AG, Austria  
\*\*Chalmers University of Technology, Sweden  
\*\*\*Vienna University of Technology, Austria
- HM 134 High strength bulk steels for high temperature structural applications produced by mechanical alloying in combination with equal channel angular extrusion**  
Kotan H.\*, Darling K.A.\*\*  
\*Konya Necmettin Erbakan University, Turkey  
\*\*U.S. Army Research Laboratory, USA
- HM 135 Colloid processing of metal bonded niobium carbide**  
Steinborn G.\*, [Woydt M.](#), Wäsche R.\*  
\*Federal Institute for Materials Research and Testing, Germany
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\*Northern Fluminense State University, Brazil
- HM 138 Solid state sintered nanoscaled hardmetals and their properties**  
Pötschke J.\*, Säuberlich T.\*\*  
\*Fraunhofer Institute for Ceramic Technologies and Systems IKTS, Germany  
\*\*H.C. Starck Tungsten GmbH, Germany
- HM 139 Direct carbothermic synthesis of tungsten carbide from tungsten minerals**  
Polini R.\*, Marcucci A., Marcheselli G.\*\*  
\*Università di Roma, Italy  
\*\*F.I.L.M.S. SpA, Italy
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Juhani K.\*, Pirso J., Tarraste M., Viljus M., Toome M.\*  
\*Tallinn University of Technology, Estonia

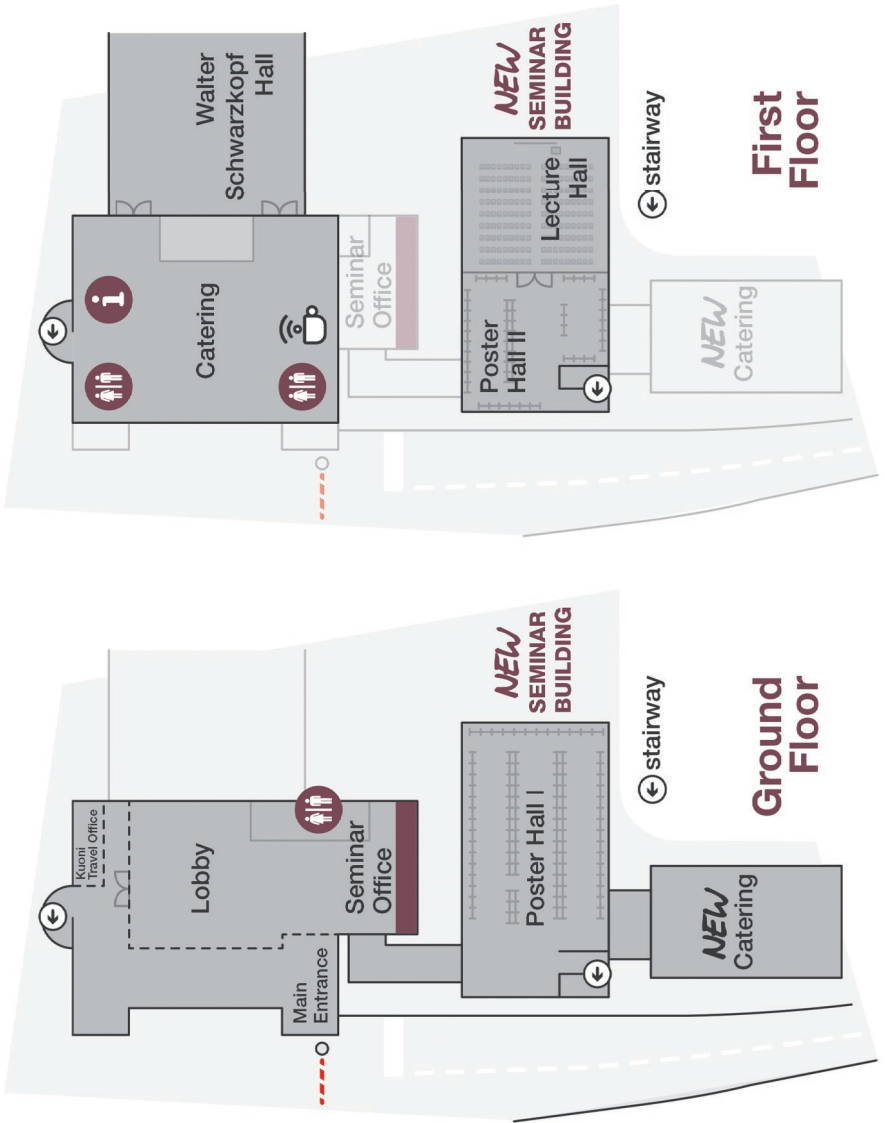
# Poster Evening

## Poster Session Recycling and Tungsten Chemistry

Location: Poster Hall I

- RC 6 Insights regarding the reaction rate of Co during the leaching of a hard metal substrate in hydrochloric media**  
Kücher G.\*, Luidold S.\*, Czettel C.\*\*, Storf C.\*\*  
\*University of Leoben, Austria  
\*\*CERATIZIT Austria GmbH, Austria
- RC 7 The International Journal of Refractory Metals and Hard Materials – A guidepost in the field of material technology**  
Ortner H.M.\*, Fang Z.Z.\*\*, Gant A.J.\*\*\*, Röddhammer P.\*\*\*\*, Song X.\*\*\*\*\*  
\*Technical University Darmstadt, Germany  
\*\*University of Utah, USA  
\*\*\*National Physical Laboratory, United Kingdom  
\*\*\*\*Reutte, Austria  
\*\*\*\*\*Beijing University of Technology, China
- RC 8 Milling characteristics of various zinc reclaim and virgin WC-Co powders**  
Laamanen T.\*, Karhumaa T.\*, Oinonen J.\*, Kurkela M.\*, Jewett T.\*\*  
\*Tikomet Oy, Finland  
\*\*Global Tungsten & Powders Corp., USA
- RC 9 Several promising purifying technologies for refractory metals**  
Hu Z.\*, Li J.\*\*, Zhang P., Zhang W.\*, Gao X., Li L.\*, Yin T.\*, Guo L.\*, Ren G.\*, Zheng J.\*\*\*  
\*Northwest Institute for Non-ferrous Metal Research, China  
\*\*Northwestern Polytechnical University, China  
\*\*\*Chinese Institute of Atomic Energy, China
- RC 10 Ecologically clean fluoride conversion – New technology of tungsten production instead powder metallurgy**  
Korolev Y.\*, Levashov E.\*\*  
\*Scientific Techn. Association of Powder Metallurgy, Russia  
\*\*National University of Science and Technology, Russia
- RC 11 Phase formation in Co(Ru)-Zn diffusion couples**  
Ebner T.\*, Luidold S.\*, Antrekowitsch H.\*, Storf C.\*\*, Czettel C.\*\*  
\*University of Leoben, Austria  
\*\*CERATIZIT Austria GmbH, Austria
- RC 12 A study of the impact of reduction conditions on molybdenum morphology**  
Bolitschek J.\*, Luidold S.\*, O'Sullivan M.\*\*  
\*University of Leoben, Austria  
\*\*Plansee SE, Austria

# Site Map



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