

# Technical Sessions & Programs

## Listings as of April 8.

Following is a detailed listing of the four Special Interest Programs and Technical Sessions for both PowderMet2011 and Tungsten Conferences on a day-by-day basis. Information on the Poster Program can be found on page 46. All presentations will be in English.

### Special Interest Programs

Will be held Thursday through Saturday. Time schedule for individual presentations in the Special Interest Programs vary from program to program. Descriptive information about each Special Interest Program is provided.

### Technical Sessions

For both PowderMet2011 and Tungsten Conferences will be held Thursday through Saturday. Eight or Nine sessions will take place concurrently, each consisting of 3 technical papers presented by authors, in English. To help differentiate between the two conferences, the Tungsten conference sessions have been highlighted in a different color on the pages within this section. Individual presentation times will last approximately 20 minutes with an additional 5 minutes for questions and answers.

### Speaker Interact

Each Technical Session will include a 15-minute period at the end of the presentations for informal discussion in the rear of the room with session speakers. This concept is designed to foster and encourage technical dialogue and information exchange.

## THURSDAY, MAY 19

### SPECIAL INTEREST PROGRAM Thursday morning

SIP

1

### MAGNET MATERIALS AND APPLICATIONS

(Yerba Buena 14)

#### Program Organizers:

Bhanu Chelluri, IAP Research, Inc.  
Ian Donaldson, GKN Sinter Metals

Devices based on magnet materials are used in automotive components and in other applications ranging from washing machines and hand tools to biomedical machinery. There is a need to make these magnet devices of higher performance, compact, light, and at low cost. Such size and weight reduction could be achieved through the innovations in materials, processing, and new design approaches. This program will present an overview of magnet materials and applications along with the challenges and opportunities for the PM community to improve these devices.

Individual presentations will run approximately 30 minutes, including questions. Manuscripts that are submitted will be included in the conference proceedings.

### PART 1: NON-SINTERED MAGNETIC MATERIALS & APPLICATIONS

#### Thursday morning

9:45–11:15 a.m. (09.45–11.15)

#### Session Chairman:

Ian Donaldson, GKN Sinter Metals

0137 U.S.A.

### Review of Insulated Powder Materials and Potential Future Materials

Francis J. Hanejko, William Tambussi, K. S. Narasimhan, FAPMI, Hoeganaes Corporation

0135 U.S.A.

### A Study of the Interfacial Magnetic and Atomic Structure of Oxide-Coated Ferrous Powder Metals

Steven R. Spurgeon, Jay Kikkawa, Amit Misra, Mitra L. Taheri, Drexel University

0128 Poland

### The Influence of Connecting Method of Hybrid Magnetic Elements for Their Physical Properties

Barbara M. Slusarek, Bartosz Jankowski, Dariusz Kapelski, Marcin Karbowski, Marek Przybylski, Tele and Radio Research Institute

## TECHNICAL SESSIONS

### Thursday morning

9:45–11:15 a.m. (09.45–11.15)

SESSION

01

### MIM I: MARKETS & TECHNOLOGY

(Yerba Buena 10)

#### Session Chairman:

Matthew Bulger  
NetShape Technologies—MIM

0037 U.S.A. 9:45 a.m. (09.45)

### A Review of Metal Powder Injection Molding—Sales, Markets, Capacity, Productivity, and Other Metrics

Randall M. German, FAPMI, San Diego State University

0015 Austria 10:10 a.m. (10.10)

### Finite Element (FE) Sintering Simulation of Metal Injection Molded Copper Brown Part

Ijaz Ul Mohsin, Christian Gierl, Herbert Danninger, Institute of Chemical Technologies and Analytics & Lager Daniel, Wolfgang Hohenauer, Austrian Institute of Technology (AIT)

0005 *India* 10:35 a.m. (10.35)  
**Manufacturing of Nickel Wick for Loop Heat Pipe through MIM Route**  
Sudip K. Samanta, Aditya K. Lohar, Himadri Roy, Siddhartha Kumar, Sukanta Sinha Roy, Debi P. Chattopadhyay Ashis K. Chowdhury, Central Mechanical Engineering Research Institute

SESSION  
**FATIGUE**

02

(*Yerba Buena 11*)

**Session Chairman:**  
James Laverick  
The Timken Company

0095 *U.S.A.* 9:45 a.m. (09.45)  
**Correlation of Wrought Steel Axial Fatigue Test Data with Stroker Durability Data from Surface Densified Races**  
Rajesh Parameswaran, Salvator Nigarura, Michael Bird, PMG Indiana Corporation

0138 *U.S.A.* 10:10 a.m. (10.10)  
**Fatigue Performance of Molybdenum Prealloyed PM Steels**  
Peter K. Sokolowski, Thomas F. Murphy, FAPMI, Bruce Lindsley, Hoeganaes Corporation

0047 *U.S.A. & Sweden*  
10:35 a.m. (10.35)  
**Dynamic Properties of Lean Diffusion-Alloyed Steel**  
Bo Hu, Roland T. Warzel III, Alexander Klekovkin, Sydney Luk, North American Höganäs & Robert Frykholm, Michael Andersson, Höganäs AB

SESSION  
**MACHINABILITY ADDITIVES**

03

(*Yerba Buena 12*)

**Session Chairman:**  
John Engquist  
Burgess-Norton Mfg. Co.

0109 *U.S.A.* 9:45 a.m. (9.45)  
**The Use of a Newly Developed Machinability Enhancer for Improving the Machinability of Fe-Cu-C Components**  
Roland T. Warzel III, Bo Hu, North American Höganäs, Inc. & Dan Bankovic, Mike O'Niell, Jim Kmetz, Metaldyne Sintered Components

0021 *U.S.A.* 10:10 a.m. (10.10)  
**The Use of a New Machinability Enhancer for Improving the Machinability of Prealloyed Powder Metal Components**  
Alexander Klekovkin, Bo Hu, Roland Warzel, Sydney Luk, North American Höganäs, Inc. & Suresh Shah, Gilbert Schluterman, Jr., Jerry Falleur, Cloyes Gear and Products

0106 *Japan* 10:35 a.m. (10.35)  
**Drilling Machinability of Iron-Based Sintered Compacts with Machinability Aids**  
Toshio Maetani, Shigeru Unami, Yukiko Ozaki, JFE Steel Corporation/Steel Research Laboratory

SESSION  
**ALTERNATIVE SINTERING PROCESSES**

04

(*Yerba Buena 13*)

**Session Chairman:**  
Daniel Reardon  
Abbott Furnace Company

0040 *U.S.A.* 9:45 a.m. (9.45)  
**Net-Shape Capabilities and Scalability of Conventional (SPS) and Free Pressureless (FPSPS) Spark-Plasma Sintering**  
Eugene A. Olevsky, Cristina Garcia, Evan Khaleghi, William L. Bradbury, Wei Li, Gordon Brown, Randall M. German, FAPMI, San Diego State University

0091 *India* 10:10 a.m. (10.10)  
**Effect of Heating Mode on Sinterability of Iron Copper (Fe-2Cu) and Copper Steel (Fe-2Cu-0.8Gr.)**  
Anish Upadhyaya, Felege N. Geremariam, Raja A. Annamalai, Indian Institute of Technology Kanpur

0158 *U.S.A.* 10:35 a.m. (10.35)  
**Infiltration Advances—Technical and Cost Assessments in Powder Metallurgy**  
Randall M. German, San Diego State University & Paul Rivest, Ultra Infiltrant

**TUNGSTEN CONFERENCE**  
Thursday morning  
9:45–11:15 a.m. (09.45–11.15)

TUNGSTEN SESSION **T1**  
**CHEMICAL PROCESSES**

(*Golden Gate C1*)

**Session Chairman:**  
James J. Oakes  
ATI Engineered Products

0055 *U.S.A.* 9:45 a.m. (9.45)  
**Modern Methods of Hydrometallurgical Production of Ammonium Paratungstate (APT)**  
Raj P. Singh Gaur, Global Tungsten and Powders, Plansee Group

0046 *U.S.A.* 10:10 a.m. (10.10)  
**Study of the Reduction of Tungsten Trioxide Doped with NaCl/KCl, KBr or Li<sub>2</sub>CO<sub>3</sub>**  
Hans-Joachim Lunk, Keith E. Newman, Global Tungsten & Powders Corp.

0009 *China* 10:35 a.m. (10.35)  
**Separation of Molybdenum and Tungsten by Selective Precipitation**  
Zhao Zhongwei, Cao Caifang, School of Metallurgical Science and Engineering, Central South University

TUNGSTEN SESSION **T2**  
**HARDMATERIALS I**

(*Golden Gate C2*)

**Session Chairman:**  
Ravi K. Enneti  
Global Tungsten & Powders Corporation

0016 *U.S.A.* 9:45 a.m. (9.45)  
**Wear-Resistant Ultrafine Double-Phase Binderless Tungsten Carbide**  
Jack Zheng, Dev Banerjee, William Huston, Roger Stark, Kennametal Inc.

0012 *U.S.A.* 10:10 a.m. (10.10)  
**Sintering of Tungsten Carbide with/without Cobalt and Nano Tungsten Carbide Powder in FAST**  
Sinthu Chanthapan, Anil K. Kulkarni, Jogender Singh, Pennsylvania State University & Pankaj Mehrotra, Kennametal

# Technical Sessions & Programs

SESSION

T3

## MOLYBDENUM ALLOYS & COMPOSITES

(Golden Gate C3)

### Session Chairman:

John A. Shields, Jr.  
PentaMet Associates LLC

0049 U.S.A. 9:45 a.m. (09.45)

### Comparison of Processing on the Mechanical and Microstructure of Powder Metallurgy Molybdenum 41% and 47.5% Rhenium

Todd A. Leonhardt, James Downs,  
Rhenium Alloys Inc.

0028 U.S.A. 10:10 a.m. (10.10)

### Recrystallization Behavior of Mo-Lanthana Sheets Upon Controlled Deformation

Maria B. Winnicka, Danny L.  
Franklin, Global Tungsten and  
Powders Corp.

0014 U.S.A. 10:35 a.m. (10.35)

### Solubility Effects on Grain Growth and Thermal Conductivity of Liquid-Phase-Sintered Mo-Cu

John L. Johnson, ATI Firth Sterling

## SPECIAL INTEREST PROGRAM

Thursday afternoon

SIP

1

## MAGNET MATERIALS AND APPLICATIONS

(continued)

(Yerba Buena 14)

### PART 2: MAGNET MATERIALS & MOTORS

Thursday afternoon

3:00–4:30 p.m. (15.00–16.30)

### Session Chairman:

Bhanu Chelluri, IAP Research, Inc.

0147 U.S.A.

### An Overview of DOE's Electric-Motor and Magnetic-Materials R&D for Vehicle Electrification

Mitch Olszewski, Oak Ridge National  
Laboratory, National Transportation  
Research Center

0148 U.S.A.

### Permanent Magnet Materials and Current Challenges

Steve Constantinides, Arnold Magnetic  
Technologies

0149 Canada

### Motor Designs with Powder Metals for Size and Weight Reduction

Philippe Viarouge, Laval University

## TECHNICAL SESSIONS

Thursday afternoon

3:00–4:30 p.m. (15.00–16.30)

SESSION

05

## MIM II: MICROMOLDING

(Yerba Buena 10)

### Session Chairman:

S. K. Tam  
Ormco Sybron Dental Specialties

0033 Germany 3:00 p.m. (15.00)

### Special Variants of Metal and Ceramic Micro Injection Molding

Volker Piotter, Tobias Mueller, Klaus  
Plewa, Hans-Joachim Ritzhaupt-Kleissl,  
Andreas Ruh, Elvira Vorster, Juergen  
Hausselt, Karlsruhe Institute of  
Technology

SESSION

06

## BINDER-TREATED PREMIXES

(Yerba Buena 11)

### Session Chairman:

Suresh O. Shah  
Cloyes Gear & Products, Inc.

0048 U.S.A. 3:00 p.m. (15.00)

### The Capability of a Bonded Mix to Improve the Precision of a Powder Metal (PM) Component

Roland T. Warzel III, Sydney Luk, North  
American Höganäs, Inc.

0111 U.S.A. 3:25 p.m. (15.25)

### Improved Powder Performance through Binder Treatment of Premixes

Christopher T. Schade, Michael L.  
Marucci, Hoeganaes Corporation

0136 U.S.A. 3:50 p.m. (15.50)

### Evaluation of Die-Wear Characteristics of FY-4500 Materials Utilizing a New Binder System

Francis J. Hanejko, William Tambussi,  
Jon Baumgartner, Hoeganaes  
Corporation

SESSION

07

## HIGH-DENSITY PROCESSING

(Yerba Buena 12)

### Session Chairman:

Virendra S. Warke  
Bodycote

0119 Canada & U.S.A.

3:00 p.m. (15.00)

### Hot-Forging Response of Aluminum PM Alloys

Donald P. Bishop, Ryan D. Mann,  
Michael D. MacDonald, Dalhousie Uni-  
versity & Richard L. Hexemer, Ian W.  
Donaldson, GKN Sinter Metals LLC

0115 Sweden 3:25 p.m. (15.25)

### Energy Needs to Produce Fully Dense Products via the Scanpac Process—a LCA Comparison with Conventionally Wrought Products

Christer Aslund, Metec Powder Metal  
AB

SESSION

08

## MODELING OF HIGH-TEMPERATURE PM PROCESSES

(Yerba Buena 13)

### Session Chairman:

Eric Baril  
National Research Council Canada  
Canada

0110 *Canada & U.S.A.*  
3:00 p.m. (15.00)

### Elastoplastic-Viscoplastic Modeling of HIP with Hardening Effects of Density and Equivalent Plastic Strain

Virendra S. Warke, Stepehn J. Mashl, Bodycote Hot Isostatic Pressing & Gholamreza Aryanpour, Masoud Farzaneh, CIGELE, Université du Québec à Chicoutimi (UQAC)

0070 *U.S.A.* 3:25 p.m. (15.25)  
**Technological Principles and Tools for the Control of Near-Net-Shape PM HIP**

Victor Samarov, Charles J. Barre, Synertech PM Inc.

0121 *U.S.A.* 3:50 p.m. (15.50)  
**Empirical Method to Model a Part's Thermal Response in an Existing Furnace**

Steven K. Smith, PMT, Gasbarre Products, Inc.

## TUNGSTEN CONFERENCE

Thursday afternoon

3:00–4:30 p.m. (15.00–16.30)

TUNGSTEN SESSION

T4

## POWDER PRODUCTION I

(Golden Gate C1)

### Session Chairman:

David A. Alven  
Aerojet Ordnance Tennessee

0036 *Korea* 3:00 p.m. (15.00)

### The Influence of Characteristics of Tungsten Yellow Oxide on the Characterization of Hydrogen Reduced Submicron Tungsten Powder

Hyun Jik Noh, Khie Hong Cho, Taegutec Ltd.

0027 *U.S.A.* 3:25 p.m. (15.25)

### Effect of Processing Conditions during Reduction of MoO<sub>3</sub> to MoO<sub>2</sub> on the Molybdenum Powder Properties

Ravi K. Enneti, Thomas Jewett, Global Tungsten and Powders Corp.

0017 *China* 3:50 p.m. (15.50)

### Interactions of Dioctyl Dimethyl Ammonium Bromide with Calcium-Containing Minerals and Selective Flotation

Sun Wei, Hu Yue-Hua, School of Minerals Processing & Bioengineering, Central South University

TUNGSTEN SESSION

T5

## PROCESSING I

(Golden Gate C2)

### Session Chairman:

Mark S. Greenfield  
Kennametal Inc.

0015 *China & U.S.A.*  
3:00 p.m. (3.00)

### Powder Injection Molding for Micro Cemented Carbide Parts

Haiqing Yin, Jinyan Tong, Xuanhui Qu, University of Science and Technology Beijing & Jack Zheng, Kennametal Inc.

0048 *U.S.A.* 3:25 p.m. (15.25)

### Applying Cermet (WC) Coatings via Laser Additive Manufacturing: Enhancements, Applications and Issues

James W. Sears, Quad City Manufacturing Laboratory

0045 *Russia* 3:50 p.m. (15.50)

### Electric Discharge Sintering and Joining of Tungsten Carbide–Cobalt with High-Speed Steel

Evgeny G. Gregoryev, Moscow Engineering Physics Institute

TUNGSTEN SESSION

T6

## IRIDIUM & RHENIUM ALLOYS

(Golden Gate C3)

### Session Chairman:

John L. Johnson  
ATI Engineered Products

0002 *U.S.A.* 3:00 p.m. (15.50)  
**Processing of High-Purity Iridium Alloys and Effects of Impurity Elements**

Evan K. Ohriner, Easo P. George, Oak Ridge National Laboratory

0041 *U.S.A.* 3:25 p.m. (15.25)

### Development of an Engineered Rhenium Microstructure Using Electrochemical Forming Techniques

Alexander Smirnov, John S. O'Dell, Anatoliy Shchetkovskiy, Plasma Processes, Inc. & Robert R. Hickman, NASA, MSFC

0032 *U.S.A.* 3:50 p.m. (15.50)

### Recycling of Rhenium-Containing Wire Scrap in the Manufacturing of W-Re Wire

Raj P. Singh Gaur, Thomas A. Wolfe, Scott A. Braymiller, Global Tungsten and Powders, Plansee Group

# Technical Sessions & Programs

FRIDAY, MAY 20

## SPECIAL INTEREST PROGRAMS Friday morning

SIP

2

### PM MATERIALS FOR ALTERNATIVE ENERGY

(Yerba Buena 14)

#### Program Organizers:

K. S. Narasimhan, FAPMI, Hoeganaes Corporation  
Thomas J. Jesberger, Abbott Furnace Company  
Ashley Nichols, FloMet LLC  
John W. von Arx, NetShape Technologies, Inc.

The powder metallurgy (PM) process, being of net shape with minimal waste, has attracted a number of industries such as fuel cells, solar energy, photovoltaics and batteries. This program addresses the advancements PM has made in these industries.

Individual presentations in part 1 will run approximately 45 minutes each, including questions. Presentations in part 2 will run approximately 30 minutes each, including questions. Manuscripts that are submitted will be included in the conference proceedings.

#### PART 1: ALTERNATE FUELS I Friday morning

8:00–9:30 a.m. (08.00–09.30)

##### Session Chairman:

K. S. Narasimhan, FAPMI, Hoeganaes Corporation

0154 Germany

#### Current Status and Future Opportunities of Solid-Oxide Fuel Cells (SOFC)—a Materials and Components-Processing View

Detlev Stöver, Hans Peter Buchkremer, Martin Bram, Norbert H. Menzler, Frank Tietz, Sven Uhlenbruck & Robert Vaßen, Forschungszentrum Jülich GmbH

0155 U.S.A.

#### Alternate Power Sources in Automobiles: Brief Review

Kalathur S. Narasimhan & Eric Boreczky, Hoeganaes Corporation

SIP

3

### TRIBOLOGY

(Yerba Buena 15)

#### Program Organizers:

Russell A. Chernenkoff, Metaldyne LLC  
Nicholas T. Mares, Asbury Graphite Mills, Inc.  
Steven R. Schmid, University of Notre Dame

Tribology is the science of interacting surfaces in relative motion including the understanding of friction, lubrication, and wear. Tribological behavior is an integral part of the powder metallurgy process, i.e., interaction between individual powder particles, powder particles and die walls, and mating PM surfaces in high-performance applications. This program includes discussion of the friction and wear behavior of sintered parts, quantifying surfaces of PM parts in regards to porosity, design aspects for wear resistance, post-processing technologies to improve wear behavior of PM parts, and the effect of tribological variables on compaction.

Individual presentation times will run approximately 30 minutes, including questions. Manuscripts that are submitted will be published in the conference proceedings.

#### PART 1: FUNDAMENTALS Friday morning

8:00–9:30 a.m. (08.00–09.30)

##### Session Chairman:

Russell A. Chernenkoff, Metaldyne LLC

0150 U.S.A.

#### Quantifying Surfaces on PM Parts

Edward P. Becker, GM Powertrain

0122 Sweden

#### Design Aspects of Powder Metal Gear Design: Macro and Micro Geometry Considerations

Anders Flodin, Höganäs AB

0160 U.S.A.

#### Graphite in Industrial Lubricants

Lance Miller, Asbury Carbons, Inc.

## TECHNICAL SESSIONS

Friday morning  
8:00–9:30 a.m. (08.00–09.30)

SESSION

09

### MIM III: HARDENABLE STEELS

(Yerba Buena 10)

#### Session Chairman:

Vince Haas  
BASF Corporation

0096 U.S.A., United Kingdom & Dominican Republic  
8:00 a.m. (08.00)

#### Properties of 4340 and 4140 MIM Parts Made via Prealloy and Master Alloy Routes

Toby Tingskog, Martin A. Kearns, Andrew Coleman, Sandvik Osprey, Ltd. & Robert Sanford, Erainy Gonzalez, TCK, S.A.

0074 Taiwan 8:25 a.m. (08.25)  
**Ultra-High Strength Sinter-Hardening PIM Alloy Steels**

Kuen-Shyang Hwang, Li-Hui Cheng, Chen Hsu, National Taiwan University

0009 Taiwan 8:50 a.m. (08.50)  
**Effect of Sintering Temperature on the Microstructure and Mechanical Properties of MIM SKD11 Component**  
Kuan-Hong Lin, Yu-Xiang Sun, Guan-Lin Chen, Kai-Ming Lin, Tungnan University & Yu-Chan Hsieh, Shun-Tian Lin, National Taiwan University of Science and Technology

SESSION

10

## LOW-ALLOY STEELS I

*(Yerba Buena 11)***Session Chairman:**W. Brian James, FAPMI  
Hoeganaes Corporation0131 *Italy & Spain*

8:00 a.m. (08.00)

**Influence of Selected Alloying Elements on the Hardenability and Fatigue Strength of Recently Developed Sinter-Hardening PM Steels**S. Saccarola, Pometon SpA & A.  
Karuppannagounder, S. Sainz, F. Castro,  
CEIT & TECNUN0090 *U.S.A.* 8:25 a.m. (08.25)**Processing of Cr- and Mn-Containing Steels to Optimize Microstructure, Mechanical Performance, and Density**Ian W. Donaldson, GKN Sinter Metals &  
Michael L. Marucci, Bruce A. Lindsley,  
Hoeganaes Corporation0062 *Canada & U.S.A.*

8:50 a.m. (08.50)

**Improvement of Dimensional Stability of Sinter-Hardening Steel Powders**Vincent Paris, Sylvain St-Laurent, Rio  
Tinto Metal Powders & Edmond Ilija,  
PMT, Metaldyne Sintered Components

SESSION

11

## POWDER PRODUCTION TECHNOLOGY

*(Yerba Buena 12)***Session Chairman:**Lou Koehler  
Koehler Associates0043 *U.S.A.* 8:00 a.m. (08.00)**Metal and Alloy Powder Production by Gas-Solid Processes in Fluidized Beds**Jordi Perez-Mariano, Kai-Hun Lau,  
Esperanza Alvarez, Marc Hornbostel,  
Gopala Krishnan, Angel Sanjurjo,  
SRI International0107 *Austria & Iran*

8:25 a.m. (08.25)

**Iron-Carbon Masteralloys—a Promising Approach for Introducing Carbon into High-Density Sintered Steels**Herbert Danninger, Christian Gierl,  
Harald S. Gschiel, Vienna University of  
Technology & Yousef Hemmatpour, Azar  
Powder Metallurgy Co.0086 *Brazil* 8:50 a.m. (08.50)**Development of 15H2MFA Ferritic Steel—NbC Composite Using High-Energy Milling**Jose Ferreira Da Silva Junior, Uilame  
Umbelino Gomes, Edalmy Oliveira de  
Almeida, Clodomiro Alves Junior, Arthur  
Pinheiro Messias, Federal University of  
Rio Grande Do Norte

SESSION

12

## ADVANCES IN TITANIUM PM I

*(Yerba Buena 13)***Session Chairman:**Hideshi Miura  
Kyushu University  
Japan0026 *U.S.A.* 8:00 a.m. (08.00)**Review of Current Titanium-Powder Production Methods**Colin G. McCracken, Daniel P. Barbis,  
Reading Alloys Inc.—An Ametek  
Company0094 *U.S.A.* 8:25 a.m. (08.25)**Developments of Titanium Applications via Additive Manufacturing**James W. Sears, Quad City Manufactur-  
ing Laboratory0098 *U.S.A.* 8:50 a.m. (08.50)**Titanium Powder Metallurgy—Merits of Press-Sinter and Metal Powder Injection Molding**Randall M. German, FAPMI, San Diego  
State UniversityTUNGSTEN CONFERENCE  
Friday morning

8:00–9:30 a.m. (08.00–09.30)

TUNGSTEN SESSION T7  
HEAVY ALLOYS I*(Golden Gate C1)***Session Chairman:**Herve R. A. Couque  
Nexter Munitions  
France0022 *U.S.A.* 8:00 a.m. (08.00)**Predictions of Tungsten Alloy Coarsening during Sintering**Randall M. German, FAPMI,  
Eugene A. Olevsky, San Diego  
State University0013 *U.S.A.* 8:25 a.m. (08.25)**The Quench Sensitivity of Several Tungsten Heavy Alloys Containing Cobalt**David A. Alven, Aerojet Ordnance  
Tennessee0018 *France* 8:50 a.m. (08.50)**Cobalt-Free Tungsten Heavy Alloys for High-Mechanical-Resistance Kinetic Energy Penetrators**Rafael F. Cury, Fabien Issartel,  
PLANSEE Tungsten Alloys

TUNGSTEN SESSION

T8

## POWDER PRODUCTION II

*(Golden Gate C2)***Session Chairman:**Thomas Jewett  
Global Tungsten & Powders  
Corporation0021 *U.S.A.* 8:00 a.m. (08.00)**Powder Properties of Nanocrystalline, Fluidized-Bed-Reduced Tungsten, Tungsten Carbide, and Tungsten-Rare-Earth Alloy Powders**Andrew J. Sherman, Brian P. Doud,  
David Hardy, Powdermet, Inc.0056 *Canada* 8:25 a.m. (08.25)**Micron and Nanosized Cobalt Powders for Hardmetal Applications**Hossein Aminian, FiMatCon  
(Fine Material Consultants)0035 *Austria* 8:50 a.m. (08.50)**Optimized Roasting for an Improved Soft Scrap Recycling**Thomas Angerer, Stefan Luidold,  
University of Leoben

TUNGSTEN SESSION

T9

## REVIEWS

*(Golden Gate C3)***Session Chairman:**Animesh Bose, FAPMI  
Materials Processing, Inc.0050 *United Kingdom*

8:00 a.m. (08.00)

**Advanced Hardmetal Manufacture in the 1950s: A Personal Memoir**Kenneth J. Brookes, International  
Carbide Data

# Technical Sessions & Programs

0042 U.S.A. 8:25 a.m. (08.25)  
**Functionally Graded Cemented Tungsten Carbide—a Review**  
Zhigang Z. Fang, Peng Fan,  
University of Utah

0004 Germany 8:50 a.m. (08.50)  
**The Impact Factor—Much Used with Little Knowledge About**  
Hugo M. Ortner, Darmstadt  
University of Technology

## SPECIAL INTEREST PROGRAMS Friday morning

## SIP 2 PM MATERIALS FOR ALTERNATIVE ENERGY (continued)

(Yerba Buena 14)

## PART 2: ALTERNATE FUELS II Friday morning 10:45–12:15 p.m. (10.45–12.15)

**Session Chairman:**  
Thomas J. Jesberger, Abbott Furnace  
Company

0169 U.S.A.  
**A Case Study on MIM Bipolar Plates for PEM Fuel Cells**  
Bruce G. Dionne, Megamet Solid Metals, Inc. & Joseph W. Newkirk, Missouri  
University of Science & Technology

0145 U.S.A.  
**Powder Metallurgy Challenges for CIGS Photovoltaics**  
Joseph Tunick Strauss, HJE Company,  
Inc.

0157 U.S.A.  
**Powder Metal Usage in Batteries**  
Lou Koehler, Koehler Associates &  
Thomas F. Stephenson, SMART Metal  
Powders

## SIP 3 TRIBOLOGY (continued)

(Yerba Buena 15)

## PART 2: WEAR RESISTANCE Friday morning

10:45–12:15 p.m. (10.45–12.15)  
**Session Chairman:**  
Steven R. Schmid, University of Notre  
Dame

0151 Sweden  
**Friction and Wear of Sintered Components in Lubricated Sliding Contacts of Machinery**  
Senad Dizdar, Höganäs AB

0022 Italy  
**Optimization of PM Parts for Wear Resistance—Design Criteria for Dry Rolling–Sliding Wear**  
Ilaria Cristofolini, Alberto Molinari,  
DIMS—University of Trento

0099 Brazil  
**Tribological Behavior of Iron-Based Sintered Alloys**  
José Daniel Biasoli de Mello, Universidade Federal de Uberlândia, Cristiano Binder, Aloisio N. Klein, Federal University of Santa Catarina & Roberto Binder, Whirlpool/Embraco

## TECHNICAL SESSIONS

Friday morning  
10:45 a.m.–12:15 p.m. (10.45–12.15)

## SESSION 13 MIM IV: ADVANCED MATERIALS

(Yerba Buena 10)

**Session Chairman:**  
Brian Holmes  
Columbia Plastics Ltd.  
Canada

0124 Germany 10:45 a.m. (10.45)  
**Nitronic 50—an Austenitic Steel with Nearly Perfect Properties**  
Stephanie Schneider & Jochen  
Eichstaedt, PolyMIM GmbH

0004 Singapore 11:10 a.m. (11.10)  
**Powder Injection Molding of High-Thermal-Conductivity Aluminum Nitride Substrates**  
Shengjie Ying, Dou Yee Technologies  
Pte. Ltd.

## SESSION 14 LOW-ALLOY STEELS II

(Yerba Buena 11)

**Session Chairman:**  
Thomas M. Zwitter, PMT  
Webster-Hoff Corporation

0072 U.S.A. 10:45 a.m. (10.45)  
**Microstructure and Mechanical Properties of Microalloyed PM Steels**  
Christopher T. Schade, Thomas F. Murphy, FAPMI, Hoeganaes Corporation & Alan Lawley, Roger Doherty, Drexel  
University

0101 U.S.A. 11:10 a.m. (11.10)  
**Mn-Containing Steels for High-Performance PM Applications**  
Bruce A. Lindsley, Hoeganaes  
Corporation & Suresh Shah, Jerry  
Falleur, Cloyes Gear & Products

0046 Canada 11:35 a.m. (11.35)  
**Copper Strengthening of PM Steel Parts**  
Fabrice Bernier, Maxime Gauthier,  
Industrial Materials Institute & Philippe  
Plamondon, Gilles L'Espérance, École  
Polytechnique de Montréal

## SESSION 15 ATOMIZATION

(Yerba Buena 12)

**Session Chairman:**  
Sylvain St. Laurent  
Rio Tinto Metal Powders  
Canada

0092 U.S.A. 10:45 a.m. (10.45)  
**Visualization of Atomization-Gas Flow and Melt Break-Up Effects in Response to Nozzle-Design Variations: Simulation and Practice**  
Iver E. Anderson, David Byrd, Andrew Heidloff, Ames Laboratory & Joel Rieken, John Meyer, Iowa State University

0079 U.S.A. 11:10 a.m. (11.10)  
**Gas-Atomization Precursor Powder Approach for Simplified Large-Scale Production of Oxide Dispersion-Strengthened (ODS) Ni-Based Alloys**  
John L. Meyer, Joel R. Rieken, Iowa State University & Iver E. Anderson, FAPMI, David Byrd, Ames Laboratory

0073 U.S.A. 11:35 a.m. (11.35)  
**Innovative Powder Processing of Oxide Dispersion-Strengthened (ODS) Ferritic Stainless Steels**  
Joel R. Rieken, Iowa State University & Iver E. Anderson, FAPMI, Matthew J. Kramer, Ames Laboratory

SESSION

16

**ADVANCES IN TITANIUM PM II**

*(Yerba Buena 13)*

**Session Chairman:**  
Deepak Madan  
Magnesium Elektron Powders

0069 U.S.A. 10:45 a.m. (10.45)  
**Advancements in Ti Alloy Powder Production by Close-Coupled Gas Atomization**  
Andrew J. Heidloff, Joel R. Rieken, Iowa State University & Iver E. Anderson, FAPMI, David J. Byrd, Ames Lab DMSE, DOE

0065 U.S.A. 11:10 a.m. (11.10)  
**Titanium Materials via Sintering of TiH<sub>2</sub> Powder**  
Pei Sun, Zhigang Fang, Hongtao Wang, University of Utah

0133 U.S.A. 11:35 a.m. (11.35)  
**Affordable PM Titanium—Microstructures, Properties and Products**  
Stanley Abkowitz, Susan M. Abkowitz, David Main, Harvey Fisher, Dynamet Technology, Inc.

**TUNGSTEN CONFERENCE**  
Friday morning  
10:45 a.m.–12:15 p.m. (10.45–12.15)

**TUNGSTEN SESSION T10**  
**TUNGSTEN I: W & DOPED W**

*(Golden Gate C1)*

**Session Chairman:**  
Hugo M. Ortner  
Darmstadt University of Technology  
Germany

0054 Austria 10:45 a.m. (10.45)  
**Potassium Doped Tungsten Beyond Incandescent Lamp Wires**  
Ingmar Wesemann, Andreas Hoffmann, PLANSEE SE

0052 U.S.A. 11:10 a.m. (11.10)  
**Development of EL-Form™ Processing for the Fabrication of Complex Tungsten Components**  
Alexander Smirnov, John S. O'Dell, Anatoliy Shchetkovskiy, Plasma Processes, Inc.

0024 Belgium 11:35 a.m. (11.35)  
**Steady-State Deformation of Pure and Doped Tungsten at Intermediate and High Temperatures**  
Subba Rao Mekala, Havells Sylvania Lighting Belgium NV

**TUNGSTEN SESSION T11**  
**HARDMATERIALS II**

*(Golden Gate C2)*

**Session Chairman:**  
Zhigang Z. Fang  
University of Utah

0043 U.S.A. 10:45 a.m. (10.45)  
**Silicon-Alloyed Cemented Carbide**  
Rajendra M. Kelkar, Jonathan W. Bitler, Tim Webb, Rick Riley, Dev Banerjee, Kennametal

0044 U.S.A. 11:10 a.m. (11.10)  
**Effects of WC Premix on the Microstructure and Properties of Polycrystalline Diamond Compact (PDC) Sintered by High Pressure and High Temperature (HPHT)**  
Guojang Fan, D. Belnap, MegaDiamond, A Schlumberger Company

0008 China 11:35 a.m. (11.35)  
**Migration of La, Ce, Pr, Nd and the In Situ Formation of Ln<sub>2</sub>S<sub>3</sub>, and Ln<sub>2</sub>O<sub>2</sub>S Phases on the Sinter Skin of Cr-Mischmetal CO-Doped WC-Co Alloy**  
Li Zhang, Hou-Ping Wu, Xiang-Jun Xiong, State Key Laboratory of Powder Metallurgy, Central South University & Shu Chen, Changsha Mining and Metallurgy Research Institute

**TUNGSTEN SESSION T12**  
**PROCESSING II**

*(Golden Gate C3)*

**Session Chairman:**  
Robert Dowding  
U.S. Army Research Laboratory

0053 U.S.A. 10:45 a.m. (10.45)  
**Materials Behavior and Manufacturing Aspects of Higher-Performance Refractory Materials by Combustion-Driven Higher-Pressure Powder Compaction**  
Karthik Nagarathnam, Dennis Massey, Utron Kinetics LLC

0069 U.S.A. 11:10 a.m. (11.10)  
**The Effect of Carrier Gas Selection on Mechanical Properties of Cold Sprayed Tantalum**  
Matthew Trexler, Robert Carter, Dennis Helfritsch, Victor Champagne, U.S. Army Research Laboratory

0060 India 11:35 a.m. (11.35)  
**Synthesis and Characterization of Cu-W Nano-Composite Strip by a Powder Metallurgy Route**  
Ravindra K. Dube, Anil K. Meena, Sanjay K. Vajpai, Indian Institute of Technology

# Technical Sessions & Programs

## SPECIAL INTEREST PROGRAM

Friday afternoon

SIP

3

## TRIBOLOGY (continued)

(*Yerba Buena 15*)

### PART 3: PROCESS TRIBOLOGY

Friday afternoon

3:30–5:00 p.m. (15.30–17.00)

#### Session Chairman:

Nicholas T. Mares, Asbury Graphite Mills, Inc.

0085 U.S.A.

#### AFM Investigation of Powder-Surface Forces

Steven R. Schmid, Michael A. Giordano, University of Notre Dame

0152 Sweden

#### Hardfacing by Powder Technologies as a Means to Improve Abrasive/Adhesive Wear and Corrosion Resistance

Senad Dizdar, Höganäs AB

0153 Canada & Australia

#### Effect of Tribological Variables on Compaction Modeling

Hossein Kashani Zadeh, Queens University & J. Jeswiet, Australian National University

## TECHNICAL SESSIONS

Friday afternoon

3:30–5:00 p.m. (15.30–17.00)

SESSION

17

## MIM V: ADVANCED PROCESSING

(*Yerba Buena 10*)

#### Session Chairman:

Michael Stucky  
NetShape Technologies—MIM

0075 U.S.A. & Korea

3:30 p.m. (15.30)

#### Gas-Assisted Powder Injection Molding: Mold-Cavity Effects on Residual Wall Thickness

Seokyoung Ahn, Kye Hwan Lee, Rajiv Nambiar, Donghan Kim, University of Texas-Pan American, Sang Won Chung, Nambu University, Seong Jin Park, Pohang University of Science and Technology & Randall M. German, FAPMI, San Diego State University

0132 Germany 3:55 p.m. (15.55)

#### 2-Component MIM Parts with a Functional Gradient in Porosity

Ana Paula Cysne Barbosa, Martin Bram, Hans-Peter Buchkremer, Detlev Stöver, Forschungszentrum Jülich GmbH

SESSION

18

## LOW-ALLOY STEELS III

(*Yerba Buena 11*)

#### Session Chairman:

Arthur E. (Bud) Jones  
Symmco, Inc.

0140 U.S.A. 3:30 p.m. (15.30)

#### Using Metallography to Understand the Behavior of Alloying Additives in Ferrous PM Materials

Thomas F. Murphy, FAPMI, Bruce Lindsley, Hoeganaes Corporation

0134 U.S.A. 3:55 p.m. (15.55)

#### A Study of Additive Diffusion in Ferrous Powder Metal Compacts Using Scanning Electron Microscopy and Energy Dispersive X-Ray Spectroscopy

Brian Sparber, Steven R. Spurgeon, Mitra L. Taheri, Drexel University & Francis J. Hanejko, Hoeganaes Corporation

0052 Switzerland 4:20 p.m. (16.20)

#### Dimensional Consistency and Mechanical Performance of PM Parts Addressed by Graphite-Type Selection

Luigi Alzati, Raffaele Gilardi, Simone Zürcher, TIMCAL SA

SESSION

19

## NOVEL POWDER PRODUCTION

(*Yerba Buena 12*)

#### Session Chairman:

Hani Henein  
University of Alberta  
Canada

0118 U.S.A. 3:30 p.m. (15.30)

#### Plasma-Sprayed Pour Tubes and Other Melt-Handling Components for Use in Gas Atomization

David Byrd, Iver E. Anderson, FAPMI, Matthew F. Besser, Ames Laboratory/Iowa State University & Joel R. Rieken, John Meyer, Iowa State University

0056 Japan 3:55 p.m. (15.55)

#### Nanomechanochemistry and Amorphous Powder Synthesis of Ceramics

Hiroshi Kimura, National Defense Academy

0123 Germany 4:20 p.m. (16.20)

#### Nanostructured Material Lighter than Aluminum and as Strong as Steel by HKP of Al + CNTs (Baytubes®)

Henning Zoz, Zoz Group

SESSION

20

## ADVANCES IN TITANIUM PM III: NEAR-NET- SHAPE PROCESSING

*(Yerba Buena 13)***Session Chairman:**

James W. Sears  
South Dakota School of Mines &  
Technology

0002 *Australia 3:30 p.m. (15.30)*

### Sintering of Titanium Alloys for Net-Shape Applications

Graham B. Schaffer, Ray J. Low,  
Shudong Luo, Ya-Feng Yang, Ma Qian,  
The University of Queensland

0051 *U.S.A. 3:55 p.m. (15.55)*

### Densification and Microstructural Behavior on the Sintering of Low-Cost Ti and Ti<sub>6</sub>Al<sub>6</sub>V Powder Metallurgy Components

Thomas M. Zwitter, Webster-Hoff Corp.  
& Xiaoyan Xu, Philip Nash, Kerem Araci,  
Illinois Institute of Technology

0025 *Sweden 4:20 p.m. (16.20)*

### Influence of Powder Size and Layer Thickness on the Properties of Ti-6Al-4V Lattice Structures Manufactured by Electron Beam Melting

Sanna Fager Franzén, Mattias  
Svensson, Isak Elfstrom, Ulf Ackelid,  
Arcam AB

SESSION

21

## IMPROVEMENTS IN SPRAY FORMING, EXTRUSION & POWDER FORGING

*(Yerba Buena 14)***Session Chairman:**

John F. Sweet, PMT  
FMS Corporation

0114 *New Zealand  
3:30 p.m. (15.30)*

### Near-Net-Shape Titanium Alloy Product Manufacturing Using Powder Compact Forging and Powder Compact Extrusion of Titanium Alloy Powders

Delaing Zhang, Mingtu Jia, Fantao  
Kong, Stilian Raynova, Brian Gabbitas,  
University of Waikato

SESSION

22

## MATERIALS FOR AUTOMOTIVE APPLICATIONS

*(Golden Gate C1)***Session Chairman:**

Roger Lawcock  
Gates Canada, Inc.  
Canada

0088 *U.S.A. 3:30 p.m. (15.30)*

### A Novel Approach for Manufacturing Powder-Forged Connecting Rods

Ian W. Donaldson, Timothy E. Geiman,  
Raymond K. Williams, GKN Sinter Metals

0108 *Germany 3:55 p.m. (15.55)*

### High-Performance PM Synchronizer Rings with Carbon Friction Linings

Salvator Nigarura, PMG Indiana  
Corporation & Guenter Rau, Patrice  
Delarbre, PMG Füssen GmbH

0159 *Germany 4:20 p.m. (16.20)*

### Fatigue Behavior of a Sintered Steel Containing 4%, 1.5% Cu, 0.5% Mo and 0.6% C

Paul Beiss, FAPMI, A. Zafari, RWTH  
Aachen University, Institut for Materials  
Applications in Mechanical Engineering  
& K. Lipp, D. Hofferberth, Fraunhofer  
Institute for Structural Durability and  
System Reliability LBF

TUNGSTEN CONFERENCE

Friday afternoon

3:30 –5:00 p.m. (15:30–17.00)

TUNGSTEN SESSION T13

## PLENARY SESSION: STATE OF THE TUNGSTEN & CEMENTED CARBIDE INDUSTRY IN CHINA

*(Golden Gate C2)***Session Chairman:**

Robert Dowding  
U.S. Army Research Laboratory

0005 *China 3:30 p.m. (15.30)*

### Introduction of China's Tungsten Industry

Li Zhang, State Key Laboratory of  
Powder Metallurgy, Central South  
University & Yi-Xian Zhang, Ke-Mei  
Luo, Hunan Nonferrous Metals  
Holding Group Co. Ltd.

0006 *China 3:55 p.m. (15.55)*

### Introduction of China's Cemented Carbide Industry

Li Zhang, State Key Laboratory of  
Powder Metallurgy, Central South  
University & Ke-Mei Luo, Yi-Xian  
Zhang, Hunan Nonferrous Metals  
Holding Group Co. Ltd.

0007 *China 4:20 p.m. (16.20)*

### Some Aspects of Technology Progresses in China's Cemented Carbide Industry

Li Zhang, Hou-Ping Wu, State Key  
Laboratory of Powder Metallurgy,  
Central South University & Chong-  
Hu Wu, Xiamen Golden Egret  
Special Alloy Co. Ltd.

# Technical Sessions & Programs

SATURDAY, MAY 21

## SPECIAL INTEREST PROGRAM

Saturday morning

SIP

4

## SINTER HARDENING AND LEANER/ECONOMIC POWDERS

(*Yerba Buena 15*)

### Program Organizers:

Carl Blais, Laval University (Canada)  
Scott Davis, PMG  
Gilles L'Espérance, FAPMI, École Polytechnique de Montréal (Canada)  
Anthony Miller, PMT, Micro Metals, Inc.

Sinter hardening is a cost-effective strategy that eliminates some of the steps involved with heat treating of PM steels. Initially, sinter hardenable powders contained significant concentrations of alloying elements to accommodate the slow cooling rates of "conventional" sintering furnaces. Nevertheless, recent optimization work in terms of thermal profile in the cooling section of sintering furnaces as well as alloy design and sinter-hardenable characterization has opened up new possibilities for sinter hardening both in terms of flexibility and cost savings. The presentations grouped in this program will put forward these new developments in the perspective of real-life applications and future trends.

Presentations in Part 1 will run approximately 45 minutes each, including questions. Presentations in Parts 2 and 3 will run approximately 30 minutes each, including questions. Manuscripts that are submitted will be published in the conference proceedings.

### PART 1: OVERVIEW

#### Saturday morning

8:00 a.m.–9:30 a.m. (08.00–09.30)

#### Session Chairman:

Carl Blais, Laval University

0030 U.S.A.  
**Sinter Hardening—an Historical Perspective**  
W. Brian James, Hoeganaes Corporation

0113 Spain  
**Sinter Hardening of PM Steels: a Review**  
Francisco Castro, CEIT

## TECHNICAL SESSIONS

Saturday morning  
8:00–9:30 a.m. (08.00–09.30)

SESSION

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## OPERATIONAL ADVANCES I

(*Yerba Buena 10*)

### Session Chairman:

Mark Opoku-Adusei  
ASCO Sintering Co.

0130 U.S.A. 8:00 a.m. (08.00)  
**Super-Abrasive Machining Welcomes Interruptions**  
Rocco Petrilli, SAMI LLC

0063 Italy 8:25 a.m. (08.25)  
**Plane-Bending-Fatigue Resistance of a Plasma Nitrided Cr-Mo Low-Alloy Sinter-Hardened Steel**  
Alberto Molinari, Cinzia Menapace, Elena Santuliana, University of Trento, Stefano Libardi, TFM SpA & Gabriele Lorenzi, Vacuum SpA

0018 India 8:50 a.m. (08.50)  
**Novel Infiltrating Formulations Using Prealloyed Metal Composite Powders for Consistent Product Performance**  
Arun K. Chattopadhyay, P. Sundarapandian, N. Chandrasekaran, The Metal Powder Company Ltd.

SESSION

24

## HIGH-ALLOY STEELS

(*Yerba Buena 11*)

### Session Chairman:

Alan Lawley, FAPMI  
Drexel University

0007 Sweden 8:00 a.m. (08.00)  
**Corrosion-Resistant Nitrogen-Alloyed Steels with High Hardness**  
Odd M. Sandberg, Alf H. Sandberg, Uddeholms AB

0067 Germany 8:25 a.m. (08.25)  
**Development of Iron-Based, Highly Abrasion-Resistant Alloys Suitable for Gas Atomization**  
Stefan Schuberth, Bernhard Wielage, Chemnitz University of Technology

SESSION

25

## SINTERING FURNACE CONTROL & OPTIMIZATION

(*Yerba Buena 12*)

### Session Chairman:

Sydney H. Luk  
North American Höganäs, Inc.

0064 U.S.A. 8:00 a.m. (08.00)  
**Techniques and Tips to Optimize, Control and Stabilize the Atmosphere Inside a Continuous Sintering Furnace**  
Thomas Philips, John J. Dwyer, Jr., Zbigniew Zurecki, Air Products and Chemicals Inc.

0139 U.S.A. 8:25 a.m. (08.25)  
**Service-Life Extension of Stainless Steel Wire-Mesh Belts for Sintering Furnaces**  
Anna Wehr-Aukland, Donald J. Bowe, Air Products and Chemicals, Inc. & Anthony M. Zaffuto, Jeremy Gabler Metaltech, Inc.

0035 *India* 8:50 a.m. (08.50)  
**Cost Reduction in a Flexible Furnace with Enhanced Sinter Hardening**  
N. Gopinath, Fluidtherm Technology

SESSION

26

**ADVANCES IN TITANIUM  
PM IV: BIOMEDICAL  
POROUS STRUCTURES**

(*Yerba Buena 13*)

**Session Chairman:**

Colin McCracken  
Ametek/Reading Alloys

0066 *Canada* 8:00 a.m. (08.00)  
**Development of Porous/Dense Implant Using Titanium Powder Injection Overmolding and Ti-Foam Inserts**  
Eric Baril, Yannig Thomas, Louis-Philippe Lefebvre, NRC—Industrial Materials Institute

0120 *Colombia & Spain* 8:25 a.m. (08.25)

**Processing and Characterization of Porous Titanium for Biomedical Applications**

Jorge Bris Cabrera, Sheila Katherine Lascano Farak, Universidad del Norte, Yadir Torres Hernandez, Ines Maria Nieto, Glenda Beatriz Hernandez, Jose Antonio Rodriguez, Universidad de Sevilla & Juan Jose Pavon Palacio, Universidad de Antioquia

0126 *U.S.A.* 8:50 a.m. (08.50)  
**Tritanium™, a Titanium Foam Coating for Use on Orthopaedic Implants**  
Gene Kulesha, N. G. D. Murray, J. J. Muth, Stryker Orthopaedics

SESSION

27

**TRENDS IN  
COMPONENT  
COMPACTING &  
MEASUREMENT**

(*Yerba Buena 14*)

**Session Chairman:**

Samuel Jaffe  
Laufer Pressen

0117 *Germany* 8:00 a.m. (08.00)  
**Electrical Servo Motor-Driven Press for Consistent High-Precision Compacting Performance**  
Gregory D. Wallis, Dorst America Inc. & Fritz Witt, Wolfgang V. Schuebl, Dorst Technologies

0125 *U.S.A. & Switzerland* 8:25 a.m. (08.25)

**Cost-Efficient Powder Compaction**  
Jack Krajcirik, Osterwalder, Inc. & Alex Wehrli, Stefa Haltner, Michael Gassmann, Osterwalder AG

0045 *Canada* 8:50 a.m. (08.50)  
**Densitometry Analysis to Determine Density Distribution in Green Compacts**

Geoffrey Beck, Stanley Selig, Darrel A. Doman, Dalhousie University

**TUNGSTEN CONFERENCE  
Saturday morning  
8:00–9:30 a.m. (08.00–09.30)**

TUNGSTEN SESSION **T14**

**TUNGSTEN II:  
MECHANICAL  
PROPERTIES**

(*Golden Gate C1*)

**Session Chairman:**

Lee S. Magness, Jr.  
U.S. Army Research Laboratory

0070 *U.S.A.* 8:00 a.m. (08.00)  
**Property-Microstructural Relationship in a Tungsten Heavy Alloy**  
David A. Alven & Timothy Brent, Aerojet Ordnance Tennessee

0057 *France* 8:25 a.m. (08.25)  
**Failure Properties of Tungsten Alloys**  
Hervé Couque, Nexter Munitions

0051 *China* 8:50 a.m. (08.50)  
**Research on the Deformation-Strengthening Mechanism and Microstructure of 93WNiCu Tungsten Alloy by Cold-Rolled Deformation**  
Liu Guirong, Wang Ling, Advanced Technology & Materials Co., Ltd.

TUNGSTEN SESSION **T15**

**HARDMATERIALS III:  
CHARACTERIZATION**

(*Golden Gate C2*)

**Session Chairman:**

Natasha Sacks  
University of Witwatersrand  
*South Africa*

0026 *Sweden* 8:00 a.m. (08.00)  
**Experimental Characterization of the WC Grain Size Evolution from the WC Raw Material, via the Milled Cemented Carbide Slurry, to the Sintered Microstructure**  
Eric Laarz, Tomas Persson, Bo Jansson, Jan Qvick, Seco Tools AB

0039 *U.S.A.* 8:25 a.m. (08.25)  
**Measurement of Surface-Residual Stress of WC-Co by Indentation Method**  
Xu Wang, Zhigang Z. Fang, University of Utah

0071 *China* 8:50 a.m. (08.50)  
**Synthesis of Ultrafine Nanocrystalline W-(30~50) Cu Composite Powders and Microstructure Characteristics of the Sintered Alloys**  
Liu Tao & Jinglian Fan, State Key Laboratory, Central South University

TUNGSTEN SESSION **T16**

**NANOGRAINED  
MATERIALS**

(*Golden Gate C3*)

**Session Chairman:**

Reinhard Tham  
Fraunhofer Society  
*Germany*

0040 *U.S.A.* 8:00 a.m. (08.00)  
**Trends of Mechanical Properties of Functionally Graded Cemented Tungsten Carbide**  
Kyu Sup Hwang, Xu Wang, Zhigang Zak Fang, Peng Fan, Michael Lefler, University of Utah

0058 *U.S.A. & China* 8:25 a.m. (08.25)

**Plasma Pressure Compaction (P2C) of Tungsten Nanopowders Produced by Salt-Assisted Combustion Synthesis**  
Franklyn R. Kellogg, Data Matrix Solutions, Bradley R. Klotz, Dynamic Science Inc., Hayk H. Nersisyan, Chungnam National University & Kyu C. Cho, U.S. Army Research Laboratory

# Technical Sessions & Programs

0064 U.S.A. 8:50 a.m. (08.50)

## High-Strain-Rate Behavior of Nanostructured Niobium Processed by Severe Plastic Deformation to Very Large Strains

Laszlo J. Kecskes, U.S. Army Research Laboratory, Suveen N. Mathaudhu, U.S. Army Research Office, Z. L. Pan, W. H. Yin, Qiuming Wei, University of North Carolina at Charlotte

## SPECIAL INTEREST PROGRAM

Saturday morning

SIP

4

## SINTER HARDENING AND LEANER/ECONOMIC POWDERS (continued)

(*Yerba Buena 15*)

## PART 2: NEW ALLOYS & PROCESSES I

Saturday morning

9:45–11:15 a.m. (09.45–11.15)

Session Chairman:

Gilles L'Espérance, FAPMI, École Polytechnique de Montréal

0087 Canada

## Optimization of Properties of Sinter-Hardened Materials

François Chagnon, Rio Tinto Metal Powders

0104 U.S.A.

## The Contribution to Physical Properties by the Use of Manganese in PM When Used as a Primary Alloying Element

Dennis L. Hammond, Apex Advanced Technologies & Richard Phillips, Engineered Pressed Materials

0027 Austria

## Factors Influencing the Austenite Grain Size in Sinter-Hardened Low Cr-Mo Alloyed PM Steels

Magdalena Dlapka, Herbert Danninger, Christian Gierl, Vienna University of Technology

## TECHNICAL SESSIONS

Saturday morning  
9:45–11:15 a.m. (09.45–11.15)

SESSION

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## OPERATIONAL ADVANCES II

(*Yerba Buena 10*)

Session Chairman:

Ronald E. Arble, PMT  
NetShape Technologies, Inc.

0013 Germany 9:45 a.m. (09.45)

## Joining of Powder Metallurgically Produced AA2017 (Al<sub>2</sub>O<sub>3</sub>)p Composite by Resistance Brazing

Sebastian Weis, Bernhard Wielage, Ina Hoyer, Chemnitz University of Technology, Institute of Materials Science and Engineering

0023 Japan 10:10 a.m. (10.10)

## Development of 1200HV-Class Gas-Atomized Powder for Shot-Peening Media

Toshiyuki Sawada, Akihiko Yanagitani, Sanyo Special Steel Co., Ltd.

0100 Russia 10:35 a.m. (10.35)

## Welding of Titanium with Stainless Steel by High-Voltage Electric-Current Pulse

Evgeny G. Grigoryev, Moscow Engineering Physics Institute

SESSION

29

## ALUMINUM

(*Yerba Buena 11*)

Session Chairman:

Chaman Lall  
Metal Powder Products Company

0089 Brazil 9:45 a.m. (09.45)

## Characterization of Spray-Formed Hypereutectic Al-Si Alloys—Corrosion Resistance

Jesualdo L. Rossi, Hamilta O. Santos, Clarisse T. Kuniوشي, Isolda Costa, IPEN—CNEN/SP & Marco A. Colosio, General Motors of Brazil

0058 Canada 10:10 a.m. (10.10)

## The Effect of Hydrogen Evolution During the Rapid Solidification of Al-9.5Si Alloy

Arash Ilbagi, Pooya Delshad Khatibi, Hamidreza Pirayesh, Hani Henein, University of Alberta & Andre B. Phillion, UBC Okanagan

0012 Iran & Austria

10:35 a.m. (10.35)

## Evolution of Properties and Microstructure During Liquid-Phase Sintering of PM Alumix 431

Maziyar Azadbeh, Sahand University of Technology & Christian Gierl, Herbert Danninger, Vienna University of Technology

SESSION

30

## COMPOSITES I

(*Yerba Buena 12*)

Session Chairman:

Jason Ting  
Consultant

0011 France 9:45 a.m. (09.45)

## Evolution of the Titanium Carbide Reinforcement During Solid-State Processing of Steel/TiC Metal Matrix Composites

Alice Courleux, Olivier Dezellus, Jean-Claude Viala, University of Lyon & Olivier Martin, Mecachrome

0042 Portugal 10:10 a.m. (10.10)

## Processing and Shear-Stress Evaluation of Functionally Graded Composites with Different Gradient Profiles

Oscar Carvalho, Selfim Soares, Filipe Silva, Nikhil Karnatak, University of Minho

0080 China 10:35 a.m. (10.35)

## Microstructure and Mechanical-Property Study of TiCx/Cu Interpenetrating Phase Composites Fabricated by Self-Infiltration

Ning Xiong, Tongwei Lin, Feixiong Chen, Tiejun Wang, Wuping Zhou, Daming Lv, Advanced Technology & Materials Co. Ltd.

SESSION

31

**ADVANCES IN  
TITANIUM V: MIM 1***(Yerba Buena 13)***Session Chairman:**J. Alan Sago  
Accellent Inc.0034 *Germany 9:45 a.m. (09.45)*  
**Metal Injection Molding of Advanced  
Titanium Alloys**Thomas Ebel, Orley Milagres Ferri,  
Wolfgang Limberg, Helmholtz-Zentrum  
Geesthacht0041 *Japan 10:10 a.m. (10.10)*  
**Dynamic Fracture Characteristics of  
Injection Molded Ti Alloy Compacts**Hideshi Miura, Hyun Goo Kang,  
Munehiro Noda, Kyushu University0078 *New Zealand, U.S.A. & Korea  
10:35 a.m. (10.35)***Encapsulation of Titanium Alloy  
Powders during Binder Removal from  
a Metal Injection Molded Part**Paul Ewart, Deliang Zhang, University of  
Waikato, Seokyoung Ahn, University of  
Texas - Pan American & Seong Jin  
Park, Pohang Univ. of Science & Engrg.  
(POSTECH)

SESSION

32

**SINTERING  
REPEATABILITY***(Yerba Buena 14)***Session Chairman:**Jose Medina, Jr., PMT  
NetShape Technologies, Inc.0082 *U.S.A. 9:45 a.m. (09.45)*  
**Documentation of Furnace  
Performance**James Litzinger, Orton Ceramic  
Foundation0039 *India 10:10 a.m. (10.10)*  
**Sintering Recipes for Repeat Results  
from a Sintering Furnace**

Ravi P. Malhotra, Malhotra Engineers

0031 *Poland 10:35 a.m. (10.35)*  
**Atmosphere Effect on Reactive  
Sintering of Aluminum-Iron Powder  
Mixtures**Tadeusz Pieczonka, Jan Kazior, Marek  
Hebda, Cracow University of Technology**TUNGSTEN CONFERENCE****Saturday morning**

9:45–11:15 a.m. (09.45–11.15)

**TUNGSTEN SESSION T17****PROCESSING III***(Golden Gate C1)***Session Chairman:**David E. Dombrowski  
Los Alamos National Laboratory0033 *China 9:45 a.m. (09.45)***Development of Fabrication of  
Tungsten as Plasma-Facing  
Materials for Fusion Application  
in INM, USTB**Changchun Ge, Jun Tan, Dandan  
Qu, Yujie Li, Zhangjian Zhou, Uni-  
versity of Science and Technology  
Beijing, Shuangquan Guo, South-  
west Jiaotong University & Xiaofeng  
Zhang, Jingdezhen Ceramic  
Institute0020 *Germany 10:10 a.m. (10.10)***Powder Injection Molding—an  
Economical Effective Fabrication  
Method for DEMO Divertor Com-  
ponents**Volker Piottor, Steffen Antusch,  
Prachai Norajitra, Hans-Joachim  
Ritzhaupt-Kleissl, Juergen  
Hausselt, Karlsruhe Institute of  
Technology0059 *China 10:35 a.m. (10.35)***Metal Injection Molding of  
W-1.5%La<sub>2</sub>O<sub>3</sub> Alloy**Jiupeng Song, Yang Yu, Junyong  
Liu, Xiamen Honglu Tungsten &  
Molybdenum Industry Co. Ltd. &  
Zhigang Zhuang, China National  
R&D Center for Tungsten Technol-  
ogy, Xiamen Tungsten Co. Ltd.**TUNGSTEN SESSION T18****GRADED AND  
NANOCRYSTALLINE  
MATERIALS***(Golden Gate C2)***Session Chairman:**Randall M. German, FAPMI  
San Diego State University0038 *U.S.A. 9:45 a.m. (09.45)***Effects of Grain Growth Inhibitor  
on Cobalt Gradient Formation in  
Cemented Tungsten Carbide**Jun Guo, Peng Fan, Xu Wang,  
Zhigang Z. Fang, University of Utah0031 *U.S.A. 10:10 a.m. (10.10)***Sintering Behaviors and Grain  
Growth of Tungsten and Tantalum  
with Nano WC Powder**Sinthu Chanthapan, Anil Kulkarni,  
Jogender Singh, Pennsylvania  
State University0065 *U.S.A. & Japan  
10:35 a.m. (10.35)***In-Situ SEM Tension and  
Compression Testing of  
Nanocrystalline and Ultra-Fine-  
Grained BCC Metals**Brian E. Schuster, U.S. Army  
Research Laboratory, Jonathan  
P. Ligda, Qiuming Wei, University of  
North Carolina at Charlotte, William  
N. Sharpe, Johns Hopkins University  
& Zenji Horita, Kyushu University**TUNGSTEN SESSION T19****WEAR BEHAVIOR***(Golden Gate C3)***Session Chairman:**Stephen C. McCrossan  
PLANSEE USA LLC0030 *Germany 9:45 a.m. (09.45)***Wear and Cutting Properties of  
Near-Nano WC/Co Cemented  
Carbides**Bernhard Caspers, Tino Säuberlich,  
Markus Zumdick, H. C. Starck  
GmbH0019 *Japan 10:10 a.m. (10.10)***Low-Friction Coating Containing  
Refractory Carbide at High  
Temperature**Kazuo Hamashima, Yasunari  
Ishikawa, Asahi Glass Co., Ltd.

# Technical Sessions & Programs

## SPECIAL INTEREST PROGRAM Saturday morning

SIP

4

### SINTER HARDENING AND LEANER/ECONOMIC POWDERS (continued)

(Yerba Buena 15)

#### PART 3: NEW ALLOYS & PROCESSES II

Saturday morning

11:30 a.m.–1:00 p.m. (11.30–13.00)

Session Chairman:

Scott Davis

Hoeganaes Corporation

0057 Canada

#### New Master Alloys for Improved Sinter-Hardening Applications

Ian Bailon-Poujol, Gilles L'Esperance, Ecole Polytechnique de Montreal

0143 U.S.A.

#### Sinter Hardening, a Furnace Perspective

Thomas J. Jesberger, Abbott Furnace Company

## TECHNICAL SESSIONS Saturday morning

11:30 a.m.–1:00 p.m. (11.30–13.00)

SESSION

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### TRENDS IN PM

(Yerba Buena 10)

Session Chairman:

Larry F. Totzke, PMT  
PSM Industries

0097 U.S.A. 11:30 a.m. (11.30)

#### Update on PM and MIM in the Defense Industry

Mitchell N. Gross, Raytheon Company

0144 U.S.A. 11:55 a.m. (11.55)

#### Magnesium Powder Technology for Ultra Lightweight Applications

Rajiv Tandon, Deepak Madan, Magnesium Elektron Powders & Kyu Cho, U.S. Army Research Laboratory

0129 China & Germany

12:20 p.m. (12.20)

#### The Development of PM in China (2007–2010)

Michael Godin, Alexander Godin, Mate Consulting Ltd. & Fenglin Han, Powder Metallurgy Association of China

SESSION

34

### STAINLESS STEEL

(Yerba Buena 11)

Session Chairman:

François Chagnon  
Rio Tinto Metal Powders  
Canada

0081 U.S.A. 11:30 a.m. (11.30)

#### Effect of Process Variables on the Dimensional Change of Ferritic Stainless Steels

Prasan K. Samal, Joseph D. Pannell, North American Höganäs, Inc.

0112 Spain 11:55 a.m. (11.55)

#### Controlled Densification of Boron-Containing Stainless Steel

Francisco Castro, Lorena Lozada, CEIT

SESSION

35

### COMPOSITES II

(Yerba Buena 12)

Session Chairman:

Susan M. Abkowitz  
Dynamet Technology, Inc.

0032 Germany 11:30 a.m. (11.30)

#### Carbon-Reinforced Metal Composites with Tailored Thermophysical and Damping Properties

Thomas Weissgaerber, Thomas Schubert, Thomas Hutsch, Bernd Kieback, Fraunhofer Institute of IFAM Dresden

0116 Turkey 11:55 a.m. (11.55)

#### Processing and Characterization of Impregnated Diamond Cutting Tools Using an Fe/Co Matrix

Kerim Emre Öksüz, Mehmet Turker, Cumhuriyet University & Yusuf Tahyn, Gazi University

0060 Brazil 12:20 p.m. (12.20)

#### Effect of Matrix on the Tribological Behavior of Plasma-Assisted Debinded and Sintered MIM Self-Lubricating Steels

Aloisio N. Klein, Cristiano Binder, Renan Schroeder, Federal University of Santa Catarina, Jose Daniel B. de Mello, Federal University of Uberlandia & Roberto Binder, Whirlpool/Embraco

SESSION

36

### ADVANCES IN TITANIUM PM VI: MIM 2

(Yerba Buena 13)

Session Chairman:

Satyajit Banerjee  
DSH Technologies, LLC

0141 U.S.A. 11:30 a.m. (11.30)

#### Development of MIM Titanium Alloys for Implantable Biomedical Devices

J. Alan Sago, Mark W. Broadley, John K. Eckert, Accellent Inc.

0071 Switzerland

11:55 a.m. (11.55)

#### Processing of Titanium-Based Materials from Titanium Hydride Powders: PIM and Tape Casting

Efrain Carreno-Morelli, Jacques-Eric Bidaux, University of Applied Sciences Western Switzerland

0003 Singapore 12:20 p.m. (12.20)

#### Titanium Powder Injection Molding

Shengjie Ying, Dou Yee Technologies Pte. Ltd.

SESSION

37

**PREDICTING  
VARIABLES IN  
COMPACTS**

*(Yerba Buena 14)*

**Session Chairman:**

Gregory D. Wallis  
Dorst America, Inc.

0049 U.S.A. 11:30 a.m. (11.30)

**The Effect of Die Temperature on  
Green Density**

Sydney Luk, Roland T. Warzel III,  
North American Höganäs, Inc.

0105 Canada 11:55 a.m. (11.55)

**Thermal and Mechanical Properties  
of EBS Wax**

James McCall, NuvoSci & John  
Blachford, H.L. Blachford Ltd. LTEE

0050 Canada 12:20 p.m. (12.20)

**Finite Element Simulation of the  
Compaction and Springback of  
Aluminum Powder Metallurgy Alloys**

Stanley G. Selig, Darrel A. Doman,  
Dalhousie University

**TUNGSTEN CONFERENCE**

**Saturday morning**

11:30 a.m.–1:00 p.m. (11.30–13.00)

TUNGSTEN SESSION **T20**

**KINETICS AND  
THERMODYNAMICS**

*(Golden Gate C1)*

**Session Chairman:**

Subba Rao Mekala  
Havells Sylvania  
Belgium

0063 U.S.A. 11:30 a.m. (11.30)

**Study of the Formation of HfW<sub>2</sub> in  
the W Hf Binary System**

Laszlo J. Kecskes, Kris A. Darling,  
U.S. Army Research Laboratory

0062 U.S.A. 11:55 a.m. (11.55)

**Achieving Thermodynamic  
Stability for Nanocrystalline  
Tungsten Powders**

Brady G. Butler, Eric M. Klier,  
Kristofer A. Darling, Micah  
Gallagher, Heidi Maupin, U.S. Army  
Research Laboratory

TUNGSTEN SESSION **T21**

**TUNGSTEN III: W-CU**

*(Golden Gate C2)*

**Session Chairman:**

Dov Chaiat  
Tungsten Powder Technology (TPT)  
Israel

0037 U.S.A. & Egypt  
11:30 a.m. (11.30)

**Advances in W-Cu: New Powder  
Systems**

Randall M. German, FAPMI, Aditya  
Bothate, Wei Li, Eugene A. Olevsky,  
San Diego State University & Walid  
M. Daoush, Sayed Moustafa, Cen-  
tral Metallurgical R&D Institute

0061 U.S.A. & Egypt  
11:55 a.m. (11.55)

**Two Stages Spark Plasma Sinter-  
ing (TSSPS) of W-Cu Alloys**

Wei Li, Aditya Bothate, Eugene A.  
Olevsky, Randall M. German,  
FAPMI, San Diego State University  
& Walid M. Daoush, Sayed  
Moustafa, Central Metallurgical  
R&D Institute

0010 China 12:20 p.m. (12.20)

**Sintering Behavior of Ultrafine/  
Nanocrystalline W/Cu Composite  
Powders Synthesized by Sol-  
Spray Drying and Subsequent  
Hydrogen Reduction Process**

Fan Jing-Lian, Zhu Song, Liu Tao,  
Huang Bai-Yun, Tian JiaMin,  
State Key Laboratory for Powder  
Metallurgy, Central South University

TUNGSTEN SESSION **T22**

**TUNGSTEN IV:  
W & Mo ALLOYS**

*(Golden Gate C3)*

**Session Chairman:**

John L. Johnson  
ATI Engineered Products

0066 U.S.A. 11:30 a.m. (11.30)

**Corrosion Behavior of Tungsten  
Heavy Alloys in Rat Muscle  
Tissue and in Simulated  
Physiological Solutions**

Brian E. Schuster, J. Derek  
Demaree, Christopher Miller, Lee S.  
Magness, U.S. Army Research  
Laboratory, Diana A. Ramirez,  
Lawrence E. Murr, University of  
Texas at El Paso & Laurie E.  
Roszell, U.S. Army Public Health  
Command

0067 U.S.A. 11:55 a.m. (11.55)

**Powder Compaction Modeling of  
WHA Parts from Three Different  
Powder Types**

Michael T. Stawovy, Dincer  
Bozkaya, H. C. Starck Inc.

0068 Austria 12:20 p.m. (12.20)

**Traditional and New Applications  
of Molybdenum Metal and Alloys**

Stephen C. McCrossan, Plansee  
USA LLC & Wolfram Knabl,  
Hermann Walser, Plansee SE

# Poster Program

An international display of posters dealing with various aspects of PM and particulate material technologies will be on display daily starting on Thursday morning. Authors will be available at their posters for protracted discussions on Friday 2:00–3:30 p.m. (14:00–15:30). Other days/times when individual authors are available may be posted at the discretion of the poster author. Manuscripts submitted from poster authors will be published in the conference proceedings.

**POSTER AWARDS:** “Outstanding Poster” and “Poster of Merit” ribbons will be awarded by the Poster Program Awards Committee for displays that best meet the following criteria:

1. Technical, scientific and professional integrity (no overt/blatant commercialism)
2. Presentation clarity and overall esthetic appearance
3. Enhanced practical or industrial value for the industry

Award ribbons will be posted prior to the designated discussion period on Friday.

## POSTER COMMITTEE

Nicholas T. Mares,  
Asbury Graphite Mills, Inc.,  
Chairman

Christopher P. Adams,  
New England Impregnators

Kyu Cho, U.S.  
Army Research Laboratory

Lane H. Donoho, PMTII,  
CMW Inc.

Cynthia Freeby, Ametek, Inc.

Jessu Joys, United States Metal  
Powders Inc.

Peter K. Sokolowski,  
Hoeganaes Corporation

Craig J. Stringer,  
The Pennsylvania State  
University

## POSTER GROUP MATERIALS

# A

0010 *Trinidad and Tobago*  
**Experimental Determination of Thermophysical Properties of Concrete for Thermal-Energy Storage**  
Anthony Ademola Adeyanju, University of the West Indies

0014 *Iran*  
**Influence of Stratified Bond Formation at Matrix-Reinforcement Interface on Properties of a PM Al/Ni<sub>3</sub>Al Composite**  
Maziyar Azadbeh, Maryam Abbasi, Sahand University of Technology

0054 *Colombia*  
**Oxidation–Reduction Behavior of Low-Alloy PM Steel Powders**  
Pablo Ortiz, Temis Coral, Juan Carlos Moreno, Maria Teresa Cortés, Universidad de los Andes

0083 *Turkey*  
**The Investigation of the Effect of Fe-Co Ratio on the Characteristics of Diamond Socket Produced by Powder Metallurgy**  
Kerim Emre Öksüz, Cumhuriyet University

0161 *Japan*  
**Uniform Distribution & Characterization of Ultrafine Re Powders in W-Re Mixtures**  
Xingbo Yang, Tasuku Ikegawa, Toshinari Sumi, Kohsei Co., Ltd.

0162 *Iran*  
**Mechanical Properties of the Prealloyed Steel Powders, Welded by GTAW**  
Negin Almasi, Nader Mabhani, Petroleum University of Technology & Ali Ashrafi, Shahid Ghamran University of Ahvaz

0167 *U.S.A.*  
**A Study of Failure Mechanisms in a Ferrous PM Component Using Scanning Electron Microscopy and Auger Electron**  
Brian A. Sparber, Steven R. Spurgeon, & Mitra L. Taheri, Drexel University

## POSTER GROUP PROCESSING

# B

0024 *Turkey*  
**Injection Molded of High-Density 316L Stainless Steel for Bio-Applications**  
Ozkan Gulsoy, Hasan Gelmez, Nagihan Gulsoy, Marmara University

0044 *Canada*  
**Instrumented Die System to Characterize Compaction Lubrication**  
Geoffrey Beck, Darrel A. Doman, Dalhousie University

0076 *U.S.A., New Zealand & Korea*  
**Powder Injection Molding of Multi-Scale Titanium Parts—Micro Features and Surface Modification**  
Seokyoung Ahn, Ernesto Zarazua, University of Texas—Pan American, Paul Ewart, Deliang Zhang, University of Waikato, Seong Jin Park, Pohang University of Science & Engineering (POSTECH) & Randall M. German, FAPMI, San Diego State University

0102 *Estonia*  
**Reactive Sintered WC-Co Hardmetals with Alloying Additives**  
Kristjan Juhani, Jüri Pirsõ, Mart Viljus, Sergei Letunovitõ, Tallinn University of Technology

0142 *U.S.A.*  
**Effect of Fe Impurity on Processing of Molybdenum**  
Ravi K. Enneti, Hans-Joachim Lunk, James C. Walck, Global Tungsten & Powders Corporation

0163 *U.S.A.*  
**Spark Plasma Sintering of Magnesium**  
Dustin Ashford, Yuhong Xiong, Baolong Zheng, Enrique J. Lavernia, Julie M. Schoenung & Jean-Pierre Delplanque, University of California Davis

0164 *U.S.A.*

**The Effect of Vacuum on Final Stage Sintering**

Li Li, Chantal Binet & Donald F. Heaney,  
The Pennsylvania State University

0166 *Canada*

**New Master Alloys for Sinter-Hardening Applications**

Ian Bailon-Poujol & Gilles L'Espérance,  
École Polytechnique de Montréal

0168 *U.S.A.*

**Statistical Analysis of Green Strength Variation in Gas and Water Atomized 316L Stainless Steel Compacts**

Ravi K. Enneti, Global Tungsten & Powders Corporation, Sundar V. Atre, Oregon State University & Randall M. German, San Diego State University

POSTER GROUP

C

**MODELING**

0028 *U.S.A.*

**Computational Fluid Dynamics Modeling Study on the Close-Coupled Gas-Atomization Process for Specialty Alloy Powder Production**

Guanghai Yu, Gregory Del Corso, Ashish Patel, Carpenter Technology Corporation

0053 *Canada*

**Finite Element Simulation of the Compaction of Aluminum-Based PM Gears**

Stanley G. Selig, Darrel A. Doman, Dalhousie University

0103 *South Africa*

**Internal Density Profiling of Pressed WC-Co Inserts**

Natasha Sacks, Ben Gale, University of the Witwatersrand