

Monday, June 29

Listings as of May 15.

Following is a detailed listing of the 6 Special Interest Programs and 46 Technical Sessions on a day-by-day basis. Information on the Poster Program can be found on page 38. All presentations will be in English.

Special Interest Programs

Will be held Monday through Wednesday. 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

Will be held Monday through Wednesday. Five-seven sessions will take place concurrently, consisting of 3 technical papers presented by authors, in English. 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.

**MONDAY MORNING
Special Interest Programs**

(St.Thomas B)

SIP 1

**A TOUR OF
DIMENSIONAL CHANGE:
FROM WHY IT HAPPENS
TO HOW TO CONTROL IT**

Program Organizers:

David Milligan, North American Höganäs, Inc.

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

The demands for increasing dimensional accuracy on Powder Metal (PM) components are increasing every year. Many applications, such as variable valve timing components, require extremely tight tolerances. In order to continue to be competitive in the future, PM components will be required to achieve these tolerances without costly secondary machining operations. There are many factors that affect the dimensional change of a PM component, including powder composition, density, alloying methods, sintering, and heat treatment.

This program will begin with a review of the basic factors that affect dimensional change. The presentations will build on this basic review to discuss actual case studies where the dimensional stability of actual PM components will be analyzed.

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

PART 1

Monday morning

9:45–11:15 a.m. (09:45–11:15)

Session Chairman:

Roland T. Warzel III
North American Höganäs, Inc.

0210 U.S.A. & Sweden

**Basics of Dimensional Change:
Practical Survey of Dimensional
Change from Compaction to Ferrous
PM Finished Product**

David Milligan, Roland Warzel, North American Höganäs, Inc. & Ulf Engstrom, Höganäs AB

0199 U.S.A.

**Effect of Alloying Elements on the
Dimensional Change of Ferrous
Components**

Roland T. Warzel III, David Milligan, North American Höganäs, Inc.

0211 U.S.A.

**Variation in Dimensional and
Mechanical Behavior with Pre-alloyed
Powders in Ferrous PM Component
Powders**

John J. Michiels, American Chemet Corporation

(St.Thomas A)

SIP 2

**ISOSTATIC PRESSING OF
PARTICULATE
MATERIALS—ADVANCES
AND APPLICATIONS**

Program Organizers:

Virendra S. Warke, Bodycote

Mats Gardin, Avure Technologies

Isostatic pressing of PM materials has come a long way in recent years. The cost of isostatic pressing has dropped by 15-20 % over the last decade making it more attractive and cost effective for PM processing. Powder metallurgy applications ranging from simple powder consolidation to more advanced diffusion bonding of dissimilar materials and production of complex shapes have gained considerable interest in materials processing industries. In the last decade, the use of computer models has greatly increased near net shape product development. In this program we will learn more about advances

in isostatic pressing applications, equipment, safety, and process modeling.

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

PART 1: Advances in Equipment, Modeling & Safety

Monday morning

9:45–11:15 a.m. (09:45–11:15)

Session Chairman:

Virendra S. Warke
Bodycote

0189 *Sweden*

New HIP Equipment Technology
Mats Gardin, Avure Technologies AB

0089 *Canada & U.S.A.*

Development of a Computational Tool to Predict the Distribution and Concentration of Argon Gas within a HIP Facility, in the Event of Catastrophic Decompression of a HIP Vessel

Peter Mtui, Aurobindo Das, Bodycote Materials Testing & Keith Johnston, Stephen J. Mashl, Virendra S. Warke, Bodycote

0021 *Japan*

Application of Finite Element Simulations for HIPed Parts

Takuji Teraoku, Minoru Ueda, Shuichi Hirayama, Daisuke Kondou, Shigenori Ishihara, KinzokuGiken Co., Ltd.

TECHNICAL SESSIONS

Monday morning

9:45–11:15 a.m. (09:45–11:15)

(Montego A)

SESSION 01

FATIGUE

Session Chairman:

Thomas F. Murphy, FAPMI
Hoeganaes Corporation

0118 *U.S.A. & Sweden* 9:45 a.m. (09:45)

Fatigue Performance of Cost-Effective Cr-Ni Prealloyed PM Steel, Designed to Replace Fe-Ni Steels and Match Wrought Steels

Alexander Klekovkin, Nagarjuna Nandivada, Ian Howe, North American Höganäs, Inc. & Sven Bengtsson, Höganäs AB

0195 *U.S.A.* 10:10 a.m. (10:10)

Fatigue Strength Comparison Between Heat-Treated and Sinter-Hardened Grade PM Materials

Ryuichiro Goto, Heron A. Rodrigues, Engineered Sintered Components

0122 *Germany* 10:35 a.m. (10:35)

Notch Effect on Fatigue Behavior of Sintered Fe-Cu-C

Ali Zafari, Paul Beiss, Institute for Materials Applications in Mechanical Engineering, RWTH Aachen

(Montego B)

SESSION 02

PIM I: MATERIAL DEVELOPMENT

Session Chairman:

Donald T. Whyche, Sr., FAPMI
CM Furnaces, Inc.

0026 *United Kingdom & U.S.A.*

9:45 a.m. (09:45)

Effects of Particle Size and Alloy Chemistry on Processing and Properties of MIM Powders

Martin A. Kearns, Keith J. Murray, Toby Tingskog, Sandvik Osprey Limited

0140 *U.S.A.* 10:10 a.m. (10:10)

Effect of HIP on the Microstructure and Impact Strength of MIM 17-4 PH Stainless Steel

Jane L. LaGoy, Stephen J. Mashl, Bodycote & Matthew K. Bulger, NetShape Technologies – MIM

0192 *U.S.A.* 10:35 a.m. (10:35)

Development of CoCr MIM Alloys Suitable for Medical Device Applications

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

(Montego C)

SESSION 03

COMPACTION PROCESSES

Session Chairman:

Michael Gill
LASCO Engineering Services L.L.C.

0115 *Germany* 9:45 a.m. (09:45)

Expected Changes in PM Part Compaction

Norbert Nies, Detlef Peters, SMS Meer GmbH

0191 *U.S.A.* 10:10 a.m. (10:10)

New Technologies for Quality Assurance in Material Saving with Forming to Near Net Shape

Gregory D. Wallis, Dorst America, Inc.

(Montego D)

SESSION 04

STAINLESS STEEL I

Session Chairman:

Thomas F. Stephenson
Inco Special Products
Canada

0119 *U.S.A.* 9:45 a.m. (09:45)

Processing and Properties of PM 440C Stainless Steel

Prasan K. Samal, Shawn Miller, Joshua Valko, North American Höganäs

0184 *U.S.A.* 10:10 a.m. (10:10)

Mechanical Behavior of PM Dual-Phase Steels with Enhanced Ductility

Nik Chawla, Jennifer Walters, Jason Williams, Arizona State University & Christopher T. Schade, K. S. Narasimhan, Hoeganaes Corporation

0150 *U.S.A.* 10:35 a.m. (10:35)

Surface Modifications of PM Stainless Steels for Enhanced Corrosion Resistance

Christopher T. Schade, Hoeganaes Corporation & Scott Justus, Ancor Specialties

(Montego E)

SESSION 05

NANOSTRUCTURED MATERIALS I

Session Chairman:
Raymond Serafini, PMT Linde, LLC

0100 U.S.A. 9:45 a.m. (09:45)

Sintering and Properties of Ultrafine Binderless WC

Xu Wang, Zhigang Fang, University of Utah

0107 U.S.A. 10:10 a.m. (10:10)

Sintering Behavior of Nanosized Tungsten

Kyu Sup Hwang, Haibo Zhang, Zhigang Fang, University of Utah & David Siddle, Kennametal Inc.

0004 China 10:35 a.m. (10:35)

The Forming Mechanism of Nano-Grains and the Effect on Properties of Ti(C,N)-Based Cermets

Shiquan Zhou, Weihao Xiong, Wei Zhao, Huazhong University of Science and Technology

(Andros AB)

SESSION 06

ADVANCED POWDER PRODUCTION TECHNIQUES

Session Chairman:

James W. Sears
South Dakota School of Mines & Technology

0148 U.S.A. 9:45 a.m. (09:45)

Direct Production of Metal Particulate by Modulation-Assisted Machining

Kevin P. Trumble, Chris Saldana, Srinivasan Chandrasekar, W. Dale Compton, Purdue University & James B. Mann, M4 Sciences Corp.

0048 Canada 10:10 a.m. (10:10)

Al-Al₂O₃ Nanocomposites Produced by Mechanical Milling

Dominique Poirier, Raynald Gauvin, McGill University & Robin Drew, Concordia University

0144 Turkey 10:35 a.m. (10:35)

Development and Characterization Investigations of Yttria Partially Stabilized Zirconia (YSZ) via High-Energy Milling

Toygan Sönmez, Doga H. Ozkaya, Selim Coskun, Mustafa L. Ovecoglu, Istanbul Technical University

**MONDAY AFTERNOON
Special Interest Programs**

(St. Thomas B)

SIP 1

A TOUR OF DIMENSIONAL CHANGE: FROM WHY IT HAPPENS TO HOW TO CONTROL IT (continued)

PART 2

Monday afternoon
3:00–4:30 p.m. (15:00–16:30)

Session Chairman:
David Milligan
North American Höganäs, Inc.

0207 U.S.A.
Effect of Alloy Composition and Processing on Dimensional Change of PM Ferrous Alloys, Parts 1 & 2
Bruce A. Lindsley, Thomas F. Murphy, Hoeganaes Corporation

0136 Sweden
High-Performance PM Solutions for New Applications
Ulf Engström, Ola Litström, Höganäs AB

(St. Thomas A)

SIP 2

ISOSTATIC PRESSING OF PARTICULATE MATERIALS—ADVANCES AND APPLICATIONS (continued)

PART 2: Isostatic Pressing Applications

Monday afternoon
3:00–4:30 p.m. (15:00–16:30)

Session Chairman:

Mats Gardin
Avure Technologies
Sweden

0093 U.S.A.

HIP Bonding Ta Foil Cover Plates to W Targets for the Materials Test Station
David E. Dombrowski, Stuart A. Maloy, Los Alamos National Laboratory

0120 U.S.A.

Advances in Near-Net-Shape HIP of Ni-Base, Ti PM Alloys and Ceramics for Critical Applications
Charles J. Barre, Victor Samarov, Synertech PM & Dennis L. Poor, Kittyhawk Products

0032 Russia

New Russian PM Nickel-Based Superalloys for Advanced Engines
Genrikh S. Garibov, Alexey V. Vostrikov, All-Russia Institute of Light Alloys (VILS)

**TECHNICAL SESSIONS
Monday afternoon
3:00–4:30 p.m. (15:00–16:30)**

(Montego A)

SESSION 07

SINTER HARDENING

Session Chairman:
Thomas J. Jesberger
Abbott Furnace Company

0076 Italy & Spain 3:00 p.m. (15:00)
Hardenability and Mechanical Properties of Novel Sinter-Hardening PM Steels

Stefano Saccarola, Pometon S.p.A. & Francisco Castro, Arulkumar Karuppanagounder, Shandra Sainz, CEIT & TECNUN

0087 U.S.A. 3:25 p.m. (15:25)

Influence of Chemistry and Austenitizing Temperature on Hardenability of PM Steels
Peter Sokolowski, Bruce A. Lindsley, Hoeganaes Corporation

0095 *Canada* 3:50 p.m. (15:50)
Modelization of the Influence of Admixing and Prealloying on the Optimization of Compressibility and Hardenability of Sinter-Hardenable Steel Powders
 Nicolas Giguere, Carl Blais, Laval University

(Montego B)

SESSION 08

PIM II: MOLDING

Session Chairman:

Hideshi Miura
 Kyushu University
 Japan

0103 *Germany* 3:00 p.m. (15:00)
New Method to Reduce the Risk of Jetting
 Uwe Haupt, ARBURG GmbH + Co. KG

0074 *Canada* 3:25 p.m. (15:25)
Three-Dimensional Numerical Modeling of Segregation in Powder Injection Molding
 Eric Baril, Florin Ilianca, Jean-Francois Hetu, National Research Council Canada

0049 *Germany* 3:50 p.m. (15:50)
Production Techniques of Near-Net-Shape Components with Graded Porosity by 2C-MIM
 Ana Paula Cysne Barbosa, Manuel Köhl, Martin Bram, Hans-Peter Buchkremer, Detlev Stöver, Research Center Jülich

(Montego C)

SESSION 09

MATERIAL TRANSFER & LUBRICATION

Session Chairman:

Eric Reinert
 Bronson & Bratton

0155 *Canada* 3:00 p.m. (15:00)
Effect of Atmospheric Humidity and Temperature on the Flowability of Lubricated Powder Metallurgy Mixes
 Yannig Thomas, Sylvain Pelletier, IMI-NRC & Sylvain St-Laurent, Claude Gelinas, QMP

0143 *Sweden & U.S.A.* 3:25 p.m. (15:25)
Performance of Mixes with New Lubricant System Based on Chromium-Alloyed Powders
 Mats Larsson, Åsa Ahlin, Höganäs AB & Shawn Miller, North American Höganäs, Inc.

(Montego D)

SESSION 10

STAINLESS STEEL II/ TITANIUM

Session Chairman:

Cynthia Freeby
 Ametek, Inc.

0168 *Denmark, U.S.A. & Sweden* 3:00 p.m. (15:00)
A Low-Cost Option for Manufacturing PM Stainless Steel Exhaust Flanges and HEGO Bosses
 Sten P. Millot, FJ Sintermetal, Prasan K. Samal, North American Höganäs & Owe Mars, Hoganas AB

0212 *U.S.A.* 3:25 p.m. (15:25)
Energy Efficient Press and Sinter of Titanium Powder for Low-Cost Components in Vehicle Applications
 Thomas Zwitter, Webster-Hoff Corporation & Philip Nash, Xiaoyan Xu, Illinois Institute of Technology

0216 *Sweden* 3:50 p.m. (15:50)
Rapid Manufacturing of Fully Dense Metal Parts by Electron Beam Melting
 Ulf Ackelid, Mattias Svensson, Arcam AB

(Montego E)

SESSION 11

NANOSTRUCTURED MATERIALS II

Session Chairman:

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

0029 *U.S.A. & Germany* 3:00 p.m. (15:00)
What's Behind "Hexagonal Molybdenum Oxide"?
 Hans-Joachim Lunk, T. A. Frisk, Global Tungsten and Powders Corp., H. Hartl, I.G. Shenderovich, D. Mauder, Freie Universität, M. Feist, Humboldt-Universität, M. J. G. Fait, Leibniz Institute for Catalysis & M.A. Hartl, L.L. Daemen, Los Alamos National Laboratory

0114 *U.S.A.* 3:25 p.m. (15:25)
Hot Pressing of Ultrafine Grained Tantalum Powders Produced from Machining Chips
 Mert Efe, Hjun Jun Kim, Kevin Trumble, Purdue University

0034 *Russia* 3:50 p.m. (15:50)
Processing and Properties of Nanostructured Porous Ceramics Based on Plasma Synthesis Powders
 Sergey N. Kulkov, Institute of Strength Physics and Material Sciences RAS

(Andros AB)

SESSION 12

THERMAL MANAGEMENT: COMPOSITE MATERIALS

Session Chairman:

Pierre W. Taubenblat, FAPMI
 Promet Associates

0098 *U.S.A.* 3:00 p.m. (15:00)
Preparation of Uniform Nano and Micro Copper and Nickel Powders for Electronic Applications
 Daniel Andreescu, Ionel Halaciuga, Syllas LaPlante, Brendan P. Farrell, Dan V. Goia, Clarkson University, Center for Advanced Materials Processing

0011 *Malaysia* 3:25 p.m. (15:25)
Powder Injection Molded Carbon Nanotube-Reinforced Copper Composites for Thermal Management
 Faiz Ahmad, Gehad Goudah, Othman Mamat & Norani M, University Technology Petronas

Tuesday, June 30

TUESDAY MORNING Special Interest Programs

(St. Thomas B)

SIP 1

A TOUR OF DIMENSIONAL CHANGE: FROM WHY IT HAPPENS TO HOW TO CONTROL IT (continued)

PART 3

Tuesday morning
8:00–9:30 a.m. (08:00–9:30)

Session Chairman:

Brian M. Sieger
Honda R&D Americas, Inc.

0202 U.S.A.

Variations in Dimensional Stability in Ferrous PM Components Utilizing Various Sintering Techniques

Stephen L. Feldbauer, Daniel Reardon, Abbott Furnace Company & Blaine Stebick, Horizon Technology Inc.

0201 U.S.A.

Improved Dimensional Consistency of Iron–Copper–Carbon VVT Components by Utilizing Diffusion Alloying and Bonded Graphite

Heron Rodrigues, Stephen Madill, Ryuichiro Goto, Engineered Sintered Components

0200 U.S.A.

The Effect of Material Handling, Alloy Addition, and Bonding Technique on the Dimensional Stability of Ferrous PM Components

David Milligan, Denis O'Keefe, Paul Hofecker, Roland T. Warzel III, North American Höganäs, Inc.

(Jamaica A)

SIP 3

BIOMEDICAL APPLICATIONS AND ISSUES CONCERNING PM COMPONENTS AND MATERIALS

Program Organizers:

Animesh Bose, Advanced Metalworking Practices, LLC
Ashley Nichols, FloMet LLC
Thomas W. Pelletiers, SCM Metal Products, Inc.

PM technology impacts the medical and biocompatible materials market in many ways. Developments in alloy technology, powder processing, and part/coating fabrication continue to increase the potential impact of PM in these areas of opportunity. This program will provide an overview and update of current developments concerning applications of PM in the biomedical area.

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

PART 1

Tuesday morning
8:00–9:30 a.m. (08:00–09:30)

Session Chairman:

Thomas W. Pelletiers
SCM Metal Products, Inc.

0017 U.S.A. (Invited Presentation) Bio-Inspired Designs — Significant Future Challenges to Powder Metallurgy

Randall M. German, San Diego State University & Giselle Thibaudeau, Mississippi State University

0194 U.S.A.

Manufacturing of Medical Devices by Metal Injection Molding

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

0020 Italy

Effect of Microstructure on the Properties of a Biomedical Co-Cr-Mo Alloy Produced by MIM

Palloma V. Mutterle, Alberto Molinari, University of Trento, & Marianna Zendron, Matteo Perina, Rudj Bardini, NCS Protech Srl

(St. Thomas A)

SIP 4

ENHANCED MECHANICAL PROPERTIES BY POST-SINTER PROCESSING

Program Organizers:

Russell A. Chernenkoff, Metaldyne Sintered Components
Roger Lawcock, Gates Canada, Inc.
Alan Lawley, FAPMI, Drexel University

Powder metallurgy components are routinely subjected to post sinter processing, such as heat treatment and mechanical methods. Efforts to develop more efficient, reliable, and cost effective components through post sinter processing have helped to broaden the use of sintered powder materials in stress-sensitive structural applications where long-term durability is required. The intent of this program is to review and assess both commercial and promising post sinter processing techniques that may be used to improve the strength and durability of PM components.

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

PART 1

Tuesday morning

8:00–9:30 a.m. (08:00–09:30)

Session Chairman:

Russell A. Chernenkoff
Metaldyne Sintered Components

0186 U.S.A.

Post-Sinter Nitrogen Alloying of PM Steels

Chris T. Schade, Thomas F. Murphy,
Hoeganaes Corporation & Alan Lawley,
Roger Doherty, Drexel University

0203 Sweden & Italy

Surface Engineering of Cr-alloyed PM Steels by Nitriding Treatments

Ulf Engström, Yang Yu, Höganäs AB,
Luigi Alzati, Höganäs Italia Srl & Barbara
Rivolta, Politecnico di Milano

0106 U.S.A.

Process and Material Selection for Induction-Hardened PM Sprockets

Howard G. Rutz, Sunil N. Patel,
Hoeganaes Corporation & Suresh O.
Shah, Gregory Falleur, Cloyes Gear and
Products, Inc.

TECHNICAL SESSIONS

Tuesday morning

8:00–9:30 a.m. (08:00–9:30)

(Montego A)

SESSION 13

**SINTERING I:
PROCESSES**

Session Chairman:

Kenneth States
Symmco, Inc.

0006 Canada

8:00 a.m. (08:00)

Effect of Sintering Temperature on Static and Dynamic Properties of Sinter-Hardened Materials

Francois Chagnon, QMP

0079 Spain

8:25 a.m. (08:25)

Low Alloy High-Strength PM Steels for Sinter-Hardening

Francisco Castro, CEIT & TECNUN &
Wilfredo García, University of Navarra

(Montego B)

SESSION 14

PIM III: CHALLENGES & OPPORTUNITIES

Session Chairman:

Mark Torgerson
BASF Corporation

0179 Singapore

8:00 a.m. (08:00)

MIM Towards Enhanced Performance and Cost Reduction

Dunstan Peiris, SolidMicron Technologies

(Montego C)

SESSION 15

FATIGUE/FRACTURE BEHAVIOR

Session Chairman:

W. Brian James, FAPMI
Hoeganaes Corporation

0166 U.S.A.

8:00 a.m. (08:00)

High-Pressure Consolidation to Develop Higher-Density PM Transmission Gear Steels with Improved Rotating-Contact Fatigue Behavior

Karthik Nagarathnam, Donald Trostle,
Dennis Massey, UTRON Kinetics LLC

0139 Italy

8:25 a.m. (08:25)

Influence of Stress Triaxiality on the Fracture Behaviour of a Fe-0.4% C PM Steel

Giovanni Straffellini, Vigilio Fontanari,
University of Trento

0131 India

8:50 a.m. (08:50)

Influence of Porosity and Ring Geometry on the Fracture Strengths of Plain Carbon PM Steels

Hemlata Nayak, Fozia Z. Haque, Krishna
S. Pandey, Maulana Azad National
Institute of Technology & C. Shanthy,
National Institute of Technology

(Montego D)

SESSION 16

CHARACTERIZATION & TESTING I

Session Chairman:

John Sweet
FMS Corporation

0169 U.S.A.

8:00 a.m. (08:00)

The Use of Metallography to Identify Common Problems in PM Steels

Thomas F. Murphy, Hoeganaes Corporation

0054 U.S.A.

8:25 a.m. (08:25)

Chemical Analysis of Powder Metal Alloys

Peter D. Damian, IMR Test Labs

0081 U.S.A.

8:50 a.m. (08:50)

Enhanced Resonant Inspection Using Component-Weight Compensation

Richard W. Bono, Gail R. Stultz, The
Modal Shop, Inc.

(Montego E)

SESSION 17

GRADIENT HARDMETALS

Session Chairman:

John L. Johnson
ATI Engineered Products

0085 U.S.A.

8:00 a.m. (08:00)

A New Method for Creating Cobalt Gradient in WC-Co Composite by Heat Treating

Jun Guo, Zhigang Fang, Peng Fan,
University of Utah & Paul Prichard,
Kennametal Inc.

0141 U.S.A.

8:25 a.m. (08:25)

Simulation of Co Gradient Formation during Heat Treatment of Sintered WC-Co

Peng Fan, Jun Guo, Zhigang Fang,
University of Utah

(Andros AB)

SESSION 18

ATOMIZATION

Session Chairman:

Robert M. Gasior
Carpenter Powder Products Inc.

0138 U.S.A. 8:00 a.m. (08:00)

A Pragmatic Approach to the Use of Close-Coupled Atomization Nozzles

Joseph Tunick Strauss, HJE Company, Inc.

**TUESDAY MORNING
Special Interest Programs**

(Jamaica A)

SIP 3

BIOMEDICAL APPLICATIONS AND ISSUES CONCERNING PM COMPONENTS AND MATERIALS
(continued)

PART 2

Tuesday morning

10:45 a.m.–12:15 p.m. (10:45–12:15)

Session Chairman:

Ashley Nichols
FloMet LLC

0053 U.S.A.

Fabrication of Titanium Osteoconductive Coatings for Medical-Implant Applications

James W. Sears, Jacob Fuerst, Dana Medlin, South Dakota School of Mines & Technology & Dan A. Neufeld, University of South Dakota

0037 Japan

Laser Sintering of Titanium Alloy Powders for Honeycomb Bone Structure
Hideshi Miura, Toshiko Osada, Hideki Ishibashi, Kenta Okawachi, Kyushu University & Makoto Uemura, Kumamoto Industrial Research Institute

0171 Finland

Rapid Manufacturing of Biomedical Parts by Direct Metal Laser Sintering

Juha Kotila, Olli Nyrhila, Tatu Syvanen, Latikka Maria, Lena Thorsson, Villek Laitila, EOS Finland

(St. Thomas A)

SIP 4

ENHANCED MECHANICAL PROPERTIES BY POST-SINTER PROCESSING
(continued)

PART 2

Tuesday morning

10:45 a.m.–12:15 p.m. (10:45–12:15)

Session Chairman:

Alan Lawley, FAPMI
Drexel University

0102 Germany

Rolling-Contact Fatigue of a Low-Cost PM Steel at Full Density

Thomas L. Janitzky, Paul Beiss, IWM, RWTH Aachen

0197 U.S.A.

Effects of Secondary Processing on Gear Geometry of Surface Densified High Core Density Automotive Sun Gear

Francis J. Hanejko, K. S. Narasimhan, Hoeganaes Corporation, Young Kim, General Motors Powertrain (Retired), Gary Goodall, Chicago Powdered Metal Products, Inc. & Arun Basil, Kinefac Corporation

TECHNICAL SESSIONS

Tuesday morning

10:45 a.m.–12:15 p.m.

(10:34–12:15)

(Montego A)

SESSION 19

SINTERING II: ATMOSPHERES

Session Chairman:

Thomas Philips
Air Products and Chemicals, Inc.

0164 Austria

10:45 a.m. (10:45)

Chemical Reactions During Sintering of Cr-Mo Prealloyed Powder Compacts in Inert and Reducing Atmospheres

Christian Gierl, Herbert Danninger, Institute of Chemical Technologies and Analytics, Vienna University of Technology

0033 United Kingdom & Sweden

11:10 a.m. (11:10)

Control of Carbon Potential and Hardening in Powder Metal Sintering Process — Not a Dream Anymore!

Akin Malas, Linde Group, Soren Wiberg, AGA AB & Sigurd Berg, Daniel Nilsson, Höganäs AB

0214 Korea

11:35 a.m. (11:35)

Effect of Carbon Content on the Microstructure and Properties of Solid Solution (Ti_{0.7}W_{0.3}) C-Ni Cermets

Moonsu Seo, Shinhoo Kang, Seoul National University

(Montego B)

SESSION 20

PIM IV: FEEDSTOCK

Session Chairman:

Michael Stucky
NetShape Technologies - MIM

0172 U.S.A.

10:45 a.m. (10:45)

MIM Feedstock Formulation-Variation Reduction

Michael D. Wilson, Mark L. Monica, J. Alan Sago, Accellent Inc.

0182 U.S.A. & Dominican Republic

11:10 a.m. (11:10)

The Importance of a Helium Pycnometer in Powder Metal Injection Molding

Satyajit Banerjee, DSH Technologies, LLC & Robert Sanford, TCK Feedstock SA

0016 France

11:35 a.m. (11:35)

Feedstock Based on Hydrosoluble Binder for Micropowder Injection Moulding

Delphine Checot, Claire Rigollet, Pierre Lourdin, ECAM Graduate School of Engineering

(Montego C)

SESSION 21

FERROUS PM ALLOY DEVELOPMENT

Session Chairman:

Francois Chagnon
QMP
Canada

0088 U.S.A. 10:45 a.m. (10:45)

Sinter-Hardening Response of Leaner Alloy Systems

Bruce A. Lindsley, Hoeganaes Corporation

0075 Spain & Italy 11:10 a.m. (11:10)

Development of Novel Ni-Containing PM Steels

Francisco Castro, Arulkumar Karuppanagounder, Daniel Pastor, CEIT & TECNUN & Stefano Saccarola, Giovanni Bellin, Sandra Bueno, Pometon S.p.A.

0057 U.S.A. & Sweden 11:35 a.m. (11:35)

New Materials for Powder-Forged Connecting Rods

Roland T. Warzel III, Ian Howe, Nagarjuna Nandivada, North American Höganäs & Sven Bengtsson, Anders Bergmark, Höganäs AB

(Montego D)

SESSION 22

CHARACTERIZATION & TESTING II

Session Chairman:

Deepak Madan
Magnesium Elektron Powders

0099 U.S.A. 10:45 a.m. (10:45)

Nonlinear Elastic Behavior and its Implications on Unloading, Ejection and Dimensional Changes of Powder Compacts

Barbara Robinson, Antonios Zavaliangos, Drexel University

0065 Iran & Austria 11:10 a.m. (11:10)

Correlation Between Dynamic Elastic Modulus, Electrical Conductivity and Sintered Density of Low-Alloyed Cr-Mo Sintered Steels

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

(Montego E)

SESSION 23

TITANIUM-BORON MATERIALS

Session Chairman:

Susan M. Abkowitz
Dynamet Technology, Inc.

0001 U.S.A. & Georgia

10:45 a.m. (10:45)

Effect of Titanium-Aluminum Ratio on the Thermal-Explosion Processing of TiAl-TiB_{0.6} Layered Composites

Laszlo Kecskes, US Army Research Laboratory, Bradley Klotz, Dynamic Science Inc., George Oniashvili, Zurab Aslamazishvili, Garegin Zakharov, Tavazde Institute of Metallurgy and Materials Science & Akaki Peikrishvili, Tsulukidze Inst. of Mining Technology

0055 U.S.A. 11:10 a.m. (11:10)

Fractography of Ti-B Materials

Scott I. Lieberman, Exponent, Arun M. Gokhale, Georgia Institute of Technology, Sesh Tamirisakandala, Ohio University & Daniel B. Miracle, Air Force Research Laboratory, Wright-Patterson Air Force Base

0047 U.S.A. 11:35 a.m. (11:35)

The Effect of Boron Additions on the Microstructure and Properties of PM Ti-5Al-5V-5Mo-3Cr

Jean M. Stewart, C. F. Yolton, Crucible Research & S. Tamirisa, FMW Composite Systems, Inc.

(Andros AB)

SESSION 24

FUNCTIONALLY GRADIENT MATERIALS

Session Chairman:

Debby Blaine
University Stellenbosch University
South Africa

0071 Portugal 10:45 a.m. (10:45)

Mechanical Evaluation of Functionally Graded Powder Metallurgy Components

Oscar Carvalho, Filipe Silva, Delfim Soares, University of Minho

0161 Norway 11:10 a.m. (11:10)

Experimental Investigation of the Consecutive Layer-by-Layer ERS Sintering of Iron Powder

Sorin Isac, Lars Arnberg, Norwegian University of Science and Technology

**TUESDAY AFTERNOON
Special Interest Programs**

(St. Thomas A)

SIP 4

**ENHANCED MECHANICAL PROPERTIES BY POST-SINTER PROCESSING
(continued)**

PART 3

Tuesday afternoon
3:30–5:00 p.m. (15:30–17:00)

Session Chairman:

Roger Lawcock
Gates Canada Inc.
Canada

0198 U.S.A. & Sweden

An Overview of Heat Treatment of Cr Alloyed PM Materials

Ian Howe, Alex Klekovkin, Shawn Miller, North American Höganäs, Inc. & Sven Bengtsson, Höganäs AB

0101 *U.S.A.*
High-Performance and High-Precision Sintered Components Produced by Vacuum Carburizing with High-Pressure Gas Quenching
 Salvator Nigarura, Juan Trasorras, PMG Indiana Corporation & Wally Fortner, MMS Thermal Processing

TECHNICAL SESSIONS
Tuesday afternoon
3:30–5:00 p.m. (15:30–17:00)

(Montego A) **SESSION 25**

SINTERING III: EQUIPMENT
Session Chairman:
 Daniel Reardon
 Abbott Furnace Company

0159 *U.S.A.* 3:30 p.m. (15:30)
Development of Vacuum Furnace Technology in the Powder Production of Refractory Metals, Titanium, and Their Alloys
 Virginia M. Osterman, Solar Atmospheres Inc.

0015 *India* 3:55 p.m. (15:55)
Sintering Furnace Monitoring System
 Ravi P. Malhotra, Malhotra Engineers

(Montego B) **SESSION 26**

PROCESS MODELING
Session Chairman:
 Antonios Zavaliangos
 Drexel University

0170 *U.S.A.* 3:30 p.m. (15:30)
Modeling for Powder Metallurgy Component Design and Life-Cycle Prediction
 Tonya W. Stone, P. G. Allison, Y. Hammi, M. F. Horstemeyer, Center for Advanced Vehicular Systems (CAVS), Mississippi State University

0177 *U.S.A. & Turkey* 3:55 p.m. (15:55)
Process Modeling: Use of Uncertainty, Sensitivity and Optimization Techniques for Improved Understanding of Compaction Model Outputs
 Tonya W. Stone, R. Carino, Y. Hammi, H. Grewal, M. F. Horstemeyer, Mississippi State University/Center for Advanced Vehicular Systems Howard I. Sanderow, Management & Engineering Technologies, & E. Acar, TOBB University of Economics and Technology

0056 *U.S.A.* 4:20 p.m. (16:20)
Effect of Contiguity on the Properties of Powder Metallurgy Composites
 John L. Johnson, ATI Engineered Products

(Montego C) **SESSION 27**

PROFITABILITY, OPPORTUNITY & OPTIMIZATION
Session Chairman:
 Richard P. Mason
 Ametek Inc.

0176 *U.S.A.* 3:30 p.m. (15:30)
Extracting Profitability Between the Squeeze
 Steven G. Meyer, Rocco Petrilli, PRIMA Problem Solving Inc.

0052 *U.S.A.* 3:55 p.m. (15:55)
Opportunities for PM and MIM in the Defense Industry
 Mitchell Gross, Raytheon Missile Systems

0045 *Sweden* 4:20 p.m. (16:20)
Optimized Selection of Processing Routes for Sintered Parts Manufacture: A Component-Oriented Approach
 Sepehr Hatami, Lars Nyborg, Chalmers University of Technology & Roland Stolt, Jonkoping University

(Montego D) **SESSION 28**

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

0223 *U.S.A.* 3:30 p.m. (15:30)
Improving Value in Machined PM Parts by Material Selection
 John Engquist, Burgess-Norton Mfg. Co.

0135 *Sweden* 3:55 p.m. (15:55)
Means to Improve Machinability of Sintered PM Steels
 Olof Andersson, Mats Larsson, Höganäs AB

(Montego E) **SESSION 29**

COMPOSITES
Session Chairman:
 Jessu Joys
 United States Metal Powder Incorporated

0157 *U.S.A.* 3:30 p.m. (15:30)
Polymer Bonding of Ultrafine-Grained Metal Particulate Produced via Modulation-Assisted Machining
 Kevin P. Trumble, Boumsoeck Kim, Srinivasan Chandrasekar, Purdue University & James B. Mann, M4 Sciences Corp.

0153 *U.S.A.* 3:55 p.m. (15:55)
Microstructure Evolution of Gas-Atomized Fe-Based ODS Alloys
 Joel R. Rieken, Iver E. Anderson, Matthew J. Kramer, Dan Shechtman, Yaqiao Q. Wu, Iowa State University, Ames Lab

(Andros AB)

SESSION 30

HIGH-DENSITY PROCESSING

Session Chairman:

Prasan K. Samal
North American Höganäs, Inc.

0124 U.S.A. 3:30 p.m. (15:30)

Rapid Densification of Hot-Forging PM Tools and Dies

David J. Novotnak, Louis W. Lherbier,
Carpenter Powder Products

0008 Sweden 3:55 p.m. (15:55)

Sintered Scapac Powders Outperform Wrought Stainless Steels

Christer Aslund, Scandinavian PowderTech

0066 Italy 4:20 p.m. (16:20)

High-Density Stainless Steel-Based Composites for Wear Applications

Vanya Stoyanova, Andrea Agnoli, Diego Basset, Association CIVEN

(St. Thomas B)

SESSION 31

PIM V: BIOMEDICAL APPLICATIONS

Session Chairman:

Torbjorn Tingskog
Sandvik Osprey Ltd.

0092 Canada 3:30 p.m. (15:30)

Development of Titanium Dental Implant by MIM: Experiments and Simulation

Yannig Thomas, Eric Baril, Jean-Francois Hetu, Florin Ilinca, IMI-NRC

0193 U.S.A. 3:55 p.m. (15:55)

The Biocompatibility of CoCr MIM Alloys Developed for Medical-Device Applications

Hao Chen, J. Alan Sago, Mark W. Bradley, John K. Eckert, Accellent Inc.

0005 Malaysia 4:20 p.m. (16:20)

Injection Molding of 316L Stainless Steel Powder for Biomedical Application Using Palm-Oil-Derivatives Binder System

Rosdi Ibrahim, Mohamad Azmiruddin, Mazlan Mohamad, Sirim Berhad, Roila Awang, Malaysian Palm Oil Board & Shamsul Muhamad, Institute Medical Research

Wednesday, July 1

**WEDNESDAY MORNING
Special Interest Programs**

(St. Thomas B)

SIP 5

ADVANCES IN LEAN MATERIALS AND SINTER FURNACE ALLOYING

Program Organizers:

K. S. Narasimhan, FAPMI, Hoeganaes Corporation
Blaine Stebick, Horizon Technology Inc.

This special interest program focuses on the use of leaner alloying compositions, furnace alloying and improved processing for cost-effective, higher performance powder metallurgy parts. Attendees will benefit by learning about selection of materials and processing conditions to satisfy customer needs while also learning how to improve profitability.

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

PART 1: Lean Alloys I

(St. Thomas A)

SIP 6

Wednesday morning

8:00–9:30 a.m. (08:00–09:30)

Session Chairman:

K. S. Narasimhan, FAPMI
Hoeganaes Corporation

0204 U.S.A.

Overview Presentation

K. S. Narasimhan, Hoeganaes Corporation

0028 Canada

Sinter-Hardened Lean Ni-Mo PM Steels

Thomas F. Stephenson, Maria Korotkin, Shawn Metcalfe, Vale-Inco Limited

0109 Canada

Effect of Mo, Ni, Cu and Graphite Contents on the Properties and Economics of Organic-Bonded Powders Used in High-Performance PM Applications

Sylvain St-Laurent, Claude Gélinas, QMP

POWDER METALLURGY TITANIUM MATERIALS AND PROCESSES—STATE OF THE ART

Program Organizers:

Zhigang Fang, University of Utah
Richard Ricchi, General Motors Corporation
Xinhua Wu, University of Birmingham

Titanium as a structural material offers many advantages for applications in aerospace, biomedical, auto, chemical, sports equipment, and other consumer product industries. However, the current market size of the titanium alloy industry is extremely limited compared to what it could be because the cost of producing products from titanium alloys is prohibitively high for many industries. Powder metallurgy, as an approach for reducing the cost of titanium products, has been the subject of R&D for many years. Recently, there have been both steady progress on using traditional PM approach and new

processing technologies that promises significantly reduced costs. This program features speakers covering topics including low oxygen powder production, injection molding, HIPing, and sintering directly from titanium hydride.

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

PART 1

Wednesday morning

8:00–9:30 a.m. (08:00–09:30)

Session Chairman:

Zhigang Fang
University of Utah

0051 U.S.A.

Status and Current Developments in Titanium Powder Metallurgy

James W. Sears, South Dakota School of Mines & Technology

0156 U.S.A.

Advances in Titanium Powder Metal Technology Commercialization

Susan M. Abkowitz, Harvey Fisher, David Main, Stanley Abkowitz, Dynamet Technology, Inc.

0113 U.S.A.

Manufacture of HDH Low-Oxygen Titanium-6Aluminium-4Vanadium (Ti-6-4) Powder Incorporating a Novel Powder De-Oxidation Step

Colin G. McCracken, Jim Robison, Charles Motchenbacher, Reading Alloys Inc.

TECHNICAL SESSIONS

Wednesday morning
8:00–9:30 a.m. (08:00–9:30)

(Montego A)

SESSION 32

SINTERING IV: MATERIALS

Session Chairman:

John W. von Arx
NetShape Technologies, Inc.

0036 U.S.A. & Sweden 8:00 a.m. (08:00)

The Effect of Carbon on the Magnetic Properties of an Iron–Phosphorus Soft Magnetic Powder Metallurgy (PM) Alloy

Craig W. Hudson, Christina Mahlon, Atlas Pressed Metals, Paul Hofecker, North American Höganäs & Ola Anderson, Höganäs AB

0061 Sweden 8:25 a.m. (08:25)

Dynamic Studies on the Sintering of Compacted Metal Powders Using an Environmental Scanning Electron Microscope

Srinivasan N. Iyengar, Lund University

0209 U.S.A., Germany & Spain

8:50 a.m. (08:50)

Sintered Components for Transmission Synchronizers

Juan R. L. Trasorras, Salvator Nigarura, PMG Indiana Corporation, Guenter Rau, Christian Dennert, Patrice Delarbre, PMG Fussen & D. Castro, PMG Asturias

(Montego B)

SESSION 33

HIGH-DENSITY APPLICATIONS

Session Chairman:

Lane H. Donoho, PMTII
CMW Inc.

0126 India 8:00 a.m. (08:00)

Hot Forging of Sintered Low-Alloy Nickel PM Steel

Krishna S. Pandey, Hemlata Nayak, Fozia Z. Haque, Maulana Azad National Institute of Technology & R. Bindu National Institute of Technology

0002 Austria 8:25 a.m. (08:25)

Investigation of a Cogging Process for Surface Densification of PM Gears by FEM Simulation

Florian Planitzer, Thomas Hatzenbichler, Materials Center for Leoben Forschung GmbH & Bruno Buchmayr, Montanuniversitat Leoben

(Montego C)

SESSION 34

ADVANCED MACHINING

Session Chairman:

Carl Blais
Laval University

0173 U.S.A. 8:00 a.m. (08:00)

Super Abrasive Machining as an Enhancement to PM's Inherent Net-Shape Processing Value Equation

Rocco Petrilli, PRIMA Problem Solving Inc. & Ed Elie, MaxTek LLC

0151 U.S.A. 8:25 a.m. (08:25)

Optimization of Machining Parameters for Powder Metals Using PCBN Tools

Frank B. Battaglia, Kennametal Inc.

0108 Germany 8:50 a.m. (08:50)

Micro Blasting to Increase the Tool Life of Coated Carbide

Arne Stuckenberg, Philipp F. Kauffmann, Arne Stuckenberg, Fritz Klocke, Christof Gorgels, WZL of RWTH Aachen University

(Montego D)

SESSION 35

HARDMETAL PROCESSING

Session Chairman:

David A. Alven
Aerojet Ordnance Tennessee

0215 Korea 8:00 a.m. (08:00)

Sintered Complete Solid-Solution Cermets: Nanocrystalline-Based (Ti_{1-x}W_x)C-20Ni

Jiwoong Kim, Moonsu Seo, Shinhoo Kang, Seoul National University

0031 Russia 8:25 a.m. (08:25)

Kinetics of the Densification of WC-Co Powder at the Electro-Discharge Compaction

Evgeny G. Grigoryev, Moscow Engineering Physics Institute

0117 U.S.A. 8:50 a.m. (08:50)

Laser Additive Manufacturing for Improved Wear Resistance and Performance

James W. Sears, South Dakota School of Mines & Technology

(Montego E)

SESSION 36

ALUMINUM COMPOSITES

Session Chairman:

Cliff Orcutt
American Isostatic Presses, Inc.

0024 *Austria & Spain* 8:00 a.m. (08:00)

Creep Resistance Depending on Particle Reinforcement Size of Al-Alloys Produced by Powder Metallurgy

Bernd Bauer, Guillermo Requena, Vienna University of Technology & Marcela Lieblich, National Centre for Metallurgical Research, CENIM-CSIC Spanish Research Council

0063 *Japan* 8:25 a.m. (08:25)

Carbon Nanotube-Reinforced Aluminum Matrix Composites Fabricated by Combined Process of SPS Sintering and Hot Extrusion

Akira Kawasaki, Hansang Kwon, Tohoku University

0133 *India* 8:50 a.m. (08:50)

Hot Extrusion of Sintered Aluminium and Aluminium-Based Composites

Fozia Z. Haque, Hemlata Nayak, Krishna S. Pandey, Maulana Azad National Institute of Technology & M. Anuradha, National Institute of Technology

**WEDNESDAY MORNING
Special Interest Programs**

(St. Thomas B)

SIP 5

**ADVANCES IN LEAN MATERIALS AND SINTER FURNACE ALLOYING
(continued)**

PART 2: Lean Alloys II

Wednesday morning

10:45 a.m.–12:15 p.m. (10:45–12:15)

Session Chairman:

Blaine Stebick
Horizon Technology Inc.

0038 *Japan*

Properties of Sintered Compacts Made of Ni-Less Premixed Powder-Based Low Mo Prealloyed Steel

Shigeru Unami, Yukiko Ozaki, Tomoshige Ono, JFE Steel Corporation

0040 *U.S.A.*

Lean High Performance Alloys Containing Manganese as the Primary Alloy Element

Dennis Hammond, Apex Advanced Technologies, LLC

0205

U.S.A.

Role of Alloying Elements in High Performance Powder Metallurgy Parts

Bruce A. Lindsley, Howard Rutz & Kalathur S. Narasimhan, Hoeganaes Corporation

(St. Thomas A)

SIP 6

**POWDER METALLURGY TITANIUM MATERIALS AND PROCESSES—STATE OF THE ART
(continued)**

PART 2

Wednesday morning

10:45 a.m.–12:15 p.m. (10:45–12:15)

Session Chairman:

Stephan J. Mashl
Bodycote

0027 *U.S.A.*

Injection Molded Titanium — Combined Technology and Economic Needs to Penetrate High-Volume Applications

Randall M. German, San Diego State University

0160 *U.S.A. & United Kingdom*

Development of Advanced Gas-Atomization Process for Ti and Ti Alloys

Iver E. Anderson, Joel R. Rieken, David Byrd, Andrew Heidloff, Ames Laboratory, Iowa State University, Mike Glynn, Mark Ward, University of Birmingham, IRC & James Sears, South Dakota School of Mines and Technology

0147 *Canada*

Oxygen Sources and Control in Titanium PM Processes

Eric Baril, Louis-Philippe Lefebvre, Yannig Thomas, National Research Council Canada – Industrial Materials Institute

TECHNICAL SESSIONS

Wednesday morning

10:45 a.m.–12:15 a.m.

(08:00–9:30)

(Montego A)

SESSION 37

HEAT TREATMENT

Session Chairman:

Mark R. Haas, PMT
Burgess-Norton Mfg. Co.

0116 *U.S.A.*

10:45 a.m. (10:45)

A Comparison of FC0208 to a 0.30% Molybdenum Prealloyed Material with 0.80% Graphite

Francis G. Hanejko, Hoeganaes Corporation

0167 *U.S.A.*

11:10 a.m. (11:10)

Heat Treatment and Sintering Effects on High-Density AISI 9310 PM and Select Wrought Steels

Matt Bednar, Karthik Nagarathnam, UTRON Kinetics, LLC

0145 *India*

11:35 a.m. (11:35)

Influence of Molybdenum Addition and Heat Treatment on the Mechanical Properties of Sintered Hot-Forged Square Cross-Section Bars of Eutectoid Steel

Krishna S. Pandey, K. Subramanian, Hemlata Nayak, Fozia Z. Haque, Maulana Azad National Institute of Technology

*(Montego B)***SESSION 38****PM ALUMINUM****Session Chairman:**

Chaman Lall

Metal Powder Products Company

0030 *Australia* 10:45 a.m. (10:45)**Formation of Aluminium Nitride during Sintering of Aluminium**

Graham B. Schaffer, Damon Kent, John Drennan, Ma Qian, The University of Queensland

*(Montego C)***SESSION 39****ADVANCED GEAR PROCESSING****Session Chairman:**

Salvator Nigarura

PMG Indiana Corporation

0112 *Germany* 10:45 a.m. (10:45)**Gear-Rolling Study**

Philipp F. Kauffmann, Fritz Klocke, Christof Gorgels, WZL at RWTH Aachen University & Alwin Nagel, Timo Bernthaler, FH Aalen University

0003 *U.S.A.* 11:10 a.m. (11:10)**Surface Durability of Ausformed Powder Metal Gears**

Nagesh Sonti, Suren B. Rao, Applied Research Laboratory, Pennsylvania State University & Gary Anderson, Keystone Powdered Metal Co.

0111 *Germany* 11:35 a.m. (11:35)**Rollability of Case-Hardening PM Steel**

Philipp F. Kauffmann, Fritz Klocke, Christof Gorgels, WZL at RWTH Aachen University & Alwin Nagel, Timo Bernthaler, FH Aalen University

*(Montego D)***SESSION 40****TUNGSTEN & TUNGSTEN ALLOYS****Session Chairman:**

Michael T. Stawovy

H.C. Starck Inc.

0134 *Belgium* 10:45 a.m. (10:45)**Deformation Behavior of Pure, Doped and Ultrafine-Grained Tungsten**

Subba Rao Mekala, Havells-Sylvania Lighting Belgium NV

0068 *Turkey* 11:10 a.m. (11:10)**Development and Characterization Investigations of Mechanically Alloyed W-Mn-VC Composites**

Selim Coskun, Aziz Genc, Mustafa L. Ovecoglu, Istanbul Technical University

0010 *Turkey* 11:35 a.m. (11:35)**Development and Characterization Investigations of Mechanically Alloyed and Sintered W-2 wt% VC-1 wt% Ni Composites**

Aziz Genc, Selim Coskun, Mustafa L. Ovecoglu, Istanbul Technical University

*(Montego E)***SESSION 41****ADVANCES IN Nd-Fe-B MATERIALS****Session Chairman:**

Sherri R. Bingert

Los Alamos National Laboratory

0128 *Brazil* 10:45 a.m. (10:45)**Assessment of the Corrosion Behavior of Sintered Nd-Fe-B Magnets Surface Treated by Phosphating or Chromating**

Isolda Costa, Emerson A. Martins, Jesualdo L. Rossi, IPEN/CNEN-SP & Hercilio G. de Melo, Escola Politecnica da USP

0152 *U.S.A.* 11:10 a.m. (11:10)**Magnetic and Physical Properties of High-Melting Rare Earth-Iron-Boron Magnet Alloys with Extrinsic Sintering Aids**

Nathaniel T. Oster, Iver E. Anderson, Wei Tang, Yaqiao Wu, Kevin W. Dennis, Matthew J. Kramer, R. W. McCallum, Iowa State University, Ames Lab

0149 *Malaysia* 11:35 a.m. (11:35)**Neodymium-Iron-Boron (NdFeB) Die-Upset-Forged Magnet Produced from Amorphous Melt-Spun Ribbon**

Mat Husin Saleh, Elliasidi Abu Othman, Norazlan Roslani, Fauzi Ismail, Mazlan Mohamad, Advanced Materials Research Centre (AMREC), SIRIM BHD.

**WEDNESDAY AFTERNOON
Special Interest Programs***(St. Thomas B)***SIP 5****ADVANCES IN LEAN MATERIALS AND SINTER FURNACE ALLOYING
(continued)****PART 3: Processing Conditions for Lean Alloys****Wednesday afternoon**

1:30–3:00 p.m. (13:30–15:00)

Session Chairman:

Blaine Stebick

Horizon Technology Inc.

0206

*U.S.A***Sinter Hardening Furnaces—A Cost Effective Approach**

Thomas J. Jesberger, Abbott Furnace Company

0137 *Sweden***Influence of Processing Conditions on Mechanical Properties**

Sven Bengtsson, Ulf Engström, Höganäs AB

0181 *Italy***Vacuum Sinter Hardening and Sinter Austempering of Low-Alloy Steels**

Alberto Molinari, University of Trento

*(St. Thomas A)***SIP 6****POWDER METALLURGY TITANIUM MATERIALS AND PROCESSES—STATE OF THE ART
(continued)****PART 3****Wednesday afternoon**

1:30–3:00 p.m. (13:30–15:00)

Session Chairman:

Zhigang Fang

University of Utah

0185 U.S.A.

Characterization of Processing-Microstructure-Property Relationships for Blended-Elemental, Powder-Based, Canless Titanium 6Al-4V Extrusions
Sami M. El-Soudani, The Boeing Company, Oscar Yu, Fusheng Sun, RTI International Metals, Inc., Vladimir S. Moxson, Vlad Duz, ADMA Products, Inc. & Michael Campbell, Joshua J. Phillips, Plymouth Engineered Shapes, Inc.

0187 United Kingdom

The Response to Hot Isostatic Pressing of Gas-Atomised and PREP Powders of Ti25V15Cr2Al0.1C and of Gas-Atomised Powder of Ti6Al4V.
Jungfa Mei, K. Zhang, Michael H. Loretto, Xinhua Wu, University of Birmingham, IRC in Materials

0190 U.S.A.

Sintering Behavior of TiH₂ Powder
Zhigang Fang, Hongtao Wang, Shuming Fang, Jiamin Zhang, University of Utah

TECHNICAL SESSIONS
Wednesday morning
8:00–9:30 a.m. (08:00–9:30)

(Montego A)

SESSION 42

SOFT MAGNETIC COMPOSITES

Session Chairman:
Sylvain St. Laurent
QMP
Canada

0044 Sweden & U.S.A. 1:30 p.m. (13:30)
Advances in Soft Magnetic Composites — Materials and Applications
Ola Andersson, Höganäs AB & Paul Hofecker, North American Höganäs, Inc.

0072 Canada 1:55 p.m. (13:55)
Development and Shaping of Lamellar Soft Magnetic Composites
Patrick Lemieux, Isac Mihaiela, Guthrie Roderick, McGill Metal Processing Center, McGill University & Sylvain Pelletier, Yannig Thomas, Industrial Materials Institute, NRC

(Montego B)

SESSION 43

WEAR

Session Chairman:
James Laverick
The Timken Company

0158 U.S.A. 1:30 p.m. (13:30)
Development of Wear-Resistant Lead-Free Tin Bronze Valve Plate Surface Layers for Axial Piston Hydraulic Pumps
Greg A. Vetterick, Iver E. Anderson, Daniel J. Sordelet, Ames Laboratory, Iowa State University

0110 Germany 1:55 p.m. (13:55)
High-Speed Gear Hobbing HSS or Carbide?
Arne Stuckenberg, Philipp F. Kauffmann, Rolf Schalaster, Fritz Klocke, Christof Gorgels, WZL of RWTH Aachen University

0064 Germany 2:20 p.m. (14:20)
Automated Handling of Green Tapes for an Inmould Label Injection Moulding Process Identifying Functional Principles
Ester Ruprecht, Christian Munzinger, Adam-Mwanga Dieckmann, University of Karlsruhe (TH), Institute of Production Science

(Montego C)

SESSION 44

JOINING & INFILTRATION

Session Chairman:
Anthony Miller, PMT
Micro Metals, Inc.

0123 U.S.A. 1:30 p.m. (13:30)
Effect of Material Characteristics of PM Press-Fit Assemblies
Leigh Duren, Paul Prescott, Richard Scott, Stephanie Renaud, Nichols Portland

0084 Germany 1:55 p.m. (13:55)
Automated Sinter Joining of PIM Parts
Ester Ruprecht, Adam-Mwanga Dieckmann, Christian Munzinger, Katharina Klimscha, Jürgen Fleischer, Universität Karlsruhe wbk Institute of Production Science

(Montego D)

SESSION 45

FOAMS & STRUCTURED SANDWICHES

Session Chairman:
David E. Dombrowski
Los Alamos National Laboratory

0042 U.S.A. 1:30 p.m. (13:30)
Nanostructured Metal Foams: Synthesis and Applications
Erik Luther, Bryce Tappan, David Chavez, Jackie Veauthier, Pallas Papin, Heather Volz, Robert Dickerson, Los Alamos National Laboratory

0096 Canada & Iran 1:55 p.m. (13:55)
Comparison of Foaming Efficiency and Compressive Behaviour of Two Different Kinds of Al-Si-SiC Foams Containing Calcium Carbonate (CaCO₃) and Titanium Hydride (TiH₂) as the Blowing Agents
Reza Tafteh, University of British Columbia & S. Mohsen Seifi, S. M. Hossein Mirbagheri, Amirkabir University of Technology

(Montego E)

SESSION 46

SPARK PLASMA SINTERING

Session Chairman:
Joseph Tunick Strauss
HJE Company, Inc.

0180 Italy 1:30 p.m. (13:30)
Spark Plasma Sintering of Nanostructured Aluminum Powders Produced by Cryomilling
Alberto Molinari, Ketner Demetrio, Ivan Lonardelli, Cinzia Menapace, University of Trento & Mario Zadra, K4Sint. S.r.l.

0091 U.S.A. 1:55 p.m. (13:55)
Introduction of High-Throughput, Commercial-Application, Spark Plasma Sintering (SPS) Technology
Robert L. Aalund, Thermal Technology LLC

0162 Norway & Sweden 2:20 p.m. (14:20)
SPS Sintering of Iron Compacts Embedded in Conductive and Non-Conductive Pressure Media
Sorin Isac, Lars Arnborg, Norwegian University of Science and Technology & Mats Nygren, University of Stockholm

An international display of posters dealing with various aspects of PM and particulate material technologies will be on display daily starting on Monday morning. Authors will be available at their posters for protracted discussions on Tuesday 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 Tuesday.

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 Tetsuya Sawayama, Kobe Steel, Ltd., Japan
 Ron Van Noort, Wire Mesh Belt Company, Canada

POSTER GROUP A

COMPOSITE MATERIALS

0014 *Turkey*
Formation of Intermetallics and Characterization Investigations in Al-Cu-X (X:6B Transition Metal Carbide) Composites Developed via Mechanical Alloying

Alper Evirgen, M. Lutfi Ovecoglu, Istanbul Technical University

0058 *Japan*
Development of the Radiation-Shielding Material Based on the Composites of Pb-Shot and Boride
 Shigeru Kito, Mutsumi Atarashi, Fukuda Metal Foil & Powder Co., Ltd., Keiichi Miyamoto, Shigeaki Okuda, Shinsho-Namari Industrial Co., Ltd. & Jun-ichi Hori, Hiroshi Yashima, Research Reactor Institute, Kyoto University

0067 *Turkey*
Effect of WC Particle Size in Microstructural and Mechanical Properties of WC-Reinforced Al Metal Matrix Composites
 Ahmet U. Söyler, Hasan Gokce, Mustafa L. Ovecoglu, Burak Ozkal, Istanbul Technical University

0073 *Iran*
Evolution of Interfacial Bonding at Reinforcement/Matrix Interfaces of an Al/Ni₃Al Sintered Composite
 Maziyar Azadbeh, Maryam Abbasi, Sahand University of Technology

0121 *Brazil*
Sintering Study of Stainless Steel 316L Reinforced with 3 wt % and 6 wt % of Tantalum Carbide (TaC)
 Uilame Umbelino Gomes, Marciando Furukava, Leiliane Oliveira, Carlson Souza, UFRN - Federal University of Rio Grande Do Norte

0097 *Korea*
Electrical-Contact Resistance Characteristics of Metal Matrix Composites Based on STS316L Fabricated by Powder Metallurgy
 Joon Hwan Choi, Jong-Jin Choi, Dong-Soo Park, Korea Institute of Materials Science

0132 *India*
Influence of Graphite Addition and Porosity on the Wear Resistance of Fe-15%Cu-2%Mn-0.6%Cr Steel
 Fozia Z. Haque, Hemlata Nayak, Krishna S. Pandey, Maulana Azad National Institute of Technology & D.SreeKanth, National Institute of Technology

POSTER GROUP B

MAGNETIC MATERIALS

0059 *Japan*
Cyclic Heat Treatment of Sintered Nd-Fe-B Magnet
 Se Hoon Kim, Hoon Sup Kim, Tae Sun Jo, Dae-Gun Kim, Young Do Kim, Hanyang University

0142 *Korea*
Effect of Sintering Conditions on Magnetic Properties
 Young-Min Kim, Gu-Hyun Kim, Jong-Gyun Kim, Gwang-Bo Choi, In-Bum Jeong, Chang Sung Corp.

0221 *U.S.A.*
Characterization and Improvement of Magnetic Properties in Phosphate Coated Iron Powder
 Andrew Chan, Mitra Taheri, Drexel University & Francis Hanejko, Hoeganaes Corporation

POSTER GROUP C

OTHER MATERIALS

0060 *Korea*
Permeability and Ion Filtration Characteristics of Surface-Modified Porous Aluminum Alloy
 Young Ik Seo, Young Jung Lee, Chang Won Park, Dae-Gun Kim, Young Do Kim, Hanyang University & Kyu Hwan Lee, Korea Institute of Science and Technology

0080 *Brazil*
Developments of Prealloyed Molybdenum Material for Synchronizing Ring Production by Powder Metallurgy
 Maria do Carmo Amorim, Amauri Loberto, Magneti Marelli Cofap & Pedro Mazza, Hoganas Brazil

0077 *Taiwan*

Making of Mg Metallic Glass Powders and Their Consolidation

Chi Tsao, Shang K. Fan, National Cheng Kung University, Jacob C. Huang, National Sun Yat-Sen University & Jason S. Jang, I-Shou University

0130 *India*

Relationship Between Densification Process and Calculated Parameters During Hot Forging of Sintered Fe-0.55C-X Mn Steels Preforms

Hemlata Nayak, Fozia Z. Haque, Krishna S. Pandey, Maulana Azad National Institute of Technology

0146 *China*

The Morphology Evolution Process of Electrolytic Copper Powder

Jinghuai Zhang, Limin Wang, Linshan Wang, GRIPM Advanced Materials Co., Ltd.

0217 *Canada & U.S.A.*

Investigation of the Compaction, Sintering and Forging Response of Commercially Available AC2014 Aluminum PM Alloys

Chris D. Boland, D.C. Walker, W.F. Caley, G.J. Kipouros, D. Paul Bishop, Dalhousie University & Ian W. Donaldson, GKN Sinter Metals

0218 *Canada & U.S.A.*

Effects of Hot Deformation on Aluminum-Silicon Powder Metallurgy Alloys

Winston G. Mosher, W.F. Caley, G.J. Kipouros, D. Paul Bishop, Dalhousie University & Ian W. Donaldson, GKN Sinter Metals

0219 *U.S.A.*

The Influence of Aging on the Microstructure and Mechanical Properties of a Dual Phase Powder Metallurgy (PM) Steel

Jennifer Walters, J.J. Williams, Nikhilesh Chawla, Arizona State University & Christopher T. Schade, K.S. Narasimhan, Hoeganaes Corporation

0220 *Canada*

New Iron Powders with Improved Machinability

Alexandre Bois-Brochu, Bernard Tougas, Université Laval

0222 *U.S.A.*

Solid Lubricant Infused Tin Bronze Bearing Materials Produced by Powder Metallurgy

Gregory A. Vetterick, Iver Eric Anderson, D.J. Sordelet, Iowa State University, Ames Laboratory

POSTER GROUP D

POWDER PROCESSING

0125 *Ukraine*

Oxide Nanostructured Materials and Their Applications

Victor Varyukhin, Igor Danilenko, Tatjana Konstantinova, Donetsk Institute of Physics & Engineering NAS of Ukraine

POSTER GROUP E

SINTERING

0018 *China*

Fabrication of Nano-SiC Ceramics by Spark Plasma Sintering

Lianjun Wang, Wan Jiang, Institute of Ceramics, Chinese Academy of Sciences

0019 *China*

Consolidation of Nanosized TiO₂ Powders by Spark Plasma Sintering (SPS)

Wan Jiang, Lianjun Wang, Institute of Ceramics, Chinese Academy of Sciences

