About this volume

The TMS 2012 Annual Meeting Supplemental Proceedings, Volume 1: Materials Processing and Interfaces, is a collection of papers from the 2012 TMS Annual Meeting and Exhibition, held March 11–March 15, in Orlando, California, U.S.A.

The papers in this volume were selected based on technical topic compatibility and represent ten symposia from the meeting. This volume, along with the other proceedings volumes published for the meeting, and archival journals, such as Metallurgical and Materials Transactions and the Journal of Electronic Materials, represents the available written record of the 65 symposia held at the 2012 TMS Annual Meeting.

The individual papers presented within this proceedings volume have not necessarily been edited or reviewed by the conference program organizers and are presented “as is.” The opinions and statements expressed within the papers are those of the individual authors only and are not necessarily those of anyone else associated with the proceedings volume, the source conference, or TMS. No confirmations or endorsements are intended or implied.
Supplemental Proceedings: Volume I: Materials Processing and Interfaces

Advances in Surface Engineering: Alloyed and Composite Coatings

Session II

Structural Coatings in Aluminum Alloy Microtruss Materials ................................................... 3
B. Yu, and G. Hibbard

Laser Cladding of High-Performance CPM Tool Steels on Hardened H13 Hot-Work Tool Steel for Automotive Tooling Applications ................................................................. 11
J. Chen, and L. Xue

Electron Beam Deposited Multilayer Optical Interference Coatings Using Oxide Composites ................................................................. 19
A. Nayak, N. Sahoo, R. Tokas, A. Biswas, and N. Kamble

Session III

Microstructure and Wear Properties of Laser In-situ Formation of TiBx and TiC Titanium Composite Coatings ................................................................. 27
J. Liang, C. Liu, S. Chen, and C. Ren

Creep Behavior of Plasma Sprayed Y-PSZ Coated 6063-T6 Aluminum Alloy ................................................................. 35
E. Erzi, C. Kahruman, and S. Yılmaz

Contribution of Ti Addition to the Electronic Structure and Adhesion at the Fe2Al5/Fe Interface in 55%Al-Zn Coating ................................................................. 41
G. Wu, Y. Ren, J. Zhang, and K. Chou
Session IV

The Roles of Diffusion Factors in Electrochemical Corrosion of TiN and CrN (CrSiCN) Coated Mild Steel and Stainless Steel

F. Cai, Q. Yang, and X. Huang

Effect of Electroplating Parameters on "HER" Current Density in Ni-MoS2 Composite Plating

E. Saraloglu Guler, I. Karakaya, and E. Konca

Production of Ceramic Layers on Aluminum Alloys by Plasma Electrolytic Oxidation in Alkaline Silicate Electrolytes

A. Lugovskoy, A. Kossenko, B. Kazanski, and M. Zinigrad

Abrasive Wear Properties of Plasma Sprayed Y-PSZ Coated 6063-T6 Aluminum Alloy

E. Erzi, S. Yildirim, and S. Yilmaz

The Electrochemical Behavior of Surgical Grade 316L SS with and without HA Coatings in Simulated Body Fluid

T. Singh, H. Singh, H. Singh, and H. Saheet

Modification Research on the Influence on Corrosion Film Properties of Pb-Ca-Sn Alloys of with Addition of Bi, Ag and Zn

L. Xu, L. Liu, and P. Zhu

Session V

Evaluation of Residual Stress in Fe2B Coating on Ductile Cast Iron

M. Doñu Ruiz, N. Lopez Perrusquia, V. Cortez Suarez, and D. Sanchez Huitron

General Poster Session

Session I

Influence of Heat Treatment on the Corrosion of Steels in CCS Environment

A. Pfennig, S. Schulz, A. Kranzmann, T. Werlitz, S. Wetzlich, E. Bülow, J. Tietböhl, and C. Frieslich
Microstructure and Property Modifications in Mould Steels Treated by Pulsed Electron Beam .................................................................111
   K. Zhang

Potential Fiberboard Material from Cow Manure and Disposable Water Bottle .........................................................................................119
   B. Ng, M. Murray, C. Bradfield, and R. Pritish

Influence of Process and Thermo-physical Parameters on the Heat Transfer at Electron Beam Melting of Cu and Ta ...........................................125
   K. Vutova, V. Donchev, V. Vassileva, and G. Mladenov

Industrial Use of a New Ultrasound Spray for Cooling and Wet Gas Treatment in the Pyrometallurgical Processes .......................................133
   M. Cirkovic, V. Trujic, and Ž. Kamberovic

Development of 3D Porous Nickel Electrodes for Hydrogen Production ........141
   V. Pérez-Herranz, I. Herráiz-Cardona, E. Ortega, and J. García-Antón

Electrochemical Recovery of Zinc Present in the Spent Pickling Baths Coming from Hot Dip Galvanizing Processes ....................................149

Laboratory Testing Results of Kinetics and Processing Technology of the Polymetallic Sulphide Concentrate Blagojev Kamen - Serbia ............157
   M. Cirkovic, Ž. Kamberovic, and V. Trujic

Hidrotalcite with Gentamicine, of the Type Mg_{0.68}Al_{0.32}(OH)_{2} (NO₃)_{0.32*0.1}H₂O, Formed by Chemical Coprecipitation in Controlled Atmosphere .................................................................165
   H. Rodríguez-Santoyo, and O. Martínez-Alvarez

Effect of Thiodiglycolamide Addition to Di-n-hexyl Sulfide on the Pd(II) Extraction Rate .................................................................173
   H. Narita, M. Tanaka, and S. Ueno

Synthesis and Characterization of Metallic Oxides .................................179
   E. Brocchi, R. Souza, M. Doneda, J. Campos, A. Wimmer, and R. Navarro

Fabrication of Lotus-Type Porous Copper by Centrifugal Casting Technique .................................................................187
   Y. Lee, H. Kim, M. Kim, and S. Hyun
Interface Structures: Characterization, Theory, and Modeling

Ultra Fast Grain Boundary Segregation In Hot Deformed Nickel .................. 257
M. Allart, F. Christien, and R. Le Gall

Quantitative NanoSIMS Analysis of Grain Boundary Segregation in Bulk Samples .................................................................................................................. 265
F. Christien, K. Moore, C. Downing, and C. Grovenor

The Periodic Unit of Doubly-diffracted Reflections from Periodic Grain Boundaries in Cubic Crystals and Its Relationship with Coincident Site Lattice ................................................................................................................. 273
M. Shamsuzzoha

Poster Session

The In-situ Intrinsic Stress Measurements of Cu and Al Thin Films ............. 281
J. Yu, and Y. Kim

Delamination Characterization of Bonded Interface Using Surface Based Cohesive Model ............................................................................................................. 289
M. Ramamurthi, and Y. Kim

Nanocomposites

Mechanical Behavior and Modelling of Nanocomposites

Compressive Strength of Epoxy- Graphite Nanoplatelets Composites .......... 299
H. Colorado, A. Wong, and J. Yang

Micromechanical Analysis of Influences of Agglomerated Nanotube Interphase on Effective Material Properties of a Three Phase Piezoelectric Nanocomposite ................................................................................................................. 307
T. Tang, and P. Wang

Effect of Nano-Paper Coating on Flexural Properties of a Fire-Treated Glass Fiber-Reinforced Polyester Composite ............................................................................. 313
J. Skovron, J. Zhuge, A. Gordon, J. Kapat, and J. Gou
Finite Element Modeling of the Nanoscratching of Polymer Surfaces .......... 321
W. Chirdon, and J. Rozas

Processing of Nanocomposites I

Manufacturing and Characterization of an Auxetic Composite .................. 329
F. Chiang

Microtruss Cellular Nanocomposites ..................................................... 337
K. Abu Samk, G. Huang, M. Skocic, H. Zurob, D. Embury,
O. Bouaziz, and G. Hibbard

Nanocomposites for Magnetic and Dielectric Applications

Synthesis of Tailored Core-Shell Magnetic Microparticles for Intravascular Embolization ................................................................. 345
G. Ferreira, A. Umpierre, and F. Machado

Dramatic Expansion of Luminescence Region in GaP/Polymer Nanocomposites ................................................................. 353
S. Pyshkin, and J. Ballato

Nanocomposite Interfaces and Characterization

Positron Lifetime Analysis of Polyurea-Nanoclay Composites .................. 361
N. Seetala, D. Hubbard, G. Burks, A. Trochez, and V. Khabashesku

Processing of Nanocomposites II

Rheological Properties of Suspensions of Nanopowders Yttrium Oxide (Y₂O₃) and Magnesium-Aluminum Spinel (MgAl₂O₄) ........................... 367
G. Zyla, M. Cholewa, A. Witek, J. Plog, V. Lehmann, T. Oerther,
and D. Gross

Thermal Properties of Hemp-High Density Polyethylene Composites: Effect of Two Different Chemical Treatments ............................................. 375
N. Lu, and S. Oza
Discarded Ultrafine Particulate Carbonaceous Materials Used as Reinforcers of Rubber Vulcanized Products .................................................................383
  G. Martín-Cortés, F. Esper, L. Galvão Dantas, W. Hennies, and F. Valenzuela-Díaz

Properties of Additional Reinforcers Materials Used to Complement NAOB – A Rubber / Organoclay Nanocomposite Material..................................................389
  F. Esper, G. Martín-Cortés, L. Dantas, A. Cutrim, W. Hennies, and F. Valenzuela-Díaz

**Poster Session**

Thermal Properties of Carbon Nano Tubes Reinforced Mg-Matrix Nanocomposites..................................................................................................................395
  S. Iqbal, A. Mustafa, S. Talapatra, and P. Filip

**New Advances in Synthesis, Characterization, and Application of Layered Double Hydroxides**

**Session I**

Designing Layered Double Hydroxides for Targeted Applications..................405
  J. Hossenlopp, S. Majoni, and C. Machingauta

Electrochemical Synthesis of Layer Double Hydroxides, Its Characterization, and Performance Study for Removal of Nitrate and Arsenic...........................413
  M. Haider, J. Gomes, K. Urbanczyk, D. Cocke, H. McWhinney, G. Irwin, and P. Bernazzani

Removal of Direct Red and Orange II Azo Dye from Synthetic Textile Water Using Electrochemically Produced Fe-LDH .............................................421
  S. Jame, J. Gomes, and D. Cocke

Removal of Arsenic Using Green Rust and Other Electrochemically Generated Floc..............................................................................................................429
  M. Rahman, J. Gomes, K. Urbanczyk, and D. Cocke

Formation of Layered Double Hydroxides in Self-Purification of Polynary Metal Electroplating Wastewaters for Effective Removal of Anionic Dye ..............437
  J. Zhou, G. Qian, C. Liu, Y. Wu, X. Ruan, Y. Xu, and J. Liu
Characterization and Chemical Modification of Electrochemically Produced Layered Double Hydroxides as Nanomaterials ........................................ 445
  M. Islam, J. Gomes, and P. Bernazzani

Randall M. German Honorary Symposium on Sintering and Powder-Based Materials

Sintering Theory and Practice

A Review on Alloying in Tungsten Heavy Alloys ........................................ 455
  A. Bose, R. Sadangi, and R. German

Current Activated and Conventional Sintering

Low-Thermal Load Consolidation of Sm-Fe-N Flake Powder by Combination of Cyclic Compression and Current Sintering ........................................ 467
  K. Takagi, H. Nakayama, and K. Ozaki

Fabrication of TiN / Fe-Al Cermet from Mixture of TiN, Fe and Al Powders .......................................................... 475
  H. Nakayama, K. Ozaki, and K. Kobayashi

Transparent Polycrystalline Alumina Obtained by SPS: Single and Double Doping Effect.......................................................... 481
  B. Apak, H. Kanbur, E. Ozkan Zayim, G. Goller, O. Yucel, and F. Cinar Sahin

Sintering of Nanocrystalline Tungsten Powder ........................................ 489
  W. de Rosset

Powder Technology

Effect of Powder Synthesis and Processing on Luminescence Properties ....... 497
  J. McKittrick, J. Han, J. Choi, and J. Talbot

Effect of Rapid Solidification and Heat Treatment on D2 Tool Steel ............. 505
  P. Delshad Khatibi, H. Henein, and D. Ivey
Powder Processing and Consolidation I

Development of Solid Freeform Fabrication for Metallic Parts Using Selective Inhibition of Sintering..............................................................513
   M. Yoozbashizadeh, and B. Khoshnevis

Numerical Simulation of Cold Pressing of Armstrong CP-Ti Powders..........521
   A. Sabau, S. Gorti, W. Peter, W. Chen, and Y. Yamamoto

The Effect of Coke Particle Size on the Thermal Profile of the Sintering Process Product.................................................................529
   N. Tahanpesaranazefuly, and A. Heidary Moghadam

Powder Processing and Consolidation II

Powder Material Principles Applied to Additive Manufacturing ...............537
   D. Bourell, and J. Beaman

Processing Challenges of Dual-Matrix Carbon Nanotube Aluminum Composites .................................................................545
   A. Esawi, K. Morsi, I. Salama, and H. Saleeb

Influence of High Pressure Torsion on the Consolidation Behavior and Mechanical Properties of AA6061-SiCp Composite Powders ..........553
   H. Salem, W. El-Garaihy, and E. Rassoul

Powder Processing and Consolidation III

LASER Powder Deposition of AlMgB$_{14}$-TiB$_2$ Ultra-Hard Coatings on Titanium and Steel Substrates.....................................................561
   J. Fuerst, M. Carter, and J. Sears

Mechanical Properties of Spark Plasma Sintered ZrC-SiC Composites ..........569
   S. Sagdic, I. Akin, F. Sahin, O. Yucel, and G. Goller

Intense Pulsed Light Sintering Technique for Nanomaterials .................577
   H. Colorado, S. Dhage, J. Yang, and H. Hahn
Recent Developments in Biological, Electronic, Functional and Structural Thin Films and Coatings

Process-Properties-Performance Correlations I

Dependence of Tribology of Carbide Derived Carbon Films on Humidity......587
M. Tlustochowicz

Structural and Optical Properties of Silicon Carbonitride Thin Films Deposited by Reactive DC Magnetron Sputtering.................................................................595
O. Agirseven, T. Tavsanoglu, E. Ozkan Zayim, and O. Yucel

Influence of TIG Re-Melting and RE (La2O3) Addition on Microstructure, Hardness and Wear of Ni-WC Composite Coating .............................................603
B. Dhakar, D. Dwivedi, and S. Sharma

Evaluation of Mechanical Properties of Ni-Ti Bi-Layer Thin Film..............609
M. Mohri, and M. Nili-Ahmadabadi

Anodic TiO2 Nanotubular Arrays with Pre-Synthesized Hydroxyapatite - A Promising Approach to Enhance the Biocompatibility of Titanium..............617
L. Wang

Preparation and Properties of Cu2ZnSnS4 Thin Films by Electrodeposition and Sulfurization .................................................................625
C. An, H. Lu, and X. Chen

Process-Properties-Performance Correlations II

Formation of Crystalline and Amorphous Phases During Deposition of Ni_xTi_{1-x} Thin Film on Si Substrate – Interpretation of Experimental Results Using Molecular Dynamics Simulations.................................................................633
S. Aich, G. Priyadarshini, M. Gupta, S. Ghosh, and M. Chakraborty

Applications to Bio, Energy and Electronic Systems

Doping and Co-Doping of Bandgap-Engineered ZnO Films for Solar Driven Hydrogen Production .................................................................641
S. Shet, N. Ravindra, Y. Yan, and M. Al-Jassim

Magnetic Field Assisted Heterogeneous Device Assembly ..............651
V. Kasisomayajula, M. Booty, A. Fiory, and N. Ravindra
Organic Thermal Mode Photoresists for Applications in Nano-Lithography...

H. Wu, M. Li, C. Yang, C. Cheng, S. Chen, and D. Huang

Process-Properties-Performance Correlations III

Nitrogen Doped ZnO (ZnO:N) Thin Films Deposited by Reactive RF Magnetron Sputtering for PEC Application

S. Shet, K. Ahn, N. Ravindra, Y. Yan, and M. Al-Jassim

Spin-Coated Erbium-Doped Silica Sol-Gel Films on Silicon

S. Abedrabbo, B. Lahlouh, S. Shet, A. Fiory, and N. Ravindra

Influence of Annealing on the Martensitic Transformation and Magnetocaloric Effect in Ni_{49}Mn_{39}Sn_{12} Ribbons

D. Wu, S. Xue, H. Zheng, and Q. Zhai

Metal Diaphragm Based Magnetic Field Sensor

A. Banobre, I. Padron, A. Fiory, and N. Ravindra

Optical and Electronic Properties of AlN, GaN and InN: An Analysis

C. Lamsal, D. Chen, and N. Ravindra

Science and Engineering of Light Metal Matrix Nanocomposites and Composites

Metal Matrix Nanocomposites

Interfacial Analysis of CNT Reinforced AZ61 Mg Alloy Composites

K. Kondoh, H. Fukuda, J. Umeda, and B. Fugetsu

Biodegradability and Mechanical Performance of Hydroxyapatite Reinforced Magnesium Matrix Nanocomposite

C. Ma, L. Chen, J. Xu, A. Fehrenbacher, Y. Li, F. Pfefferkorn, N. Duffle, J. Zheng, and X. Li

Mechanical Properties of A356-CNTCast Nano Composite Produced by a Special Compocasting Route

B. Abbasipour, B. Niroumand, and S. Monirvaghefi

Production of Cast AZ91-CNT Nano-Composite by Addition of Ni-P-CNT Coated Magnesium Powder to the Melt

M. Firoozbakht, B. Niroumand, and S. Monirvaghefi
Wear Behavior of Magnesium Matrix Nanocomposites at Room and Elevated Temperature.................................................................749
W. Li, and S. Liu

Nanocomposites and Composites

Uniform Dispersion of Nanoparticles in Metal Matrix Nanocomposites .......757
L. Chen, H. Choi, A. Fehrenbacher, J. Xu, C. Ma, and X. Li

Effect of Core-shelled Nanoparticles of Carbon-Coated Nickel on Magnesium ........................................................................765
Y. Sun, H. Choi, H. Konishi, V. Pikhovich, R. Hathaway, and X. Li

In Situ Composite of (Mg2Si)/Al Fabricated by Squeeze Casting .............775
H. Lus, G. Ozer, and K. Guler

Optimization of Tensile Strength of Friction Stir Welded Al-(10 to 14 wt.%) TiB2 Metal Matrix Composites ........................................783
S. Joseph Vijay, N. Murugan, and S. Parameswaran

Metal Matrix Composites

Slow-Shot High Pressure Die-Casting (SS-HPDC) Process for AE44 Magnesium Single-Cylinder Engine Block with Short-Fiber Reinforcement in the Bore.............................................................................791
B. Hu, P. Wang, B. Powell, and X. Zeng

Compressive Properties of Al-B4C Composites over the Temperature Range of 25-500°C.................................................................799
S. Gangolu, A. Rao, N. Prabhu, V. Deshmukh, and B. Kashyap

Aluminum Metal Matrix Composite via Direct Metal Laser Deposition: Processing and Characterization..............................................807
B. Waldera, and S. Kalita

Damage Evolution Model for Hybrid Metal Matrix Composites ..............815
J. Dibelka, and S. Case

Numerical Simulation of Pressure Infiltration Process for Making Metal Matrix Composites: Effect of Process Parameters.....................823
B. Wang, and K. Pillai

xvi
Titanium: Advances in Processing, Characterization and Properties

**Processing and Process Modeling I**

Microstructural Evolution and Mechanical Properties of $\beta$-Titanium Ti-10V-2Fe-3Al during Incremental Forming ................................................................. 833
S. Winter, S. Fritsch, and M. Wagner

Study on Hot Deformation Behavior of TC4 Titanium Alloy ......................... 841
Y. Lu, S. Jiao, X. Zhou, and A. Dong

Evolution of Microstructures and Properties of Ti-44Al-6V-3Nb-0.3Y Alloy after Forging and Rolling ................................................................. 849
Y. Chen, H. Niu, S. Xiao, P. Sun, and C. Zhang

Effect of Forging on Microstructural Characteristic and Tensile Properties of In-Situ (TiB+TiC)/Ti Composite ................................................................. 857
Y. Chen, C. Zhang, S. Xiao, D. Wu, and H. Niu

**Processing and Process Modeling II**

Microstructure and Mechanical Properties of Ti-6Al-4V Fabricated by Selective Laser Melting ................................................................. 863
M. Simonelli, Y. Tse, and C. Tuck

Computational Modeling of the Dissolution of Alloying Elements .................... 871
J. Ou, A. Chatterjee, D. Maijer, S. Cockcroft, and C. Reilly

Cost Effective and Eco-Friendly Process for Preparation of Wrought Pure Ti Material via Direct Consolidation of TiH$_2$ Powders ................................................ 879
T. Mimoto, N. Nakanishi, T. Threrujirapapong, J. Umeda, and K. Kondoh

Effect of Dual-Laser Beam Welding on Microstructure Properties of Thin-Walled $\gamma$-TiAl Based Alloy Ti-45Al-5Nb-0.2C-0.2B (TNB) ......................... 887
J. Liu, V. Ventzke, P. Staron, H. Brokmeier, M. Oehring, N. Kashaev, and N. Huber
Microstructure Evolution and Characterization I

Recrystallization Behavior in Ti-13Cr-1Fe-3Al Alloy after Severe Plastic Deformation ................................................................. 895
M. Ueda, H. Matsuhira, Y. Takasaki, M. Ikeda, and Y. Todaka

Mechanical Properties

Crack Initiation and Microstructurally Short Crack Growth of Ti-6Al-4V ...... 903
H. Christ, H. Knobbe, P. Koester, C. Fritzen, and M. Riedler

Three-dimensional Investigation of the Microtexture near Tensile Crack Tip in Ti-6Al-4V ........................................................................................................................................ 911
X. Xu, Y. Tse, G. West, and A. Huang

Machinability of β-Titanium Alloy Ti-10V-2Fe-3Al with Different Microstructures ................................................................. 919
H. Abrahams, C. Machai, and D. Biermann

Residual Stress Relaxation Effects on the Cracking and Wear Processes of Shot Peened Ti-6Al-4V Titanium Alloy under Fretting-Fatigue Loading .......... 927
R. Ferre, S. Fouvry, B. Berthel, R. Amargier, and A. Ferre

General Abstracts

Efficient Oxidation Protection of Ti- and TiAl-alloys by F-treatments .......... 935
A. Donchev, M. Schütze, R. Yankov, and A. Kolitsch

Characteristics and Wear Performance of Nitrided Ti6Al7Nb ................... 941
F. Siyahjani, M. İpekci, and H. Cimenoglu

Composition Analysis of Diffusion Bonded γ-TiAl Intermetallic: TiAlV Alloy Interface by Using STEM ......................................................... 947
P. Sivagnanapalani, Gouthama, and M. Sujata

Effect of Erbium Addition on Microstructure of As-Cast Ti-22Al-25Nb Alloy ........................................................................................................ 955
J. Dai, H. Lu, and Z. Cai

Fracture Behaviors of TiN and TiN/Ti Multilayer Coatings on Ti Substrate during Nanoindentation .......................................................... 963
Y. Sun, C. Lu, A. Tieu, Y. Zhao, H. Zhu, K. Cheng, and C. Kong
Wettability and Interfacial Phenomena between Metals and Ceramic/Refractory Materials

Session I

Chemical Wear of Basic Brick Linings in the Non-Ferrous Industry ..................981
D. Gregurek, A. Spanring, M. Kirschen, and C. Majcenovic

Study on Wettability of Cu and 85Cu-15Ni Alloy on 18NiO-NiFe₂O₄ Composite Ceramics .................................................................................................................989
J. Du, Y. Liu, G. Yao, Z. Zhang, and G. Zu

Interfacial Reactions in the Liquid/Solid and Liquid/Vapor Interfaces of Al-Si-Mg Alloys and B₁₂ (Bc₂) Substrates .........................................................................................997
O. Herrera-Romero, M. Pech-Canul, Z. Chaudhury, and G. Newaz

TMS2011 General Abstracts: Structural Materials Division

Microstructure

Microstructure of α’ Martensites in Ti-V-Al Alloys Studied by High-Resolution Transmission Electron Microscopy ..............................................................1007
K. Sato, H. Matsumoto, A. Chiba, and T. Konno

Author Index ........................................................................................................1013

Subject Index ........................................................................................................1019