

International Thermal Spray Conference and Exposition (ITSC 2019)

**New Waves of Thermal Spray Technology
For Sustainable Growth**

**Yokohama, Japan
26-29 May 2019**

Editors:

**F. Azarmi
Y. Lau
J. Veilleux
C. Widener
F. Toma**

**H. Koivuluoto
K. Balani
H. Li
K. Shinoda**

ISBN: 978-1-5108-8800-5

Printed from e-media with permission by:

Curran Associates, Inc.
57 Morehouse Lane
Red Hook, NY 12571



Some format issues inherent in the e-media version may also appear in this print version.

Copyright© (2019) by ASM International
All rights reserved.

Printed by Curran Associates, Inc. (2019)

For permission requests, please contact ASM International
at the address below.

ASM International
9639 Kinsman Road
Materials Park, Ohio 44073-0002
USA

Phone: +1 440.338.5151

memberservicecenter@asminternational.org

Additional copies of this publication are available from:

Curran Associates, Inc.
57 Morehouse Lane
Red Hook, NY 12571 USA
Phone: 845-758-0400
Fax: 845-758-2633
Email: curran@proceedings.com
Web: www.proceedings.com

Contents

Cold and Thermal Spray Processes and Equipment

High Rate Deposition in Cold Spray 1

Ozan C. Ozdemir¹, Sinan Muftu¹, Lauren Randaccio¹, Aaron T. Nardi², Victor K. Champagne, Jr.², Christian A. Widener³

(1) Northeastern University, Department of Mechanical and Industrial Engineering, Boston, MA, USA

(2) Army Research Laboratory, Aberdeen proving Ground, MD, USA

(3) VRC Metal Systems, Rapid City, SD, USA

Powder Jet Variations Using Low Pressure Cold Spraying—For an Improvement of the Spraying Field 9

Libin Lalu Koithara, Rija Nirina Raoelison, Sophie Costil, Marie-Pierre Planche, Université de Bourgogne Franche-Comté-UTBM, Laboratoire Interdisciplinaire Carnot de Bourgogne, Belfort Cedex, France

HVAF—Chance and Challenge for Users and for Powder Producers 15

Oliver Lanz and Benno Gries, H.C. Starck Surface Technology and Ceramic Powders GmbH, Germany

Influence of Spray Process Parameters in Cascaded Plasma Spray Gun on YSZ Coating Morphology and Properties 23

Kaito Takagi and Ryota Shindo, TOCALO Co., Ltd., Akashi, Japan

Cold Spray Processing

Residual Stress Development of Laser Assisted Cold Sprayed Ni Alloy 718 Coatings 29

Mike Walker¹, Paul Howes¹, Phil McNutt², and Dave Harvey²

(1) University of Leicester, Department of Physics, Leicester, UK

(2) TWI, Cambridge, UK

Economic Potential of Cold Spraying MCrAlY Coatings: Use of Nitrogen and Feasibility of Powder Recycling 37

Deliang Guo¹, Bertrand Jodoin¹, and Ruben Fernandez²

(1) University of Ottawa, Ottawa, ON, Canada

(2) University of Chile, Santiago, Chile

Cold Sprayed FeCoNiCrMn High Entropy Alloy (HEA) Coating: Microstructure and Tribological Property 45

Shuo Yin¹, Rocco Lupoi¹, Wenyi Li², Yixin Xu², Bo Song³, Xingchen Yan⁴, Min Kuang⁴

(1) Trinity College Dublin, The University of Dublin, Department of Mechanical and Manufacturing Engineering, Dublin, Ireland

(2) Key Laboratory of Solidification Processing, Shaanxi Key Laboratory of Friction Welding

Technologies, School of Materials Science and Engineering, Northwestern Polytechnical University, Xi'an, China
(3) Key Laboratory of Materials Processing and Die and Mould Technology, Huazhong University of Science and Technology, Wuhan, China
(4) National Engineering Laboratory for Modern Materials Surface Engineering Technology; The Key Lab of Guangdong for Modern Surface Engineering Technology; Guangdong Institute of New Materials, Guangzhou, China

Residual Stress Measurement of Cold Sprayed Metallic and Ceramic Coating During Spraying 53

Yuta Watanabe¹, Motohiro Yamada², Masahiro Fukumoto²
(1) National Institute of Technology, Kurume College, Kurume, Fukuoka, Japan
(2) Toyohashi University of Technology, Toyohashi, Aichi, Japan

Diagnostics and Control

Control of the Arc Motion in DC Plasma Spray Torch with a Cascaded Anode 59

Rodion Zhukovskii, Christophe Chazelas, Armelle Vardelle, Vincent Rat, Université de Limoges, Limoges, France

Comparative Analysis of the Effect of CO₂ Laser Radiation on Light Propulsion Acceleration of Powder Particles During Laser Cladding 65

D.V. Sergachev¹, O.B. Kovalev¹, G.N. Grachev², A.L. Smirnov², P.A. Pinaev²
(1) Khristianovich Institute of Theoretical and Applied Mechanics, Novosibirsk, Russia
(2) Institute of Laser Physics, Novosibirsk, Russia

Environmental Impact

Environmental, Economical and Performance Impacts of Ar/H₂ and N₂/H₂ Plasma Sprayed YSZ TBCs 71

Rogerio S. Lima¹, Bruno M.H. Guerreiro¹, Nicholas Curry², Matthias Leitner², Kari Körne²
(1) National Research Council of Canada, Boucherville, QC, Canada
(2) Treibacher Industrie AG, Althofen, Austria

Investigation of CMAS Resistance of Sacrificial Suspension Sprayed Alumina Topcoats on EB-PVD 7YSZ Layers 79

Christoph Mikulla¹, Ravisankar Naraparaju¹, Uwe Schulz¹, Filofteia-Laura Toma², Maria Barbosa^{2,3}, Christoph Leyens^{2,3}
(1) German Aerospace Center (DLR), Institute of Materials Research, Cologne, Germany
(2) Fraunhofer Institute for Material and Beam Technology (IWS), Dresden, Germany
(3) Technical University of Dresden (TUD), Institute of Materials Science, Dresden, Germany

Effect of Laser Remelting on the Microstructure and Erosion-Corrosion Resistance of NbC Thermal Spray Coatings 86

Hipólito Carvajal Fals¹, Angel Sanchez Roca¹, João Batista Fogagnolo², Leonardo Fanton², Maria Júlia Xavier Belém³, Carlos Roberto Camello Lima³
(1) Oriente University, Santiago de Cuba, Cuba
(2) State University of Campinas, Campinas, Brazil
(3) Methodist University of Piracicaba, Santa Bárbara d'Oeste, Brazil

Hydroxyapatite and Environmental Applications

Interfacial Strength of Plasma-Sprayed Hydroxyapatite Coatings 93
Motofumi Ohki, Niigata University, Niigata, Japan

Laser Shock Adhesion Test (LASAT) Applied to Bioceramic Coatings Involving Two-Dimensional Shock Wave Propagation 101

A. Cottin¹, V. Guipont¹, B. Cauwe², C. Demangel²
(1) MINES ParisTech, PSL Research University, MAT–Centre des Matériaux, France
(2) CRITT MDTs, Charleville-Mézières, France

Evaluation of Advanced Weld Overlay, Thermal Spray and Laser Clad Coatings in an Operating Waste Wood Fired Biomass Boiler 109

Colin Davis¹ and Iain Hall²
(1) Uniper Technologies Ltd., Nottingham, UK
(2) Integrated Global Services, Richmond, VA, USA

Laser Cladding and Miscellaneous Processes

High-Speed Laser Cladding for Innovative Applications 115
Ivan Smirnov and Conny Lampa, HÖganäs AB, HÖganäs, Sweden

Equipment and Technologies of Atmospheric Air Plasma Spraying of Functional Coatings 119

D.V. Sergachev¹, V.I. Kuzmin¹, I.P. Gulyaev¹, A.A. Bochegov², I.V. Vandyshova³
(1) Khristianovich Institute of Theoretical and Applied Mechanics SB RAS, Novosibirsk, Russia
(2) Ural's Innovative Technologies, Ekaterinburg, Russia
(3) Ural Federal University, Ekaterinburg, Russia

Materials and Technology

Gearing Up Solution Precursor Plasma Spray for YAG TBCs for Production 125

Eric H. Jordan¹, Maurice Gell¹, Rishi Kumar², and Chen Jiang²
(1) University of Connecticut and Solution Spray Technologies LLC, Storrs, CT, USA
(2) Solution Spray Technologies LLC, Storrs, CT, USA

Dilatometric Study of High Temperature Exposure Effects in Multiphase Fe-Al Intermetallic/Oxide Ceramic Coating Deposited by Gas Detonation Spraying 131

Andrzej J. Panas¹, Cezary Senderowski², Bartosz Fikus³
(1) Air Force Institute of Technology, Warsaw, Poland
(2) University of Warmia and Mazury, Department of Materials Technology and Machinery, Olsztyn, Poland
(3) Military University of Technology, Faculty of Mechatronics and Aerospace, Warsaw, Poland

Influence of Feedstock Pre-Treatment of Dynamic Flowability of HVOF Powders 136

W. Tillmann and A. Brinkhoff, TU Dortmund University, Dortmund, Germany

Effects of Gun Scanning Pattern on the Structure and Corrosion Resistance of Plasma Sprayed YSZ Coatings 143

Takuma Ohnuki^{1,2}, Seiji Kuroda¹, Hiroshi Araki¹, Xiaolong Chen¹, Makoto Watanabe¹, Yukihiko Sakamoto²

(1) National Institute for Materials Science, Tsukuba, Ibaraki, Japan

(2) Chiba Institute of Technology, Narashino, Chiba, Japan

Interfacial TEM Analysis of Cold Sprayed MCrAlY Coating onto CMSX-4 Superalloy Using Nitrogen 151

Ruben Fernandez¹, Deliang Guo², Bertrand Jodoin², Yin Wang³

(1) University of Chile, Santiago, Chile

(2) University of Ottawa, Ottawa, ON, Canada

(3) AECC Commercial Aircraft Engine Manufacturing Co., Ltd., Shanghai, China

Multi-scale Modelling and Artificial Intelligence-based Approaches

Artificial Intelligent Aided Analysis and Prediction of High Velocity Oxy Fuel (HVOF) Sprayed Cr3C2-25NiCr Coatings 158

Meimei Liu, Zexin Yu, Hongjian Wu, Sihao Deng, Yicha Zhang, Hanlin Liao,
Université de Bourgogne Franche-Comté, Belfort France

A New Approach to Simulate Coating Thickness in Cold Spray 165

Hongjian Wu, Xinliang Xie, Memei Liu, Sihao Deng, Hanlin Liao,
Université de Bourgogne Franche-Comté, Belfort France

Numerical 3D Simulation of Heat and Mass Transfer in a Molten Pool During Chemical Interaction of Mixture Components at the Laser Alloying or Cladding 172

A.M. Gurin, O.B. Kovalev, SB RAS Khristianovich Institute of Theoretical and Applied Mechanics, Novosibirsk, Russia

New Coating Materials Development I

Dense to Columnar Microstructure Evolution of Ba(Mg_{1/3}Ta_{2/3})O₃ TBCs Through Tailoring of Suspension Plasma Spray Conditions 178

Huidong Hou^{1,2}, Jocelyn Veilleux¹, François Gitzhofer¹, Quansheng Wang²

(1) Université de Sherbrooke, Sherbrooke, Québec, Canada

(2) Beijing Institute of Technology, Beijing, China

Deposition of Silicon Carbide-based Coatings using High Velocity Oxy-Fuel Spraying 185

M.A. Riley, A.K. Tabecki, F. Zhang, TWI Ltd., Granta Park, Great Abington, Cambridge, UK

Oerlikon Metco Young Professionals Session

Influence of the Injector Head Geometry on the Particle Injection in Plasma Spraying 192

K. Bobzin, M. Öte, M.A. Knoch, H. Heinemann, Surface Engineering Institute, RWTH Aachen University, Aachen, Germany

Dyanmic Behavior of Anode Arc Jets in a Cascade Plasma Torch with an External Magnetic Field	199
Hiroki Saito, Hikaru Matsumoto, Takayasu Fujino, University of Tsukuba, Ibaraki Japan	

Paper Removed.....	207
---------------------------	------------

Poster Session

High Temperature Corrosion Behavior of Selected Thermally Sprayed Alloy Based Coatings in Aggressive Environment at 690 °C	214
---	------------

Zdeněk Česanek¹, Šárka Houdková¹, Katerina Lencová¹, Jan Schubert¹, Radek Mušálek², František Lukáč²

(1) Research and Testing Institute in Pilsen LTd., Pilsen, Czech Republic

(2) Institute of Plasma Physics, The Czech Academy of Sciences, Prague, Czech Republic

Research on High-Temperature Performance of CoCrAlSiY Coatings	222
---	------------

Zhang Shuting¹, Si Lina¹, Xu Hongyan², Yan Hongjuan¹

(1) School of Mechanical and Materials Engineering, North China University of Technology, Beijing, China

(2) Department of Micro-nano Fabrication Technology, Institute of Electronics Engineering, Chinese Academy of Sciences, Beijing, China

The Microstructure and Properites of Plasma Sprayed Nanostructured 5 wt.% and 8 wt. % yttria Stabilized Zirconia Coatings	228
--	------------

Zheng Li and Yang Gao, Thermal Spray Center of the Dalian Maritime University, Dalian, Liaoning, China

Paper Removed.....	235
---------------------------	------------

Development of Plasma Spray Gun for Inner Diameter Suspension and Fabrication of Thermal Spray Coating	241
---	------------

Mitsuru Yoshida, Yutaka Tateishi, Tadashi Osako, Motoyuki Kondo, Yasushi Nomura, Shinco Metalicon Co., Ltd., Shiga, Japan

Low-Thermal Conduction Mechanisms in Cation-Deficient Perovskite Type Oxides	246
---	------------

Satoshi Kiaoka¹, Tsuneaki Matsudaira¹, Naoki Kawashima¹, Takafumi Ogawa¹, Craig A.J. Fisher¹, Takeharu Kato¹, Daisaku Yokoe¹, Yoichiro Habu²

(1) Japan Fine Ceramics Center, Nagoya, Japan

(2) TOCALO Co. Ltd., Akashi, Japan

Development of Fluoropolymer Coating Using Low Pressure Cold Spray 252

W. Lock Sulen, K. Ravi, Y. Ichikawa, K. Ogawa, Fracture and Reliability Research Institute (FRI), Graduate School of Engineering, Tohoku University, Japan

Elaboration of Sacrificial Zinc Coating on Carbon Steel via High Pressure Cold Spray Technique 259

Elizaveta Lapushkina^{1,2}, Sheng Ying¹, Nicolas Mary^{1,2}, Kazuhior Ogawa^{2,3}, Bernard Normand¹
(1) MATEIS Lab UMR, Lyon, France

(2) ELYTMaZ UMI3757, CNRS-Tohoku University-Université de Lyon, Sendai, Japan

(3) Fracture and Reliabilkity Research Institute, Tohoku University, Sendai, Japan

Paper Removed 265**Multivariate Analysis and Evaluation of the Porous Architecture of Suspension****Plasma Sprayed Coatings 272**

Yongli Zhao^{1,2}, Yan Wang^{2,3}, François Peyraud², Marie-Pierre Planche², Hanlin Liao², Ghislain Montavon², Jan Ilavsky⁴, Audrey Lasalle⁵, Alain Allimant⁵

(1) School of Mechanical and Automotive Engineering, Shanghai University of Engineering Science, China

(2) ICB UMR 6303, CNRS, Université de Bourgogne Franche-Comté, Belfort, France

(3) School of Metallurgical Engineering, Xi-an University of Architecture and Technology, Xi'an, China

(4) Advanced Photon Source, Argonne National Laboratory, Argonne, Illinois, USA

(5) Saint-Gobain CREE, Cavaillon, France

Influence of Nozzle Expansion Ratio of Circular and Rectangular Cross-Section Nozzle on Velocity and Temperature of Copper Particle with HP Cold Spraying by Computational Fluid Dynamics and Experimental Analysis 279

Kazuhiko Sakaki¹, Kiyotaka Iijima², Tomoki Tsubata²

(1) Faculty of Engineering, Shinshu University, Nagano City, Japan

(2) Shinshu University, the Graduate School of Science and Technology, Nagano City, Japan

Paper Removed..... 285**Metal Matrix Composites using Surface Modified Particles Fabricated by Cold Spray Technique 291**

Nana Okimura, Nobuhisa Ata, Yuki Hirata, Naoto Ohtake, Hiroki Akasaka,
Tokyo Institute of Technology, Tokyo, Japan

Microstructural Characteristics of Arc Sprayed CoCr-based Coatings 298

W. Tillmann and L. Hagen, TU Dortmund University, Institute of Materials Engineering, Dortmund, Germany

Adhesion of HVOF Sprayed WC-Co Coatings on Additively Processed 316L 306

W. Tillmann¹, L. Hagen¹, C. Schaak¹, J. Liß¹, M. Schaper², K.-P. Hoyer², M.E. Aydin Öz², K.-U. Garthe²

(1) TU Dortmund University, Institute of Materials Engineering, Dortmund, Germany

(2) Paderborn University, Chair of Materials, Paderborn, Germany

Paper Removed 314**Study of HVOF Parameters Influence on Microstrucutre and Wear Resistance of Cr3C2-25 Ni Cr Coatings 320**

K. Bertuol¹, M.T. Ribas¹, A.R. Mayer¹, A.G.M. Pukasiewicz¹, I.B.A.F. Siqueira², A. Chicoski², M.J. de Souza³

(1) Federal University of Technology, Parana, Brazil

(2) Institute of Technoloy for Development (LACTEC), Parana, Brazil

(3) Santo Antônio Energia, São Paulo, Brazil

Design the Compositions of Low Friction Coefficient Bimodal Caotings for Heavy Load Component 326

Fuxing Ye^{1,2,3}, Pengbo Mi^{1,2,3}, Changjiu Li⁴

(1) School of Materials Science and Engineering, Tianjin University, Tianjin, China

(2) Key Laboratory of Advanced Ceramics and Machining Technology of Ministry of Education, Tianjin University, Tianjin, China

(3) Tianjin Key Laboratory of Advanced Joining Technology, Tianjin Univeristy, Tianjin, China

(4) State Key Laboratory for Mechanical Behavior of Materials, Xi'an Jiaotong University, Xi'an, China

Numerical Design of an Adaptive-Pressure Plasma Coating Process 332

Dmitrii Ivchenko¹, Gilles Mariaux¹, Armelle Vardelle¹, Simon Goutier¹, Tatiana E. Itina²

(1) University Limoges, Limoges, France

(2) Laboratorie Hubert-Curien, Universti Lyon, UJM-St-Etienne, France

Preparation and Thermophyscial Properties of CeO₂-Gd₂O₃ Co-Stablized Zirconia Thermal Barrier Coatings 340

T. Yang^{1,2}, W. Ma^{1,2}, X.-F. Meng^{1,2}, E.-B. Li^{1,2}, Y. Bai^{1,2}, C.-W. Liu^{1,2}, H.-Y. Dong^{2,3}

(1) School of Materials Science and Engineering, Inner Mongolia University of Technology, China

(2) Inner Mongolia Key Laboratory of Thin Film and Coatings Technology, China

(3) School of Chemical Engineering, Inner Mongolia University of Technology, China

Solid Particle Erosion Wear of Plasma Sprayed NiTi Alloy used for Aerospace Applications 346

Biswajit Swain¹, Swadhin Patel¹, Priyabrata Mallick², Soumya Sanjeeb Mohapatra³, Ajit Behera¹

(1) Department of Metallurgical and Materials Engineering, Odisha, India

(2) Plasma Spray Division, Hindustan Aeronautic Limited, Odisha, India

(3) Department of Chemical Engineering, Odisha, India

Evaluation of Cavitation and Corrosion Synergism Mechanism on Cr₃C₂–25NiCr Coatings Deposited by HVOF Process 352

Anderson G.M. Pukasiewicz¹, André R. Mayer¹, Kae Bertuol¹, Irene B.A.F. Siqueira²,

Rodolpho F. Vaz², Andre R. Capra², M.J. de Souza³

(1) Federal University of Technology Paraná, Brazil

(2) Latec Institute of Technology for Development, Paraná, Brazil

(3) Santo Antônio Energia, São Paulor, Brazil

Corrosion Resistance of Iron-based Alloy Coatings Deposited by HVOF Process 359

Anderson Gerlado Marenda Pukasiewicz¹, Gustavo Bavaresco Sucharski², Irene Bida de Araújo

Fernandes Siqueira³, Juliano de Andrade³, Rodolpho Fernando Váz³, Luiz Alberto⁴,

Jorge Procopiak⁴

(1) Federal University of Technology Paraná, Paraná, Brazil

(2) Federal University of Parana, Paraná, Brazil

(3) Latec, Paraná, Brazil

(4) Copel, Paraná, Brazil

Effects of Composition on Mechanical Properties of Suspension Plasma-Sprayed Hydroxyapatite/Titania Coating 369

Mirazul Mahmud Abir, Sarita Morakul, Yuichi Otsuka, Yukio Miyashita, Yoshiharu Mutoh,

Nagaoka University of Technology, Niigata, Japan

SOFC & Hydrogen

Characterization of Atmospheric Plasma-Sprayed Strontium Doped Lanthanum Chromite Interconnector for Tubular Solid Oxide Fuel Cells 376

Xu Chen, Shan-Lin Zhang, Cheng-Xin Li, Chang-Jiu Li, State Key Laboratory for Mechanical Behavior of Materials, School of Materials Science and Engineering, Xi'an Jiaotong University, Xi-an, China

Development of ScSZ Electrolyte Fabricated by Very Low Pressure Plasma Spraying for Metal Supported SOFCs Applications 382

Yue-Peng Wang, Jiu-Tao Gao, Wei Chen, Cheng-Xin Li, Shan-lin Zhang, Guan-Jun Yang, Chang-Jiu Li, State Key Laboratory for Mechanical Behavior of Materials, School of Materials Science and Engineering, Xi'an Jiaotang University, Xi'an, China

Paper Removed..... 388

Aerosol Spraying of Bismuth Vanadate for Hydrogen Technology 394

Charline Wolpert¹, Frank Gärtner¹, Maria Villa Vidaller¹, Thomas Klassen¹, Jun Akedo², Kentaro Shinoda², Mauricio Schieda³, Thomas Emmle³

(1) Helmut-Schmidt University, Department of Mechanical Engineering, Hamburg, Germany

(2) National Institute of Advanced Industrial Science and Technology, Advanced Coating Technology Research Center, Tsukuba, Japan

(3) Helmholtz-Zentrum Geesthacht, Sustainable Energy Technology, Geesthacht, Germany

Wear

Etch Behavior of Yttrium-based Plasma Resistant Coating Prepared by Vacuum Kinetic Spray 400

Yeonju Kim, Hansol Kwon, Changhee Lee, Kinetic Spray Coating Lab, Division of Materials Science and Engineering, Hanyang University, Seoul, South Korea

Automotive, Heavy, Marine and Nuclear Industries

Field Application of Cold Spray for Repairs in the Navy and Industry 406

Christian A. Widener, Kyle Johnson, Kris Klus, VRC Metal Systems, Rapid City, SD, USA

Evaluation of the Ductility of Cold-Sprayed Copper Coatings for the Long-Term Disposal of Nuclear Fuel 413

Bruno Guerreiro¹, Phyong Vo¹, Dominique Poirier¹, Jean-Gabriel Legoux¹, Xuan Zhang², Jason D. Giallonardo²

(1) National Research Council of Canada, Boucherville, QC, Canada

(2) Nuclear Waste Management Organization (NWMO), Toronto, ON, Canada

Thin Cold Sprayed Coatings for Nuclear Fuel with Enhanced Accident Tolerance 420

Jorie L. Walters¹, Javier E. Romero¹, Andrew J. Mueller¹, Richard S. Stiteler², Hemant H. Shah¹,

Robert L. Oelrich¹

(1) Westinghouse Electric Company, LLC, Hopkins, SC, USA

(2) Westinghouse Electric Company LLC, Blairsville, PA, USA

Erosive Wear Testing of Laser Clad an HVOF Coatings for Drilling in Mining 427

C.Schulz¹, E. Charrault¹, C.J. Hall¹, T.Schläfer²

(1) Future Industries Institute, University of South Australia, Mawson Lakes, Australia

(2) LaserBond Ltd, Cavan, Australia

Cold Spray Coatings for Automotive Cylinder Block Application 433

Laurent Aubanel^{1,2}, Loic Lefevre^{1,2}, Francesco Delloro¹, Michel Jeandin¹, Edoardo Sura²

(1) MINES ParisTech, PSL Research University, MAT, Centre des Matériaux, Evry, France

(2) Renault Technocentre, Guyancourt, France

CFD Enhanced Thermal Spray Process for Coating of Cylinder Bores of Car Engines 441

Bernd Schilder¹, Andre Garling¹, Fabian Reimer¹, Matthias Hamann¹, Rainer Joos¹, Jens Hüger¹, Mathias Pöhlmann¹, Thomas Lampke²

(1) Daimler AG, Stuttgart, Germany

(2) Institute of Materials Science and Engineering, Chemnitz University of Technology, Germany

Cold Spray I

The Mechanisms of Enhancement of Inter-Particle Bonding in In-Situ Micro-Forging Assisted Cold Spray 450

Ying-Kang Wei, Xiao-Tao Luo, Chang-Jiu Li, State Key Laboratory for Mechanical Behavior of Materials, School of Materials Science and Engineering, Xi'an Jiaotong University, Xi'an, China

The Effect of In-Process Heat Treatment on the Mechanical Properties of Cold Spray Coatings 456

Richard Jenkins, Barry Aldwell, Jonathan Cassidy, Rocco Lupoi, Trinity College Dublin,
The University of Dublin, Department of Mechanical and Manufacturing Engineering, Parsons
Building, Dublin, Ireland

The Feasibility Study of GaN Coatings by Cold Spray Technique 462

Shaoyun Zhou, Chrystelle A. Bernard, Kesavan Ravi, Yuji Ichikawa, Kazuhiro Ogawa,
Fracture and Reliability Research Institute, Tohoku University, Sendai, Japan

Property Enhancement of Cold Sprayed Al-diamond MMC Coating by using Core-Shelled Diamond Reinforcements 469

Shuo Yin¹, Rocco Lupoi¹, Chaoyue Chen²
(1) Trinity College Dublin, The University of Dublin, Department of Mechanical and Manufacturing
Engineering, Parsons Building, Dublin, Ireland
(2) State Key Laboratory of Advanced Special Steels, School of Materials Science and Engineering,
Shanghai University, Shanghai, China

Cold Spray Metals, Ceramics, and Metal Matrix Composite Coatings

**Microstructure and Mechanical Properties of In-Situ TiB₂ Particle Reinforced
AlSi10Mg Composite Coatings Produced by Cold Spraying 476**

Xinliang Xie¹, Chaoyue Chen¹, Hongjian Wu¹, Christophe Verdy¹, Hanlin Liao¹, Zhe Chen²,
Haowei Wang², Gang Ji³
(1) Université Bourgogne Franche-Comté, Belfort, France
(2) State Key Laboratory of Metal Matrix Composites, Shanghai Jiao Tong University, Shanghai,
China
(3) Unité Matériaux et Transformations, Université Lille, France

Quantification and Assessment of the Mechanical Strength of Low-Pressure Cold-Sprayed Tungsten Carbide-Nickel Metal Matrix Composite Coatings 484

Guriqbal Singh Munday, James David Hogan, André McDonald, Department of Mechanical
Engineering, University of Alberta, Edmonton, AB, Canada

Functional Coatings

**Thermal Sprayed Aluminum Coatings Al199 and AlSi12 on Carbon Fiber
Reinforced Magnesium-Alloy AZ91 for Integration in Aluminum-Cast Processes 491**

Tino Mrotzek¹, Jan Condé-Wolter¹, Thomas Behnisch¹, Maik Gude¹, Maria Barbosa², Stefan
Scheitz², Davide Schultz², Christoph Leyens²
(1) Institute of Lightweight Engineering and Polymer Technology, Technische Universität Dresden,
Germany
(2) Fraunhofer Institute for Material and Beam Technology, IWS, Dresden, Germany

**Influence of Particle Size and Spray Parameters on Structural, Mechanical
and Electrical Insulation Properties of Alumina Coatings by Atmospheric
Plasma Spraying 497**

Toshiyuki Yamane, Kazuya Fujimori, Junya Kitamura, Tetsuyoshi Wada, Oerlikon Metco (Japan)
Ltd., Tokyo, Japan

Use of Alternative Process Gases and Modifications for Manufacturing Heating Elements by Arc Spraying 504

M. Hauer¹, B. Ripsch¹, W. KrÖmmer², K.-M. Henkel³

(1) Fraunhofer Research Institution for Large Structures in Production Engineering IGP, Welding, Rostock, Germany

(2) Linde AG-Linde Gases Division, Untershleßheim, Germany

(3) University of Rostock, Chair of Joining Technology, Rostock, Germany

Microstructural and Performance Anlayses of Thermally Sprayed Electric Resistance Heating Systems as De-Icing Elements 512

Milad Rezvani Rad¹, André McDonald¹, Morvarid Mohammadian Bajgiran², Christian Moreau²

(1) Department of Mechanical Engineering, University of Alberta, Edmonton, Alberta, Canada

(2) Department of Mechanical, Industrial and Aerospace Engineering (MIAE), Concordia University, Montreal, Quebec, Canada

Techno-Economic Assessment of Coating-Based Resistive Heating Systems versus Conventional Heat Tracers 520

Milad Rezvani Rad¹, Kingsley Ngaokere¹, Amit Kumar¹, André McDonald¹, Daniel Hayden²

(1) Department of Mechanical Engineering, University of Alberta, Edmonton, Alberta, Canada

(2) Hayden Corporation, West Springfield, MA, USA

An Experimental Study of the Performance of Flame-Sprayed Ni-based Metal Matrix Composite Coatings as Resistive Heating Elements 527

Shahed Taghian Dehaghani¹, André McDonald¹, Ali Dolatabadi²

(1) University of Alberta, Edmonton, AB, Canada

(2) Concordia University, Montreal, QC, Canada

Materials and Technology II

Armor W-Cr Coatings for Plasma-Facing Components in Tokamaks by Cold Spray and RF-ICP 535

Jan Cizek¹, Jakub Klecka¹, Monika Vilemova¹, Jiri Matejicek¹, Jakub Veverka¹, Radek Musalek¹, Frantisek Lukac¹, Jan Kondas², Rostislav Zlatník³

(1) Institute of Plasma Physics, The Czech Academy of Sciences, Prague, Czech Republic

(2) Impact Innovations GmbH, Rattenkirchen, Germany

(3) Institute of Materials Science and Engineering, Brno University of Technology, Brno, Czech Republic

Microstructure and Phase Compositions of Silicon Carbide Coatings Prepared by Plasma Spray-Vapor Deposition 541

Di Wang, Shan-Lin Zhang, Chang-Jiu Li, State Key Laboratory for Mechanical Behavior of Materials, School of Materials Science and Engineering, Xi'an Jiaotong University, Xi'an, China

The Microstructure and Deposition Behavior of the NiCr Alloy Coating using Laminar Plasma Spray 546

Hui-Yu Zhang¹, Sen-Hui Liu¹, Cheng-Xin Li¹, Guan-Jun Yang¹, Chang-Jiu Li¹, Shan-Lin Zhang¹, Lu Li²

(1) State Key Laboratory for Mechanical Behavior of Materials, School of Materials Science and Engineering, Xi'an Jiaotong University, Xi'an, China

(2) Zhenhou Plasma Technology Company, Chendu, China

How Al and Ta Diffusion Responses the Oxidation of NiCoCrAlYTa Coatings— Experiments 553

Zhangqiu Li^{1,2,3}, Kang Yuan^{1,2,3}, Yueguang Yu^{1,2,3}, Jianming Liu^{1,2,3}, Deming Zhang^{1,2,3}

(1) BGRIMM Technology Group, Beijing, China

(2) BGRIMM Advanced Materials Science and Technology Co., Ltd., Beijing, China

(3) Beijing Engineering Technology Research Center of Surface Strengthening and Repaing of
Industry Parts, Beijing, China

Miscellaneous - Wire Arc Coatings, Powders, and Polymer Substrates

Capability of Cold Spraying to Obtain High Deposition Efficiency for the Metallization of PEEK 557

Rija Nirina Raoelison, Libin Lalu Koithara, Sophie Costil, Xinliang Xie, Université de Bourgogne
Franche-Comté—UTBM, Laboratoire Interdisciplinaire Carnot de Bourgogne, Belfort, France

Effect of Process Parameters on Properties of Flame-Sprayed Icepobic Polymer Coatings 563

Valentina Donadei, Heli Koivuluoto, Petri Vuoristo, Faculty of Engineering and Natural Sciences,
Tampere University, Tampere, Finland

Investigation of the Powder Feeding Behavior of Different WC-Co(Cr) Powders for ID Applications 571

W. Tillmann, C. Schaak, B. Krekler, TU Dortmund University, Dortmund, Germany

Observation of a Redisposition Effect while Cold Spraying Sn-Al Mixed Powders onto Carbon Fibre Reinforced Polymers 578

Andre Liberati¹, Hanqing Che¹, Stephen Yue¹, Phuong Vo²

(1) Mining and Materials Engineering, McGill University, Montreal, QC, Canada

(2) National Research Council Canada, Boucherville, QC, Canada

Metallization of Polymers by Cold Spraying with Low Melting Point Powders .. 586

Hanqing Che¹, Stephen Yue¹, Phuong Vo², Amir Nobari³, Ana Da Silva Marques³

(1) Department of Mining and Materials Engineering, McGill University, Montreal, Canada

(2) National Research Council Canada, Boucherville, Canada

(3) 5N Plus Inc. Micro Powders, Montreal, Canada

Modelling and Simulation

Transient Thermal Evolution during Deposition of Cold-Sprayed Coatings 592

Amirhossein Mahdavi, Aminallah Pourasghar, Zengtao Chen, André McDonald, Department of
Mechanical Engineering, Unviersity of Alberta, Edmonton, AB, Canada

How Al and Ta Diffusion Responses the Oxidation of NiCoCrAlYTa Coatings— Simulations 599

Yueguang Yu^{1,2,3}, Kang Yuan^{1,2,3}, Jianming Liu^{1,2,3}, Deming Zhang^{1,2,3}

(1) BGRIMM Technology Group, Beijing, China

(2) BGRIMM Advanced Materials Science and Technology Co., Ltd., Beijing, China

(3) Beijing Engineering Technology Research Center of Surface Strengthening and Repairing of
Industry Parts, Beijing, China

Macroscopic Modelling of an Agglomerated and Sintered Particle in Air Plasma Spraying 604

K. Bobzin, M. Öte, M.A. Knoch, I. Alkhasli, Surface Engineering Institute at RWTH Aachen University, Aachen Germany

A Novel Numerical and Experimental Investigation into Radial Injection for Suspension High Velocity Oxy Fuel (SHVOF) Thermal Spray 612

S.Chadha, R. Jefferson-Loveday, T. Hussain, University of Nottingham, Faculty of Engineering, Nottingham, UK

New Coating Materials Development II

Deposition of Co_3O_4 Films as High-Performance Supercapacitor Electrodes via the Solution Precursor Plasma Spray Route Place 620

Zexin Yu¹, Meimei Liu¹, Chen Song¹, Michel Moliere¹, Hanlin Liao¹, Yangzhou Ma², Xuanning Huang², Guangsheng Song², Chen Song³

(1) Université de Bourgogne Franche-Comté, Belfort, France

(2) School of Materials Science and Engineering, Anhui University of Technology, Ma'anshan, China

(3) Guangdong Institute of New Materials, National Engineering Laboratory for Modern Materials Surface Engineering Technology, Guangzhou, China

Suspension High Velocity Oxy Fuel Spray of Graphene Nanoplatelets for Low-Friction Wear Protective Films 628

F. Venturi and T. Hussain, Faculty of Engineering, University of Nottingham, Nottingham, UK

Utilizing Computational Materials Design in the Development of Iron-based Alloys for Hardfacing 635

Robert Frykholm, Barbara Maroli, and Karin Frist, Höganäs AB, Höganäs, Sweden

Bioinspired Mechanically Robust Metal-based Water Repellent Surface Enabled by Scalably Constructing a Flexible Coral-Reef Like Cu-based Architecture 643

Xiao-Tao Luo and Chang-Jiu Li, State Key Laboratory for Mechanical Behavior of Materials, School of Materials Science and Engineering, Xi'an Jiaotong University, Xi'an, China

Novel Processes

Effect of Hydrogen Admixture on Plasma Jet Characteristics in Low Pressure Spray Processes 650

Georg Mauer, Forschungszentrum Jülich, Germany

Capability of High-Speed Laser Cladding Process with Iron-based Alloys 659

C. Schmengler, A. Hitzek, and A. Wank, GTV Verschleiss-Schutz, Luckenbach, Germany

Cascaded Arc Gun for Low Pressure Plasma Spray Applications 666

Jose Colmenares¹, Jonathan Guteleber¹, Malko Gindrat², and Aaron Pegler²

(1) Oerlikon Metco (US) Inc., Westbury, NY, USA

(2) Oerlikon Metco AG, Wohlen, Switzerland

Low Power Microwave Plasma Spraying for Low Resistivity Cu Deposition onto Resin Substrate 672

Toshiaki Yasui¹, Keisuke Yamada¹, Naoya Seto², and Masahiro Fukumoto¹

(1) Toyohashi University of Technology, Toyohashi, Aichi, Japan

(2) Mitsui Kinzoku ACT Corporation, Yokohama, Kanagawa, Japan

Volume-Based Deposition Factor – A Practical Approach to Estimate Deposition Efficiency 678

Richard Trache, Nicholas Curry, Karl Körner, Matthias Leitner, Treibacher Industrie AG, Althofen, Austria

A Novel Strategy for Applying Oxide-Free Self-Fluxing Alloys Coatings by Self-Fusing Atmospheric Plasma Spraying 682

Xin-Yuan Dong, Xiao-Tao Luo, Shan-Lin Zhang, Chang-Jiu Li, State Key Laboratory for Mechanical Behavior of Materials, School of Materials Science and Engineering, Xi'an Jiaotong University, Xi'an, China

Protective Coatings - Wear I

Paper Removed..... 688

Tailoring Thermal Properties of Plasma Spray Ceramic Coatings for Aluminum Molding 695

David Levasseur, Jimmy Simard, Franco Chiesa , Centre de Metallurgie du Quebec, Canada

Improvement of Wear Resistance by Thermal Spraying on Surface Layers Prepared by Plasma Transferred Arc Welding on Gray Cast Iron Components..... 701

M. Oechsner¹, T. Engler¹, J. Ellermeier¹, B. Heider¹, U. Reisgen², R. Sharma², E. Zokoll², E. González Olivares²

(1) Center for Structural Materials, State Materials Testing Institute Darmstadt (MPA), Chair and Institute for Materials Technology (IfW), Hessen, Germany

(2) Welding and Joining Institute ISF, RWTH Aachen University, Nordrhein-Westfalen, Germany

A New Way to In-Situ Synthesize Rutile TiO₂ Coating 709

Xiujuan Fan, Geoffrey Darut, Xiaohua Fen, Chen Song, Marie Pierre Planche, Hanlin Liao, Ghislain Montavon, UBFC, Belfort, France

Suspension & Solution Thermal and Plasma Spray

Cr-doped Al₂O₃ Deposited by Solution Precursor Plasma Spraying by Hybrid Water-Stabilized Plasma Torch 714

Tomas Tesar, Radek Musalek, Jan Medricky, Jan Cizek, Frantisek Lukac, Stefan Csaki, Tomas Chraska, Department of Materials Engineering, Institute of Plasma Physics CAS, Prague, Czechia

Evolution of Agglomerate Yttria Stabilized Zirconia Particles During Flight in Suspension Plasma Spray 720

Seyyed Morteza Javid¹, Javad Mostaghimi¹, Christian Moreau²

(1) Department of Mechanical and Industrial Engineering, University of Toronto, Toronto, ON, Canada

(2) Department of Mechanical, Industrial and Aerospace Engineering, Concordia University, Montreal, QC, Canada

Modeling of Suspension Plasma Spraying Process 727

E. Dalir¹, J. Mostaghimi¹, A Dolatabadi²

(1) Department of Mechanical and Industrial Engineering, University of Toronto, Toronto, ON, Canada

(2) Department of Mechanical, Industrial and Aerospace Engineering, Concordia University, Montreal, QC, Canada

Thermal Barrier Coatings/Applications

Behavior of TBCs' Spallation in Flame Thermal Shock Testing 734

Kang Yuan, BGRIMM Technology Group, Beijing China; BGRIMM Advanced Materials Science and Technology Co., Ltd., Beijing, China; Beijing Engineering Technology Research Center of Surface Strengthening and Repairing of Industry Parts, Beijing, China

Microstructures and Properties of Thermal Barrier Coatings Deposited by Hybrid Water-Stabilized Plasma Torch 738

Radek Musalek¹, Tomas Tesar¹, Jan Medricky¹, Frantisek Lukac¹, Tomas Chraska¹, Mohit Gupta²

(1) Institute of Plasma Physics CAS, Prague, Czech Republic

(2) University West, Trollhättan, Sweden

Bondcoat, Surface Preparation and Coating Thickness

HVOF Spraying MCrAlY Coatings on Single Crystals with Various Sand Blasting Forces 746

Xiaoliang Lu, Kang Yuan, Yueguang Yu, Deming Zhang, Jianming Liu, BGRIMM Technology Group, Beijing, China; BGRIMM Advanced Materials Science and Technology Co., Ltd., Beijing, China; Beijing Engineering Technology Research Center of Surface Strengthening and Repairing of Industry Parts, Beijing, China

Properties of Laser Melted MCRAIY Coatings on Cu Alloy Substrates 750

Hiroki Yokota, Daisuke Kawai, Tocalo Co., Ltd. Thermal Spraying Technology R&D Laboratories, Akashi, Hyogo, Japan

Anti-Corrosion Performance of the NiCrAlY Coatings Deposited by Two Different Spraying Technologies 755

Shuqing Li, Weihua Yang, Guojia Ma, Qilian Li, Aviation Industry Corporation of China Manufacturing Technology Institute, Beijing, China

Finish Turning of FeCr17NiC0.2 Iron-based Sprayed Coatings – Influences of Substrate Preparation and Cutting Speed on the Coating and Surface Properties 761

T. Grund¹, G. Paczkowski¹, T. Lampke¹, H. Liborius², A. Nestler², A. Schubert²

(1) Professorship of Materials and Surface Engineering, Chemnitz University of Technology, Chemnitz, Germany

(2) Professorship Micromanufacturing Technology, Chemnitz University of Technology, Chemnitz, Germany

Characterization and Testing: Mechanical and Chemical Properties

Gas Gun Flyer Plate Impact Testing of Stainless Steel Deposited by Low Pressure Plasma Spraying and Cold Gas Dynamic Spraying 768

David R. Jones, Benjamin M. Morrow, Kendall J. Hollis, Los Alamos National Laboratory, Los Alamos, New Mexico, USA

Fracture Toughness of Cold Sprayed Pure Metals 775

Onrej Kovarik¹, Jan Siegl¹, Jan Cizek², Tomas Chraska², Jan Kondas³

(1) Department of Materials, Faculty of Nuclear Science and Physical Engineering, Czech Technical University, Prague, Czech Republic

(2) Institute of Plasma Physics, Czech Academy of Sciences, Prague, Czech Republic

(3) Impact Innovations, Rattenkirchen, Germany

Cold Spray II

Effect of Hot Isostatic Pressing (HIP) on Microstructure and Mechanical Properties of Ti6Al4V Alloy Fabricated by Cold Spray Additive Manufacturing 781

Chaoyue Chen¹, Zhongming Ren¹, Yingchun Xie², Renzhong Huang², Min Liu², Xingchen Yan³, Xinliang Xie³, Hanlin Liao³

(1) State Key Laboratory of Advanced Special Steels, School of Materials Science and Engineering, Shanghai University, Shanghai, China

(2) National Engineering Laboratory for Modern Materials Surface Engineering Technology, The Key Lab of Guangdong for Modern Surface Engineering Technology, Guangdong Institute of New Materials, Guangzhou, China

(3) CNRS, Université Bourgogne-Franche-Comté, Belfort, France

Three-Dimensional Modelling of Cold Spray for Additive Manufacturing 789

Saeed Garmeh and Ali Dolatabadi, Department of Mechanical, Industrial and Aerospace Engineering, Concordia University, Montreal, Canada

Surface Grain Refinement of AZ91D Magnesium Alloy by Cold Spraying Shot Peening Process 795

Hong-Tao Wang¹, Hai-Long Yao¹, Xiao-Bo Bai¹, Qing-Yu Chen¹, Gang-Chang Ji¹, Bertrand Jodoin²

(1) Jiangxi Province Engineering Research Center of Materials Surface Enhancing and Remanufacturing, School of Mechanical and Materials Engineering, Jiujiang University, Jiujiang, China

(2) Mechanical Engineering Faculty, University of Ottawa, Ottawa, ON, Canada

Hybrid Additive Manufacture of 316L Stainless Steel with Cold Spray and Selective Laser Melting: Microstructure, Mechanical Properties, and Case Study 802

Shuo Yin¹, Richard Jenkins¹, Marios Kazasidis¹, Rocco Lupoi¹, Xingchen Yan², Chaoyue Chen²

(1) Trinity College Dublin, The University of Dublin, Department of Mechanical and Manufacturing Engineering, Parsons Building, Dublin, Ireland

(2) Université Bourgogne Franche-Comté, Université de Technologie Belfort-Montbéliard, Belfort, France

Effect of Laser Texturing of Substrate Surface on Coating Properties of Cold-Srayed and Laser-Assisted Cold-Sprayed Aluminum Coatings 810

Heli Koivuluoto¹, Jarkko Kiilakoski¹, Sophie Costil²

(1) Tampere University, Materials Science and Environmental Engineering, Tampere, Finland

(2) Université de Bourgogne Franche-Comté, UTBM, Laboratoire Interdisciplinaire Carnot de Bourgogne, Belfort, France

Cold Spray Processing II

On Parametric Analysis of Cold Spray of Metallic Coating onto Ceramic Substrates Using Ceramic Damage Evolution Approach 816

Marco José Echeverría¹, Pedro O. Quintero¹, Ozan Ozdemir², Dimeji Ibitayo³, Victor K. Champagne³

(1) Univeristy of Puerto Rico-MayagÜez, MayagÜez, Puerto Rico USA

(2) Nothereastern Univeristy, Boston, MA, USA

(3) Army Reserach Laboratory, Adelphi, MD, USA

Cold Spray Metal Coating of Wood for Cabinet Making Applications 824

Patrizio Lomonaco¹, Antoine Debray¹, Francesco Delloro¹, Michel Jeandin¹, Bernardo Favini²,

Arnaud Bousquet³, Seven Leprize⁴

(1) MINES ParisTech, MAT-Centre des Matériaux, Evry, France

(2) Facoltà di Ingegneria Civile de Industriale, University of Rome Sapienza, Rome, Italy

(3) MatériaupÔe, Vitry-sur-Seine

(4) ARCA ébénisterie, Bussy-Saint-Georges

Cold Spray as an Innovative Process to Develop Leak Tight Aluminum Coatings for Ultrahigh Vacuum Applications in a Large Particle High-Energy Collider 831

Sebastien Weiller, Antoine Debray, Fabrice Gaslin, Mohamed Sennour, Francesco Delloro,

Michel Jeandin, MINES ParisTech, PSL Research University, MAT-Centre des Matériaux, Evry, France

Analysis of Interface Delamination of Cold Sprayed Coatings Due to Thermal Cycling 838

Enqiang Lin¹, Isaac Nault², Victor K. Champagne, Jr.², Aaron Nardi², Sinan Müftü¹

(1) Department of Mechanical and Industrial Engineering, Northeastern University, Boston, MA, USA

(2) United States Army Research Laboratory, Aberdeen Proving Ground, MD, USA

Cold Spray Simulation, Particle Impact, and Splat Formation

Impact Mechanics of Spherical Metallic Particles with Uniformly Distributed Porosity 846

Qiyong Chen¹, Enqiang Lin¹, Victor K. Champagne, Jr.², Aaron Nardi², Sinan Müftü¹

(1) Department of Mechanical and Industrial Engineering, Northeastern University, Boston, MA, USA

(2) United States Army Research Laboratory, Aberdeen Proving Ground, MD, USA

A Study of the Mixed Powders Interaction Behavior Upon Impact in Cold Spray 853

Xin Chu¹, Stephen Yue¹, Phuong Vo²

(1) Department of Mining and Materials Engineering, McGill University, Montreal, Quebec, Canada

(2) National Research Council Canada, Boucherville, Quebec, Canada

Materials and Technology III

Hot Corrosion Behavior of HVOF ($\text{Cr}_3\text{C}_2 + 25\text{NiCrAlY}$) and PVD (CrN) Coating on a Waspaloy Nickel-Base Superalloy in $60\%\text{V}_2\text{O}_5 + 30\%\text{Na}_2\text{SO}_4 + 10\%\text{NaCl}$ Environment: A Comparative Study 859

Giovany Biava¹, Anderson Gerlado Marenda Pukasiewicz¹, I.B.A.F. Siqueira², Rodolpho Fernando Vaz²

(1) Federal University of Technology, Paraná, Brazil

(2) Institute of Technology for Development, Paraná, Brazil

Development of Super Stainless Steel Coating with Improved Corrosion Resistance and Enhanced Hardness Focusing on Characteristics of Atmosphere Plasma Spray Process 867

Zhensu Zeng¹, Yukinobu Makino¹, Sayaka Sako¹, Hidenori Era², Ken Muraoka³, Seiji Kuroda⁴

(1) Kurashiki Boring Kiko Co., Ltd., Kurashiki, Okayama, Japan

(2) Kyushu Institute of Technology, Kitakyushu, Japan

(3) Industrial Technology Center of Okayama Prefecture, Okayama, Japan

(4) National Institute for Materials Science, Tsukuba, Japan

New Coating Materials Development III

Study of Atmospheric Plasma Parameters for Denser Bioactive Glass Coatings .. 872

O. Rojas^{1,2}, M. Prudent¹, M.E. López², F. Vargas², H. Ageorges¹

(1) University of Limoges, IRCEP, Limoges, France

(2) University of Antioquia-Colombia, Medellin, Colombia

Other Additive Manufacturing

Preparation and Application of 316L Stainless Steel Powder for Selective Laser Melting Process 880

Du Kaiping^{1,2,3}, Li Shengfeng^{1,2,3}, Li Zhengqiu^{1,2,3}, Shen Jie^{1,2,3}, Sun Haibo⁴, Zhang Shuting⁵

(1) BGRIMM Technology Group, Beijing, China

(2) Beijing Key Laboratory of Special Coating Materials and Technology, Beijing, China

(3) Beijing Industrial Parts Surface Hardening and Repair Engineering Technology Research Center, Beijing, China

(4) School of Materials Science and Energy Engineering, Foshan University, Foshan, Guangdong, China

(5) School of Mechanical and Materials Engineering, North China University of Technology, Beijing, China

Investigation on Microstructural Properties of 3D Printed and Thermally Sprayed Alumina 886

Fardad Azarmi and X.W. Tangpong, Department of Mechanical Engineering, North Dakota State University, Fargo, ND, USA

A Novel Method for Generating a Single Layer of Powder and Calculating the Packing Density with the Assistance of White-Light Interferometry, for Electron Beam Powder Bed Fusion (EB-PBF)..... 893

Basel Alchikh-Sulaiman¹, Paul R. Carriere², Stephen Yue¹

(1) McGill University, Montreal, Quebec, Canada
(2) RadiaBeam Technologies, Santa Monica, California, USA

Protective Coatings - Corrosion

Study on the Microstructures and Corrosion Behavior of Plasma Sprayed Dicalcium Silicate Coatings..... 901

Fang Shao, Yuan Xiao, Yin Zhuang, Jinxing Ni, Huayu Zhao, Shunyan Tao, The Key Laboratory of Inorganic Coating Materials CAS, Shanghai Institute of Ceramics, Chinese Academy of Sciences, Shanghai, China

Investigation on Relationship Between Microstructural Characteristics and Mechanical Properties of Wire Arc Sprayed Zn-Al Coating..... 908

Amir Darabi¹, Fardad Azarmi¹, Ying Huang²
(1) Department of Mechanical Engineering, North Dakota State University, Fargo, ND, USA
(2) Department of Civil and Environmental Engineering, North Dakota State University, Fargo, ND, USA

Residual Stress Measurements in Wire-Arc Sprayed ZnAl15 Coatings..... 916

Kristen Bobzin, Mehmet Öte, Martin Andreas Knoch, Surface Engineering Institute, RWTH Aachen University, Germany

Corrosion Properties of Thermally Sprayed Bond Coatings Under Plasma Sprayed Chromia Coating in Sulfuric Acid Solutions 923

Petri Vuoristo¹, Tommi Varis¹, Damiano Meschini², Giovanni Bolelli², Luca Lusvarghi²
(1) Tampere University, Faculty of Engineering and Natural Sciences, Materials Science, Tempere, Finland
(2) University of Modena and Reggio Emilia, Department of Engineering "Enzo Ferrari," Modena, Italy

How Laser Cladding Combined with Thermal Spray Technologies Improve Yield and Particle Performances in Latest Semiconductor PVD Production Chambers . 931

Olivier Marchand¹, Reed Rosenberg², Gary Groshong³, Doug Schlumpf⁴
(1) Cleanpart - UP-SGI, Seyssinet-Pariset, France
(2) Cleanpart - Southwest, Phoenix, Arizona, USA
(3) Cleanpart SET, Santa Clara, California, USA
(4) Cleanpart South, Richardson, Texas, USA

Protective Coatings - Wear II

The Effect of Electromechanical Treatment on Structure and Wear Resistance of the Plasma Sprayed Ni Coating..... 937

Yu. Ivannikov¹, V.I. Kalita¹, D.I. Komlev¹, A.A. Radyuk¹, M.V. Prozhega²
(1) Baikov Institute of Metallurgy and Material Science, Russian Academy of Sciences, Moscow, Russia
(2) Institute of Machines Sciense named after A.A. Blagonravov of the Russian Academy of Sciences, Moscow, Russia

The Development of Next Generation Wear Plate Overlays using Big Data 943

James Vecchio, Oerlikon Metco, San Diego, CA, USA

Cavitation Erosion Characteristics of HVOF Thermal Sprayed WC-Cermet Coatings 950

Akihior Kanno and Kaito Takagi, TOCALO Co., Ltd., Akashi, Hyogo, Japan

Suspension & Solution Thermal and Plasma Spray II

Improvement of Online Diagnostic System to Monitor In-flight Particles in Thermal Spray Processes 957

A. Akbarnozari¹, S. Amiri¹, C. Moreau¹, O. Bamber², J-D. Gernon², M. Choquet², L. Pouliot²

(1) Concordia University, Montreal, Quebec, Canada

(2) Tecnar Automation Ltée, Saint-Bruno-de-Montréal, Quebec, Canada

Coating Verification and Examination Task to Realize Inner Diameter Thermal Spraying by Suspension Spray Method 965

Tadashi Osako, Yutaka Tateishi, Mitsuru Yoshido, Motoyuki Kondo, Yasuhui Nomura,

Shinco Metalicon Co., Ltd., Shiga, Japan

Microstructure and Thermal Properties of Double Rare-Earth Co-doped SrZrO₃ Coating by the Solution Precursor Plasma Spray 969

X.-F. Meng^{1,2,3}, W. Ma^{1,2}, W. Huang^{1,2}, E.-B. Li^{1,2}, Y. Bai^{1,2}, C.-W. Liu^{1,2}

(1) School of Materials Science and Engineering, Inner Mongolia University of Technology, Hohhot, China

(2) Inner Mongolia Key Laboratory of Thin Film and Coatings Technology, Hohhot, China

(3) Department of Mechanical Engineering, Liaoning Engineering Vocational College, Tieling, China

Thermal Barrier Coatings/ R&D Fundamentals

Influence of YSZ Powder Characteristics on the Morphology of PS-PVD Thermal Barrier Coatings 975

Fang Jia^{1,2}, Lihua Gao^{1,2}, Yueguang Yu^{1,2}, Xiojuan Ji^{1,2}, Deming Zhang^{1,2}, Haoran Peng^{1,2}, Xiaoliang Lu^{1,2}, Weiao Hou^{1,2}

(1) BGRIMM Technology Group, Beijing, China

(2) Beijing Engineering Technology Research Center of Surface Strengthening and Repairing of Industry Parts, Beijing, China

Toward Durable Thermal Barrier Coating with Low Thermal Conductivity Superiority: Material Design, Process Optimization and Performance Evaluation 981

Xinqing Ma¹, Kristina Rivellini¹, Peter Ruggiero¹, George Wildridge²

(1) Surface Technologies Division, Curtiss-Wright Corporation, East Windsor, CT, USA

(2) IMR Test Labs, Curtiss-Wright Corporation, Lansing, NY, USA

Particle Size Effect on Gd₂O₃ Preferential Evaporation during Plasma Spraying of Gd₂Zr₂O₇ 989

Cong-Cong Kou, Xu Chen, Shan-Lin Zhang, Cheng-Xin Li, Guan-Jun Yang, Chang-Jiu Li, State Key Laboratory for Mechanical Behavior of Materials, School of Materials Science and Engineering, Xi'an Jiaotong University, Xi'an, China