

Materials Performance and Characterization

Contents:

Special Issue on Materials for Extreme Environments, Part 2

Guest Editors: S. V. S. Narayana Murty and Richard W. Neu

- 1 Editorial: Special Issue on Materials for Extreme Environments, Part 2—**
S. V. S. Narayana Murty and Richard W. Neu

REVIEW PAPERS

- 2 Core Materials for Sodium-Cooled Fast Reactors: Past to Present and Future Prospects—***G. V. Prasad Reddy, V. Karthik, S. Latha, C. N. Venkiteswaran, Divakar Ramachandran, and Shaju K. Albert*
- 53 A Review on the Material Development and Corresponding Properties for Power Plant Applications—***Jeet P. Patil, Manas Paliwal, and Sushil K. Mishra*
- 88 Development and Qualification of Materials for Indian Advanced Ultra-Supercritical Coal-Fired Power Plant—***A. K. Bhaduri, Shaju K. Albert, A. Nagesha, A. Moitra, Utpal Borah, G. V. Prasad Reddy, K. Laha, Kulvir Singh, and A. K. Das*
- 109 Thermo-Oxidative Behavior of Four-Directional Carbon-Carbon Composites as Throat Inserts for Solid Propulsion Systems—***Jhon Paul, B. Santhosh, E. N. Ananthapadmanabhan, and P. K. Das*
- 127 High Temperature Corrosion Stability of Ceramic Materials for Magnetohydrodynamic Generators—***Michael S. Bowen, Kyei-Sing Kwong, Peter Hsieh, David P. Cann, and C. Rigel Woodside*
- 139 Stress Corrosion Cracking in Austenitic Stainless Steels in Reactor Primary Water—High Purity Oxidizing and in Supercritical Conditions—***Annesha Das, Supratik Roychowdhury, and Vivekanand Kain*
- 157 Corrosion Behavior of Surface Nanostructured IN718 Superalloy at 650°C—***Sanjeev Kumar, K. Chattopadhyay, Z. Alam, Vakil Singh, D. V. V. Satyanarayana, and Vikas Kumar*
- 171 Active Protection of Magnesium Alloy AZ91D Using Corrosion Inhibitor Encapsulated Halloysite Nanoclay-Based Smart Sol-Gel Coatings—***Swapnil H. Adsul, Shirish H. Sonawane, and R. Subasri*
- 186 Improving the Corrosion Resistance of Magnesium Alloy AZ31 by a Duplex Anodized and Sol-Gel Coating—***K. Pradeep Prem Kumar and R. Subasri*

- 200 Microstructural and Mechanical Characterization of 1.6-mm-Thick Nimonic-75 Superalloy Welds**—*R. K. Gupta, V. Anil Kumar, Ravi Ranjan Kumar, R. Vivek, and P. V. Venkitakrishnan*
- 210 Dissimilar Welding of Cast Alloy 706 with Different Prior Heat Treatment Conditions and Austenitic Stainless Steel 321**—*S. G. K. Manikandan, Tejas Baliram Patil, and M. Kamaraj*
- 225 Study of Weldability for Aluminide Coated Steels through A-TIG Welding Process**—*Arunsinh B. Zala, N. I. Jamnapara, Vishvesh J. Badheka, C. S. Sasmal, Shiju Sam, and Mukesh Ranjan*
- 239 Influence of Complete Tool-Offset Position on Intrinsic Microstructure and Its Effect on Fatigue Life of AA2024 Alloy-Copper Joint Made by Friction Stir Welding**—*Anbukkarasi Rajendran, Rajneesh Hariharan, and Satish Vasu Kailas*
- 249 Comparative Studies on Normal and Pulsed Cold Metal Transfer Welding of Aerospace Grade Aluminum Alloy 2024**—*Prakash Sadasivam, S. Jerome, M. Sathishkumar, and M. Manikandan*
- 264 Effect of Bonding Temperature and Interlayer(s) on Microstructure Evolution, Hardness, and Shear Properties of Diffusion Bonded Ti-6Al-4V Alloys**—*Manil Raj, M. J. N. V. Prasad, and K. Narasimhan*
- 281 Accelerated Creep Testing of Inconel 718 Using the Stepped Isostress Method (SSM)**—*Calvin M. Stewart, Md Abir Hossain, Jacob Pellicotte, Robert Mach, David Alexander, and Sanna F. Siddiqui*
- 301 Effect of Specimen Thickness on Threshold Stress Intensity Factor (K_{IH}) Associated with DHC in Zr-2.5 Nb Alloy Pressure Tube Material**—*Saurav Sunil, A. K. Bind, T. N. Murty, R. N. Singh, G. Avinash, and I. V. Singh*
- 315 Formation of Ultrafine Single-Variant Martensite from Prior Ferrite + Cementite Microstructure and Its Mechanical Properties**—*Shiro Torizuka, Ryusuke Oya, Kartik Prasad, and Atsushi Ito*



ASTM INTERNATIONAL
Helping our world work better

ISSN: 2379-1365
Stock #: MPC2202

www.astm.org

EDITOR-IN-CHIEF

Dr. Richard W. Neu
Georgia Institute of Technology
Atlanta, GA, USA

EDITORIAL OBJECTIVES

Materials Performance and Characterization (MPC) is published online by ASTM International, a nonprofit technical organization that develops and publishes voluntary consensus standards and related information for materials, products, systems, and services.

Contributions are peer reviewed prior to publication.

EDITORIAL SERVICES

Sara Welliver
Supervisor, Peer Review Services
J&J Editorial Services
201 Shannon Oaks Cir #124
Cary, NC 27511, USA
tel +1.919.650.1459, ext. 210
astm@jjeditorial.com

POSTMASTER send address change to:

ASTM International—MPC
100 Barr Harbor Drive
P.O. Box C700
West Conshohocken, PA 19428-2959

PURPOSE AND SCOPE

The journal publishes high-quality, original articles, including full papers, review papers, and technical notes, on both theoretical and practical aspects of the processing, structure, properties, and performance of materials used in mechanical, transportation, aerospace, energy systems, and medical devices. These materials include metals and alloys, glass and ceramics, polymers, composite materials, textiles, and nanomaterials. The journal covers topics related to the integrity of materials which encompasses mechanical testing, fatigue and fracture, corrosion, wear, and erosion, as well as the integrity of components and systems such as rolling element bearings, piping and pressure vessels, fasteners, space technology, and nanotechnology. The journal publishes articles on both qualitative and quantitative methods used to characterize materials including all forms of microscopy, chemical analysis, and nondestructive evaluation.

EDITORIAL BOARD

Dr. Lutz-Michael Berger
Fraunhofer Institute for Ceramic Technologies and Systems
Dresden, Germany

Rodney Boyer
RBTi Consulting
Issaquah, WA, USA

Mr. Brian Cochran
Wabash, IN, USA

Prof. Leszek A. Dobrzański
ASKLEPIOS Ltd.
Gliwice, Poland

Dr. Ana Sofia C. M. D'Oliveira
Universidade Federal do Paraná
Curitiba, PR, Brazil

Dr. Jianfeng Gu
Shanghai Jiao Tong University
Shanghai, China

Dr. Nikhil Gupta
New York University
Brooklyn, NY, USA

Dr. Mohamed Hamed
McMaster University
Hamilton, ON, Canada

Dr. Iwona Jasiuk
University of Illinois at Urbana-Champaign
Urbana, IL, USA

Dr. W. Steven Johnson
Georgia Institute of Technology
Atlanta, GA, USA

Dr. Debra Kaiser
National Institute of Standards and Technology
Gaithersburg, MD, USA

Dr. Toshiharu Kazama
Muroran Institute of Technology
Hokkaido, Japan

Dr. Fred Klaessig
Pennsylvania Bio Nano Systems
Doylestown, PA, USA

Dr. Nikolai Kobasko
Technologies Inc.
Akron, OH, USA

Dr. Robert Lancaster
Swansea University
Wales, UK

Dr. Reto Luginbühl
RMS Foundation
Bettlach, Switzerland

Dr. Jianbin Luo
Tsinghua University
Beijing, China

Prof. Xinmin Luo
Jiangsu University
Zhenjiang, Jiangsu, China

Dr. Lemmy Meekisho
Portland State University
Portland, OR, USA

Dr. Rafael David Mercado-Solis
Universidad Autonoma de Nuevo Leon
Nuevo Leon, Mexico

Dr. Jin K. Montclare
New York University
New York, NY, USA

Dr. S. V. S. Narayana Murty
Vikram Sarabhai Space Center
Trivandrum, India

Dr. Rosa Simencio Otero
Universidade de São Paulo
São Carlos, Brazil

Dr. Bojan Podgornik
Institute of Metals and Technology
Ljubljana, Slovenia

Dr. K. Narayan Prabhu
National Institute of Technology
Karnataka State, India

Barbara Rivolta
Politecnico di Milano
Milano, Italy

Dr. Jeremy Robinson
University of Limerick
Limerick, Ireland

Dr. Satyam Sahay
John Deere Technology
Center India
Magarpatta City, Pune, India

Dr. Nima Shamsaei
Auburn University
Auburn, AL, USA

Dr. Preet Singh
Georgia Institute of Technology
Atlanta, GA, USA

Dr. Richard D. Sisson, Jr.
Worcester Polytechnic Institute
Worcester, MA, USA

Prof. Igor Sizov
East Siberia State University of Technology and Management
Ulan-Ude, Russia

Dr. Calvin Stewart
The University of Texas at El Paso
El Paso, TX, USA

Dr. Sabu Thomas
Mahatma Gandhi University
Kottayam, India

Dr. Simon C. Tung
Tung Innovation Technology Consulting Inc.
Rochester Hills, MI, USA

EXECUTIVE COMMITTEE

Cesar A. Constantino, Ph.D., **Chair**
Bill Ellis, **Vice Chair**
Bill Griese, **Vice Chair**
Amer Bin Ahmed, **Finance and Audit Committee Chair**
John R. Logar, **Past Chair**
Andrew G. Kireta, Jr., **Past Chair**
Katharine E. Morgan, **President**

DIRECTORS

Francine S. Bovard
Michael J. Brisson
Alexandra Florin
Tripp Fischer
Linda Freeman
Janet L. Gbur, Ph. D.
John Hadjioannou, P.E.
Bonnie McWade-Furtado
Timothy J. Morris
Elise Owen
Carol Pollack-Nelson, Ph.D.
Christopher R. Reid, Ph.D.
Casandra W. Robinson
Julia Schimmelpennin
Brian P. Shiels
Pamela M. Shinoda, P. Eng
Debra R. Wilson
Dalia Yarom

COMMITTEE ON PUBLICATIONS

William J. Likos, **Chair**
K. Russell DePriest, **Vice Chair**
Cesar A. Constantino, Ph.D., **ex officio**
Jay Bhatt
John E. Haddock
Yinlun Huang
Jason H. Ideker
Ibironke Lawal
M. R. Mitchell
Richard W. Neu
Majdi A. Othman
Sudarsan Rachuri
Donya Stubbs
Theresa A. Weston
Nazli Yesiller

INFORMATION FOR AUTHORS

For details regarding paper submission go to <http://mc04.manuscriptcentral.com>.

The subject matter must not be of a speculative nature and the contents must not include materials of an advertising nature. The paper must not be seriously defective as to literary form and structure, continuity of thought, and clarity of expression. The substance of the paper should not have been published previously in the open literature. Authors preparing papers for submittal should observe the conventions of style explained in the ASTM Style Manual. Since the journal does not request page charges, the author is expected to conform to these standard conventions for style. SI units are to be used throughout; if data were not measured in SI units, a note should appear to that effect and the original units should be included in parentheses after the SI units.

IN APPRECIATION OF THE REVIEWERS

The high quality of the papers that appear in this publication is a tribute not only to the obvious efforts of the authors represented but to the unheralded, though essential, efforts of their reviewers. It is to the reviewers' dedication to upholding the high standards of their profession that this note pays tribute. On behalf of ASTM International and the authors as well, we acknowledge with appreciation their important contribution to the success of this journal.

ASTM International's Materials Performance and Characterization is ONLINE.

Take advantage of these benefits:

- Search papers & authors
- Current subscribers receive online access.
- View abstracts
- View table of contents
- Non-subscribers can download individual papers for \$25.00 each
- Download individual papers
- IP access is available

For information visit: www.astm.org

Materials Performance and Characterization (Print ISSN 2379-1365; E-ISSN 2165-3992) is published online by ASTM International. The views expressed in this journal are not those of ASTM International. The data and opinions appearing in the published material were prepared by and are the responsibility of the contributors, not of ASTM International.

Copyright © 2022 ASTM International, 100 Barr Harbor Drive, PO Box C700, West Conshohocken, PA 19428-2959. All rights reserved. This material may not be reproduced or copied, in whole or in part, in any printed, mechanical, electronic, film, or other distribution and storage media without the written consent of the publisher.

Subscriptions

Individual subscriptions
1 year online access \$267.00

Institutional subscriptions (one geographic site via IP access)
1 year online access \$447.00

Single copies \$55.00

Multi-site subscription and pricing
sales@astm.org
tel +1.877.909.ASTM

To subscribe
please send prepaid order to ASTM International, Customer Service, 100 Barr Harbor Drive, P.O. Box C700, West Conshohocken, PA 19428-2959 or visit www.astm.org.

Photocopy Rights

Authorization to photocopy items for internal, personal, or educational classroom use, or the internal, personal, or educational classroom use of specific clients, is granted by ASTM International provided that the appropriate fee is paid to:

Copyright Clearance Center
222 Rosewood Drive
Danvers, MA 01923

tel +1.978.646.2600
www.copyright.com