

Cambridge University Press & Assessment

978-1-605-11458-3 — Structural and Chemical Characterization of Metals,

Alloys and Compounds—2012, Volume 1481

Edited by Ramiro Pérez Campos , Antonio Contreras Cuevas , Rodrigo A. Esparza Muñoz

Frontmatter

[More Information](#)

**Structural and Chemical Characterization of Metals,
Alloys and Compounds—2012**

Cambridge University Press & Assessment

978-1-605-11458-3 — Structural and Chemical Characterization of Metals,

Alloys and Compounds—2012, Volume 1481

Edited by Ramiro Pérez Campos, Antonio Contreras Cuevas, Rodrigo A. Esparza Muñoz

Frontmatter

[More Information](#)

**MATERIALS RESEARCH SOCIETY
SYMPOSIUM PROCEEDINGS VOLUME 1481**

Structural and Chemical Characterization of Metals, Alloys and Compounds—2012

Symposium held August 12–17, 2012, Cancún, México

EDITORS

Dr. Ramiro Pérez Campos

Centro de Física Aplicada y Tecnología Avanzada, UNAM
Querétaro, México

Dr. Antonio Contreras Cuevas

Instituto Mexicano del Petróleo
San Bartolo Atepehuacan, México

Dr. Rodrigo A. Esparza Muñoz

Centro de Física Aplicada y Tecnología Avanzada,
UNAM
Querétaro, México



Materials Research Society
Warrendale, Pennsylvania



CAMBRIDGE
UNIVERSITY PRESS

Cambridge University Press & Assessment
978-1-605-11458-3 — Structural and Chemical Characterization of Metals,
Alloys and Compounds—2012, Volume 1481
Edited by Ramiro Pérez Campos, Antonio Contreras Cuevas, Rodrigo A. Esparza Muñoz
Frontmatter
[More Information](#)



Shaftesbury Road, Cambridge CB2 8EA, United Kingdom
One Liberty Plaza, 20th Floor, New York, NY 10006, USA
477 Williamstown Road, Port Melbourne, VIC 3207, Australia
314–321, 3rd Floor, Plot 3, Splendor Forum, Jasola District Centre, New Delhi – 110025, India
103 Penang Road, #05–06/07, Visioncrest Commercial, Singapore 238467

Cambridge University Press is part of Cambridge University Press & Assessment, a department of the University of Cambridge.

We share the University's mission to contribute to society through the pursuit of education, learning and research at the highest international levels of excellence.

www.cambridge.org
Information on this title: www.cambridge.org/9781605114583

© Materials Research Society 2013

This publication is in copyright. Subject to statutory exception and to the provisions of relevant collective licensing agreements, no reproduction of any part may take place without the written permission of Cambridge University Press & Assessment.

This book has been registered with Copyright Clearance Center, Inc.
For further information please contact the Copyright Clearance Center,
Salem, Massachusetts.

First published 2013

CODEN: MRSPDH

A catalogue record for this publication is available from the British Library

ISBN 978-1-605-11458-3 Hardback

Cambridge University Press & Assessment has no responsibility for the persistence or accuracy of URLs for external or third-party internet websites referred to in this publication and does not guarantee that any content on such websites is, or will remain, accurate or appropriate.

CONTENTS

Preface	ix
Acknowledgments.....	xi
Materials Research Society Symposium Proceedings.....	xiii
 <i>CHARACTERIZATION OF MATERIALS BY X-RAY DIFFRACTION (XRD), SCANNING ELECTRON MICROSCOPY (SEM) AND DIFFERENTIAL SCANNING CALORIMETRY (DSC)</i>	
Synthesis and Determination of Thermodynamical Properties of the Compounds of the System Ca-Mg-Bi.....	3
C. Ramírez, J.A. Romero, A. Hernández, and F. Pérez	
Study of the Synthesis of Mullite from Kaolin- α -Al ₂ O ₃ and Kaolin-Al(NO ₃) ₃	11
E.M. Lozada, O. Alanís, F. Legorreta, and L.E. Hernández	
Particle Size Characterization of Commercial Raw Materials and Graphite Nanoparticles of a Refractory Bricks Mix of the System Al ₂ O ₃ -SiC-C.....	19
A.M. Paniagua, J. Martínez, V. Mauro, and E. Díaz	
 <i>CHARACTERIZATION OF MATERIALS BY DIFFERENTIAL THERMAL ANALYSIS (DTA), THERMOGRAVIMETRY (TGA), FOURIER TRANSFORM INFRARED SPECTROSCOPY (FTIR), TRANSMISSION ELECTRON MICROSCOPY (TEM) AND RAMAN SPECTROSCOPY</i>	
Preparation of Lithium Aluminum Layered Double Hydroxide from Ammonium Dawsonite and Lithium Carbonate.....	29
C.A. Contreras Soto, E. Ramos-Ramírez, V. Reyes Zamudio, and J.I. Macías	
Study of Optical Vibrations Modes of Mineral Graphite by Micro Raman Spectroscopy.....	37
R.A. Silva-Molina, R. Gámez-Corrales, J.M. Hernández-Cazares, and I.G. Espinoza-Maldonado	

Chemical Precipitation Synthesis of Nano-crystalline Mg(OH)₂45
A. Medina, L. Béjar, and G. Herrera-Pérez***MECHANICAL AND MICROSTRUCTURAL CHARACTERIZATION
OF STEELS USED IN THE OIL INDUSTRY*****Effect of the Aging Treatment in Micro-alloyed Steel55**
M.A. Doñu Ruiz, J.A. Ortega Herrera, N. López Perrusquia,
V.J. Cortés Suárez, and L.D. Rosado Cruz**Characterization Microstructural and Mechanical of X-60
Steel Heat-treated.63**
N. López Perrusquia, J.A. Ortega Herrera, M.A. Doñu Ruiz,
V.J. Cortés Suárez, and L.D. Cruz Rosado**Tension Tests Behavior of API 5L X60 Pipeline Steel in a
Simulated Soil Solution to Evaluate SCC Susceptibility.71**
A. Contreras, S.L. Hernández, R. Galvan-Martinez,
and O. Vega-Becerra***CHARACTERIZATION OF MATERIALS FOR INDUSTRIAL
APPLICATIONS*****Vacuum Foaming of Aluminum Scrap.83**
J.A. Garabito, H. Granados, V.H. López,
A.R. Kennedy, and J.E. Bedolla**Study of the Thermoluminescent Characteristics of Ceramic
Roof Tiles Exposed to Beta Radiation89**
A.R. García-Haro, R. Bernal, C. Cruz-Vázquez,
S.E. Burrueal-Ibarra, V.R. Orante-Barrón, and F. Brown**Evaluation of Resistance Spot Welding Conditions Using
Experimental Design.97**
D.Y. Medina, R. Bermejo, R.T. Hernandez,
I. Hernandez, and S. Orozco***CHARACTERIZATION OF MATERIALS USED IN
COATINGS AND THIN FILMS*****Diffusion of Hard Coatings on Ductile Cast Iron.105**
N. López Perrusquia, M. Antonio Doñu Ruiz,
E.Y. Vargas Oliva, and V.J. Cortés Suárez

Luminescence in a Ba(Ti,Zr)O₃ Films Deposited by Ultrasonic Spray Pyrolysis Method	113
D.Y. Medina, R.T. Hernández, I. Hernández, and S. Orozco	

***MICROSTRUCTURAL CHARACTERIZATION OF
NANOSTRUCTURED MATERIALS***

Characterization on Fracture Surfaces of 304 Stainless Steels Joined by Brazing using Silicon Nanoparticles	119
L. Santiago-Bautista, H.M. Hernández-García, R. Muñoz-Arroyo, M. Garza-Castañón, F. García-Vázquez, and J. Acevedo-Dávila	

Synthesis of ZnO at Different Atomic Proportion Produced by Chemical Precipitation	127
A. Medina, L. Béjar, and G. Herrera-Pérez	

Author Index	135
-------------------------------	------------

Subject Index	137
--------------------------------	------------

PREFACE

The XXI International Materials Research Congress was held in Cancun México from 12 to 17 August 2012. It was organized by Mexican Materials Society (SMM). About 1300 specialized scientists from more than 40 countries participated in the 28 different symposium, workshops, plenary lectures and tutorial courses. The 28 symposia that comprise the technical program of IMRC 2012 are grouped in several clusters, namely: Nanoscience and Nanotechnology, Materials Characterization, Materials for Energy Production, Biomaterials, Polymers, Electronic and Photonic Materials, Fundamentals Materials Science and General (Strategy for academy-industry relationship).

This Materials Research Society Proceedings contains papers presented at the Symposium 2D "Structural and Chemical Characterization of Metals, Alloys and Compounds" of the XXI International Materials Research Congress. This event is intended to be a forum for the dissemination of research results on materials research. The participants and the organizers have found this event very successful due to the high quality and novelty of the scientific results presented. Among the important achievements of the symposium were the new personal contacts between the scientists, for the creation of multinational thematic and research networks, as well as promoting contacts for future collaboration.

This special issue covers several aspects of the structural and chemical characterization of the materials in the following areas: metals, alloys, steels, composites, polymeric compounds, welding, nanomaterials, and surface coatings, among others. They are amorphous, crystalline, powders, coatings, fibers, thin films, etc., which were prepared with different techniques. The structural characterization techniques included: scanning electron microscopy (SEM), X-ray diffraction (XRD), transmission electron microscopy (TEM), RAMAN spectroscopy, optical microscopy (OM), Fourier transform infrared spectroscopy (FTIR), differential thermal analysis (DTA), differential scanning calorimetry (DSC), thermogravimetry analysis (TGA), thermo luminescence (TL), laser emission, etc. Theoretical models from these properties are included too.

The scientific program of symposium 2D included 67 oral and 146 poster presentations. In addition, invited talks were focused on different topics like X-ray diffraction, characterization of coatings and characterization of nanostructured materials. The special issue contains 16 papers based on contributions presented on the symposium. All manuscripts included in this special issue have been accepted after peer review.

Cambridge University Press & Assessment

978-1-605-11458-3 — Structural and Chemical Characterization of Metals,

Alloys and Compounds—2012, Volume 1481

Edited by Ramiro Pérez Campos , Antonio Contreras Cuevas , Rodrigo A. Esparza Muñoz

Frontmatter

[More Information](#)

We would like to express our deep acknowledgement to the Mexican Materials Society Advisory Committee, as well as sincere thanks to the reviewers for their valuable assistance and help in the review process. We also would like to thank the Mexican Materials Society (SMM), National University of México (UNAM) and Mexican Petroleum Institute (IMP) for the support in organization of the symposium.

Dr. Ramiro Pérez Campos

Dr. Antonio Contreras Cuevas

Dr. Rodrigo A. Esparza Muñoz

Editors

Cambridge University Press & Assessment

978-1-605-11458-3 — Structural and Chemical Characterization of Metals,

Alloys and Compounds—2012, Volume 1481

Edited by Ramiro Pérez Campos, Antonio Contreras Cuevas, Rodrigo A. Esparza Muñoz

Frontmatter

[More Information](#)

ACKNOWLEDGMENTS

We would like to thank the members of MRS-México advisory committee, as well as the reviewers for their valuable comments, which have certainly helped to improve the quality of the manuscripts. We also wish to thank the Mexican Materials Research Society, Universidad Nacional Autónoma de México (UNAM) and Mexican Petroleum Institute (IMP) for their support in organizing the symposium 2D “Structural and chemical characterization of metals, alloys and compounds”.

Additionally, we would like to thank all those who have worked to make this congress an exciting and fruitful meeting, meeting chairs, symposia organizers, IMRC staff, MRS staff, editors, management committee, advisory committee, and Materials Research Society of México.

MATERIALS RESEARCH SOCIETY SYMPOSIUM PROCEEDINGS

- Volume 1477 — Low-Dimensional Bismuth-based Materials, 2012, S. Muhl, R. Serna, A. Zeinert, S. Hirsekor, ISBN 978-1-60511-454-5
- Volume 1478 — Nanostructured Carbon Materials for MEMS/NEMS and Nanoelectronics, 2012, A.V. Sumant, A.A. Balandin, S.A. Getty, F. Piazza, ISBN 978-1-60511-455-2
- Volume 1479 — Nanostructured Materials and Nanotechnology—2012, 2012, C. Gutiérrez-Wing, J.L. Rodríguez-López, O. Graeve, M. Munoz-Navia, ISBN 978-1-60511-456-9
- Volume 1480 — Novel Characterization Methods for Biological Systems, 2012, P.S. Bermudez, J. Majewski, N. Alcantar, A.J. Hurd, ISBN 978-1-60511-457-6
- Volume 1481 — Structural and Chemical Characterization of Metals, Alloys and Compounds—2012, 2012, A. Contreras Cuevas, R. Pérez Campos, R. Esparza Muñoz, ISBN 978-1-60511-458-3
- Volume 1482 — Photocatalytic and Photoelectrochemical Nanomaterials for Sustainable Energy, 2012, L. Guo, S.S. Mao, G. Lu, ISBN 978-1-60511-459-0
- Volume 1483 — New Trends in Polymer Chemistry and Characterization, 2012, L. Fomina, M.P. Carreón Castro, G. Cedillo Valverde, J. Godínez Sánchez, ISBN 978-1-60511-460-6
- Volume 1484 — Advances in Computational Materials Science, 2012, E. Martínez Guerra, J.U. Revels, A. Aguayo González, ISBN 978-1-60511-461-3
- Volume 1485 — Advanced Structural Materials—2012, 2012, H. Calderon, H.A. Balmori, A. Salinas, ISBN 978-1-60511-462-0
- Volume 1486E — Nanotechnology-enhanced Biomaterials and Biomedical Devices, 2012, L. Yang, M. Su, D. Cortes, Y. Li, ISBN 978-1-60511-463-7
- Volume 1487E — Biomaterials for Medical Applications—2012, 2012, S. Rodil, A. Almaguer, K. Anselme, J. Castro, ISBN 978-1-60511-464-4
- Volume 1488E — Concrete with Smart Additives and Supplementary Cementitious Materials, 2012, L.E. Rendon Diaz Miron, B. Martinez Sanchez, K. Kovler, N. De Belie, ISBN 978-1-60511-465-1
- Volume 1489E — Compliant Energy Sources, 2013, D. Mitlin, ISBN 978-1-60511-466-8
- Volume 1490 — Thermoelectric Materials Research and Device Development for Power Conversion and Refrigeration, 2013, G.S. Nolas, Y. Grin, A. Thompson, D. Johnson, ISBN 978-1-60511-467-5
- Volume 1491E — Electrocatalysis and Interfacial Electrochemistry for Energy Conversion and Storage, 2013, T.J. Schmidt, V. Stamenkovic, M. Arenz, S. Mitsushima, ISBN 978-1-60511-468-2
- Volume 1492 — Materials for Sustainable Development—Challenges and Opportunities, 2013, M-I. Baraton, S. Duclous, L. Espinal, A. King, S.S. Mao, J. Poate, M.M. Poulton, E. Traversa, ISBN 978-1-60511-469-9
- Volume 1493 — Photovoltaic Technologies, Devices and Systems Based on Inorganic Materials, Small Organic Molecules and Hybrids, 2013, K.A. Sablon, J. Heier, S.R. Tatavarti, L. Fu, F.A. Nuesch, C.J. Brabec, B. Kippelen, Z. Wang, D.C. Olson, ISBN 978-1-60511-470-5
- Volume 1494 — Oxide Semiconductors and Thin Films, 2013, A. Schleife, M. Allen, S.M. Durbin, T. Veal, C.W. Schneider, C.B. Arnold, N. Pryds, ISBN 978-1-60511-471-2
- Volume 1495E — Functional Materials for Solid Oxide Fuel Cells, 2013, J.A. Kilner, J. Janek, B. Yildiz, T. Ishihara, ISBN 978-1-60511-472-9
- Volume 1496E — Materials Aspects of Advanced Lithium Batteries, 2013, V. Thangadurai, ISBN 978-1-60511-473-6
- Volume 1497E — Hierarchically Structured Materials for Energy Conversion and Storage, 2013, P.V. Braun, ISBN 978-1-60511-474-3
- Volume 1498 — Biomimetic, Bio-inspired and Self-Assembled Materials for Engineered Surfaces and Applications, 2013, M.L. Oyen, S.R. Peyton, G.E. Stein, ISBN 978-1-60511-475-0
- Volume 1499E — Precision Polymer Materials—Fabricating Functional Assemblies, Surfaces, Interfaces and Devices, 2013, C. Hire, ISBN 978-1-60511-476-7
- Volume 1500E — Next-Generation Polymer-Based Organic Photovoltaics, 2013, M.D. Barnes, ISBN 978-1-60511-477-4
- Volume 1501E — Single-Crystalline Organic and Polymer Semiconductors—Fundamentals and Devices, 2013, S.R. Parkin, ISBN 978-1-60511-478-1
- Volume 1502E — Membrane Material Platforms and Concepts for Energy, Environment and Medical Applications, 2013, B. Hinds, F. Fornasiero, P. Miele, M. Kozlov, ISBN 978-1-60511-479-8
- Volume 1503E — Colloidal Crystals, Quasicrystals, Assemblies, Jammings and Packings, 2013, S.C. Glotzer, F. Stellacci, A. Tkachenko, ISBN 978-1-60511-480-4
- Volume 1504E — Geometry and Topology of Biomolecular and Functional Nanomaterials, 2013, A. Saxena, S. Gupta, R. Lipowsky, S.T. Hyde, ISBN 978-1-60511-481-1

MATERIALS RESEARCH SOCIETY SYMPOSIUM PROCEEDINGS

- Volume 1505E — Carbon Nanomaterials, 2013, J.J. Boeckl, W. Choi, K.K.K. Koziol, Y.H. Lee, W.J. Ready, ISBN 78-1-60511-482-8
- Volume 1506E — Combustion Synthesis of Functional Nanomaterials, 2013, R.L. Vander Wal, ISBN 978-1-60511-483-5
- Volume 1507E — Oxide Nanoelectronics and Multifunctional Dielectrics, 2013, P. Maksymovych, J.M. Rondinelli, A. Weidenkaff, C-H. Yang, ISBN 978-1-60511-484-2
- Volume 1508E — Recent Advances in Optical, Acoustic and Other Emerging Metamaterials, 2013, K. Bertoldi, N. Fang, D. Neshev, R. Oulton, ISBN 978-1-60511-485-9
- Volume 1509E — Optically Active Nanostructures, 2013, M. Moskovits, ISBN 978-1-60511-486-6
- Volume 1510E — Group IV Semiconductor Nanostructures and Applications, 2013, L. Dal Negro, C. Bonafos, P. Fauchet, S. Fukatsu, T. van Buuren, ISBN 978-1-60511-487-3
- Volume 1511E — Diamond Electronics and Biotechnology—Fundamentals to Applications VI, 2013, Y. Zhou, ISBN 978-1-60511-488-0
- Volume 1512E — Semiconductor Nanowires—Optical and Electronic Characterization and Applications, 2013, J. Arbiol, P.S. Lee, J. Piqueras, D.J. Sirbuly, ISBN 978-1-60511-489-7
- Volume 1513E — Mechanical Behavior of Metallic Nanostructured Materials, 2013, Q.Z. Li, D. Farkas, P.K. Liaw, B. Boyce, J.Wang, ISBN 978-1-60511-490-3
- Volume 1514 — Advances in Materials for Nuclear Energy, 2013, C.S. Deo, G. Baldinozzi, M.J. Caturia, C-C. Fu, K. Yasuda, Y. Zhang, ISBN 978-1-60511-491-0
- Volume 1515E — Atomic Structure and Chemistry of Domain Interfaces and Grain Boundaries, 2013, S.B. Sinnott, B.P. Uberuaga, E.C. Dickey, R.A. De Souza, ISBN 978-1-60511-492-7
- Volume 1516 — Intermetallic-Based Alloys—Science, Technology and Applications, 2013, I. Baker, S. Kumar, M. Heilmaier, K. Yoshimi, ISBN 978-1-60511-493-4
- Volume 1517 — Complex Metallic Alloys, 2013, M. Feuerbacher, Y. Ishii, C. Jenks, V. Fournée, ISBN 978-1-60511-494-1
- Volume 1518 — Scientific Basis for Nuclear Waste Management XXXVI, 2012, N. Hyatt, K.M. Fox, K. Idemitsu, C. Poinssot, K.R. Whittle, ISBN 978-1-60511-495-8
- Volume 1519E — Materials under Extreme Environments, 2013, R.E. Rudd, ISBN 978-1-60511-496-5
- Volume 1520E — Structure-Property Relations in Amorphous Solids, 2013, Y. Shi, M.J. Demkowicz, A.L. Greer, D. Louca, ISBN 978-1-60511-497-2
- Volume 1521E — Properties, Processing and Applications of Reactive Materials, 2013, E. Dreizin, ISBN 978-1-60511-498-9
- Volume 1522E — Frontiers of Chemical Imaging—Integrating Electrons, Photons and Ions, 2013, C.M. Wang, J.Y. Howe, A. Braun, J.G. Zhou, ISBN 978-1-60511-499-6
- Volume 1523E — Materials Informatics, 2013, R. Ramprasad, R. Devanathan, C. Breneman, A. Tkatchenko, ISBN 978-1-60511-500-9
- Volume 1524E — Advanced Multiscale Materials Simulation—Toward Inverse Materials Computation, 2013, D. Porter, ISBN 978-1-60511-501-6
- Volume 1525E — Quantitative *In-Situ* Electron Microscopy, 2013, N.D. Browning, ISBN 978-1-60511-502-3
- Volume 1526 — Defects and Microstructure Complexity in Materials, 2013, A. El-Azab, A. Caro, F. Gao, T. Yoshiie, P. Derlet, ISBN 978-1-60511-503-0
- Volume 1527E — Scanning Probe Microscopy—Frontiers in Nanotechnology, 2013, M. Rafailovich, ISBN 978-1-60511-504-7
- Volume 1528E — Advanced Materials Exploration with Neutrons and Synchrotron X-Rays, 2013, J.D. Brock, ISBN 978-1-60511-505-4
- Volume 1529E — Roll-to-Roll Processing of Electronics and Advanced Functionalities, 2013, T. Blaudeck, G. Cho, M.R. Dokmeci, A.B. Kaul, M.D. Poliks, ISBN 978-1-60511-506-1
- Volume 1530E — Materials and Concepts for Biomedical Sensing, 2013, P. Kiesel, M. Zillmann, H. Schmidt, B. Hutchison, ISBN 978-1-60511-507-8
- Volume 1531E — Low-Voltage Electron Microscopy and Spectroscopy for Materials Characterization, 2013, R.F. Egerton, ISBN 978-1-60511-508-5
- Volume 1532E — Communicating Social Relevancy in Materials Science and Engineering Education, 2013, K. Chen, R. Nanjundaswamy, A. Ramirez, ISBN 978-1-60511-509-2
- Volume 1533E — The Business of Nanotechnology IV, 2013, L. Merhari, D. Cruikshank, K. Derbyshire, J. Wang, ISBN 978-1-60511-510-8

Cambridge University Press & Assessment

978-1-605-11458-3 — Structural and Chemical Characterization of Metals,

Alloys and Compounds—2012, Volume 1481

Edited by Ramiro Pérez Campos , Antonio Contreras Cuevas , Rodrigo A. Esparza Muñoz

Frontmatter

[More Information](#)

MATERIALS RESEARCH SOCIETY SYMPOSIUM PROCEEDINGS

Volume 1534E — Low-Dimensional Semiconductor Structures, 2012, T. Torchyn, Y. Vorobie, Z. Horvath,
ISBN 978-1-60511-511-5

Prior Materials Research Society Symposium Proceedings available by contacting Materials Research Society