

Ceramic Materials for Energy Applications V

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Volume Editors



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*A Collection of Papers Presented at the
39th International Conference on
Advanced Ceramics and Composites
January 25–30, 2015
Daytona Beach, Florida*

Editors
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Preface

This proceedings issue contains contributions from three energy related symposia that were part of the 39th International Conference on Advanced Ceramics and Composites (ICACC), in Daytona Beach, Florida, January 25-30, 2015:

- Advanced Ceramics and Composites for Sustainable Nuclear Energy and Fusion Energy
- Advanced Materials and Technologies for Energy Generation, Conversion, and Rechargeable Energy Storage
- Advanced Ceramic Materials and Processing for Photonics and Energy

The first two symposia were sponsored by The American Ceramic Society's (ACerS) Engineering Ceramics Division and the third by ACerS Nuclear & Environmental Technology Division.

The editors wish to thank the authors and presenters for their contributions, the symposium organizers for their time and labor, and all the manuscript reviewers for their valuable comments and suggestions. Acknowledgment is also due for financial support from the Engineering Ceramics Division, the Nuclear & Environmental Technology Division, and The American Ceramic Society. The editors wish to thank ACerS for assembling and publishing the proceedings.

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Introduction

This CESP issue consists of papers that were submitted and approved for the proceedings of the 39th International Conference on Advanced Ceramics and Composites (ICACC), held January 25–30, 2015 in Daytona Beach, Florida. ICACC is the most prominent international meeting in the area of advanced structural, functional, and nanoscopic ceramics, composites, and other emerging ceramic materials and technologies. This prestigious conference has been organized by the Engineering Ceramics Division (ECD) of The American Ceramic Society (ACerS) since 1977.

The 39th ICACC hosted more than 1,000 attendees from 40 countries and over 800 presentations. The topics ranged from ceramic nanomaterials to structural reliability of ceramic components which demonstrated the linkage between materials science developments at the atomic level and macro level structural applications. Papers addressed material, model, and component development and investigated the interrelations between the processing, properties, and microstructure of ceramic materials.

The 2015 conference was organized into the following 21 symposia and sessions:

- Symposium 1 Mechanical Behavior and Performance of Ceramics and Composites
- Symposium 2 Advanced Ceramic Coatings for Structural, Environmental, and Functional Applications
- Symposium 3 12th International Symposium on Solid Oxide Fuel Cells (SOFC): Materials, Science, and Technology
- Symposium 4 Armor Ceramics: Challenges and New Developments
- Symposium 5 Next Generation Bioceramics and Biocomposites
- Symposium 6 Advanced Materials and Technologies for Energy Generation and Rechargeable Energy Storage
- Symposium 7 9th International Symposium on Nanostructured Materials and Nanocomposites
- Symposium 8 9th International Symposium on Advanced Processing & Manufacturing Technologies for Structural & Multifunctional Materials and Systems (APMT), In Honor of Prof. Stuart Hampshire

- Symposium 9 Porous Ceramics: Novel Developments and Applications
- Symposium 10 Virtual Materials (Computational) Design and Ceramic Genome
- Symposium 11 Advanced Materials and Innovative Processing ideas for the Industrial Root Technology
- Symposium 12 Materials for Extreme Environments: Ultrahigh Temperature Ceramics (UHTCs) and Nanolaminated Ternary Carbides and Nitrides (MAX Phases)
- Symposium 13 Advanced Ceramics and Composites for Sustainable Nuclear Energy and Fusion Energy
- Focused Session 1 Geopolymers, Chemically Bonded Ceramics, Eco-friendly and Sustainable Materials
- Focused Session 2 Advanced Ceramic Materials and Processing for Photonics and Energy
- Focused Session 3 Materials Diagnostics and Structural Health Monitoring of Ceramic Components and Systems
- Focused Session 4 Additive Manufacturing and 3D Printing Technologies
- Focused Session 5 Single Crystalline Materials for Electrical, Optical and Medical Applications
- Focused Session 6 Field Assisted Sintering and Related Phenomena at High Temperatures
- Special Session 2nd European Union-USA Engineering Ceramics Summit
- Special Session 4th Global Young Investigators Forum

The proceedings papers from this conference are published in the below seven issues of the 2015 CESP; Volume 36, Issues 2-8, as listed below.

- Mechanical Properties and Performance of Engineering Ceramics and Composites X, CESP Volume 36, Issue 2 (includes papers from Symposium 1)
- Advances in Solid Oxide Fuel Cells and Electronic Ceramics, CESP Volume 36, Issue 3 (includes papers from Symposium 3 and Focused Session 5)
- Advances in Ceramic Armor XI, CESP Volume 36, Issue 4 (includes papers from Symposium 4)
- Advances in Bioceramics and Porous Ceramics VIII, CESP Volume 36, Issue 5 (includes papers from Symposia 5 and 9)
- Advanced Processing and Manufacturing Technologies for Nanostructured and Multifunctional Materials II, CESP Volume 36, Issue 6 (includes papers from Symposia 7 and 8 and Focused Sessions 4 and 6)
- Ceramic Materials for Energy Applications V, CESP Volume 36, Issue 7 (includes papers from Symposia 6 and 13 and Focused Session 2)
- Developments in Strategic Ceramic Materials, CESP Volume 36, Issue 8 (includes papers from Symposia 2, 10, 11, and 12; from Focused Sessions 1 and 3); the European-USA Engineering Ceramics Summit; and the 4th Annual Global Young Investigator Forum

The organization of the Daytona Beach meeting and the publication of these proceedings were possible thanks to the professional staff of ACerS and the tireless

dedication of many ECD members. We would especially like to express our sincere thanks to the symposia organizers, session chairs, presenters and conference attendees, for their efforts and enthusiastic participation in the vibrant and cutting-edge conference.

ACerS and the ECD invite you to attend the Jubilee Celebration of the 40th International Conference on Advanced Ceramics and Composites (<http://www.ceramics.org/daytona2016>) January 24-29, 2016 in Daytona Beach, Florida.

To purchase additional CESP issues as well as other ceramic publications, visit the ACerS-Wiley Publications home page at www.wiley.com/go/ceramics.

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Volume Editors

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Ceramics and Composites for Sustainable Nuclear and Fusion Energy
