

## Preface

As energy demands increase and in a context of decreasing natural resources' availability, it is necessary to develop new materials that can enhance the efficiency of power generation and conversion systems. Specifically, ceramic materials offer distinct advantages such as a high melting point, low thermal conductivity and excellent mechanical properties, which allow for high temperature applications. However, ceramic materials still have some drawbacks that prevent their full-scale deployment, such as poor toughness, high temperature creep and poor oxidation resistance in the case of non-oxide ceramics.

To overcome these drawbacks, substantial efforts have been devoted to improving the properties of ceramic materials by means of novel processing techniques. Among these techniques, directional solidification of eutectic ceramics has proven to be a way to push forward the boundaries and limitations of traditional ceramics.

Significant advances in this field during last seven years have brought eutectic ceramics closer to industrial application. Solidification processes are better understood, more insight has been gained in structure-properties relationships and modeling, and further improvements in growth techniques have allowed the development of eutectic ceramics with exceptional properties.

Motivated by these advances, the 3rd Directionally Solidified Eutectic and Advanced Ceramics Workshop took place in Seville, Spain, in November 2009. It was the continuation of two highly successful meetings devoted to this topic, the first one held in Paris in 2003 and the second one held in Kyoto in 2006. Delegates from Spain, Poland, Ukraine, France, the USA, Japan, Russia and China attended. Sessions covered all aspects of Eutectic Ceramics, from Innovative Processing to Applications. This volume contains a selection of 20 of the 47 manuscripts presented.

Our deepest appreciation goes to the members of the organizing and scientific committees:

### *Organizing Committee*

- Prof. V. M. Orera (Instituto de Ciencia de Materiales de Aragón-CSIC, Spain) – Conference Chair
- Dr. Joaquín Ramírez-Rico (Dpto. Física de la Materia Condensada-ICMSE, Universidad de Sevilla-CSIC, Spain)
- Prof. J. Martínez-Fernández (Dpto. Física de la Materia Condensada-ICMSE, Universidad de Sevilla-CSIC, Spain)

- Prof. A. R. de Arellano-López (Dpto. Física de la Materia Condensada-ICMSE, Universidad de Sevilla-CSIC, Spain)
- Prof. J. Llorca (Instituto IMDEA Materiales – Universidad Politécnica de Madrid, Spain)

### *Scientific Committee*

- Dr. A. Sayir (NASA Glenn Research Center, Cleveland, OH, USA)
- Dr. Y. Waku (Shimane University, Japan)
- Dr. J. Fuller (Air Force Office of Scientific Research, USA)
- Dr. K. C. Goretta (Asian Office of Aerospace Research, USA)
- Prof. M-H. Berger (École des Mines de Paris, France)
- Dr. R. I. Merino (Universidad de Zaragoza-CSIC, Spain)

### **Acknowledgements**

Our gratitude goes to the funding agencies that made this meeting possible. Funding from the Air Force Office of Scientific Research and the Asian Office of Aerospace Research and Development under award no. FA2386-09-1-1037 is gratefully acknowledged. Additional funding was received from the Spanish Ministerio de Ciencia e Innovación (MAT2008-05111-E), Junta de Andalucía, Consejo Superior de Investigaciones Científicas (CSIC) and the University of Seville.

Joaquín Ramírez-Rico\*

*Dpto. Física de la Materia Condensada, Facultad de Física  
Universidad de Sevilla Av/ Reina Mercedes s/n Apdo. 1065,  
41080 Sevilla, Spain*

Julián Martínez-Fernández

*Dpto. Física de la Materia Condensada, ICMS Universidad  
de Sevilla, CSIC Avda. de Reina Mercedes,  
s/n 41012 Sevilla, Spain*

Javier Llorca

*Departamento de Ciencia de Materiales, Universidad  
Politécnica de Madrid, E. T. S. de Ingenieros de Caminos,  
28040 Madrid, Spain and Instituto Madrileño de Estudios  
Avanzadas de Materiales (Instituto IMDEA Materiales),  
C/ Profesor Aranguren s/n, 28040-Madrid, Spain*

Victor M. Orera  
*Instituto de Ciencia de Materiales de Aragón, ICMA,  
CSIC-Universidad de Zaragoza, Pedro Cerbuna 12,  
50009, Zaragoza, Spain*  
Ali Sayir  
*NASA Glenn Research Center, Brookpark Road,  
Cleveland OH 44135, USA*

\* Corresponding author. Tel.: +34954552891.  
*E-mail addresses:* [jrr@us.es](mailto:jrr@us.es) (J. Ramírez-Rico),  
[martinez@us.es](mailto:martinez@us.es) (J. Martínez-Fernández),  
[jllorca@mater.upm.es](mailto:jllorca@mater.upm.es) (J. Llorca), [orera@unizar.es](mailto:orera@unizar.es)  
(V.M. Orera), [ali.sayir@grc.nasa.gov](mailto:ali.sayir@grc.nasa.gov) (A. Sayir)