

Preface

Structural ceramics are ceramic materials that resist deformation and fracture better than metals at high temperatures (typically over 1000 °C). They are technologically important because they can substitute metals in the hottest parts of engines, allowing them to work at higher temperatures. The higher is the temperature at which an engine can run, the higher is its efficiency, and the cleaner is the energy it produces. The environmentally-conscious society of the 21st Century demands fuel-efficiency. Cooperation between Europe, the United States and Japan, is specially important for this effort of obtaining cheaper and cleaner energy.

Metals typically oxidise and deform plastically at high temperature. On the other hand classical ceramics, like glasses or pottery, are brittle. They can advantageously compete with metals at high temperature because they resist plastic deformation (they keep constant shape) and are chemically more stable (they do not degrade).

Structural ceramics are the result of more than 30 years of intensive effort by industrialised countries to produce ceramics that show less tendency to brittle fracture. In this time, outstanding efforts and resources have been devoted to research in ceramics for high-temperature applications such as turbine blades, heat exchangers, and diesel engine components, all of significant impact in modern technology. Improved fabrication procedures and novel materials have resulted, understanding of the properties-microstructure relationships has been achieved, and tentative models have been proposed, all leading to a better knowledge of the fundamentals and potential applications of ceramics in modern technology. Fracture, creep, slow-crack growth, and anelasticity are important mechanical properties at high-temperatures. These properties are strongly sensitive to environment (atmosphere, temperature, etc.) and therefore knowledge of the interaction of the environment and these properties is particularly appropriate. It is possible to conclude, that the field was mature enough for a deep exchange of ideas on the subjects mentioned.

The Conference held in Seville in October 2001, has brought together world experts to exchange ideas and produce a prospective look into future developments. The initiative for the conference in 1999 is due to four

researchers: Professor Antonio Ramirez de Arellano Lopez and Professor Julian Martinez Fernandez (Universidad de Sevilla, Spain), Dr. William Luecke (National Institute for Standards and Technology, USA), and Dr. Huay-Tay Lin (Oak Ridge National Laboratory, USA). An intensive outspread of the idea, brought the endorsement of the most important professional societies (Sociedad Espanola de Ceramica y Vidrio, The European Ceramic Society, The American Ceramic Society and Ceramic Society of Japan). Support was provided by ten different agencies from Spain, Europe, and the United States.

The Conference consisted of six topical sessions:

- Modelling of High-Temperature Mechanical Properties
- New Thinking about Silicon Nitride Deformation
- Trends in Structural Materials
- New Developments in Oxide Materials
- New Developments in SiC Materials
- Environmental Effects in Non-Oxide Structural Ceramics

The event lasted 5 days, and was attended by 87 scientists, from 17 different countries. Industrial or industrial-related research was represented by 17% of the participants. Up to 22 young attendees (less than 35 years old) were fully sponsored by the European Commission. Among the keynote/invited speakers, the conference counted with the leading world experts in the field: Sheldon Wiederhorn, Fumihiro Wakai, Atul Chokshi, Manuel Jimenez Melendo, David Wilkinson, Tanguy Rouxel, Tatsuki Ohji, Frantisek Lofaj, Kazunori Kijima, Victor Orera, Javier Llorca, W. Roger Cannon, Carmen Baudin, M. Singh, Ali Sayir, Takashi Goto, Greg Morscher, etc. Finally, 79 contributions were presented at the conference, 49 of them orally, and 50 submitted as papers for this Special Issue. One of highlights of the conference was the Round Table with participation representatives of European, American and Japanese Agencies, on the future trends of the research on structural ceramics.

All this meant a great networking opportunity for the international community of structural ceramics. This objective is specially important for young researchers, as they will be the main characters of future developments, and will be the promoters of the much needed industrial links. For this reason, it was specially encouraged by the organisers, and was fulfilled with success.

Special thanks are due to the Universidad de Sevilla for the support and cooperation this event found among its academic authorities. Also special thanks are due to

all the Conference Board and Committee members for their good advice and help.

Professor Antonio Ramirez de Arellano Lopez
Departamento de Fisica de la Materia Condensada,
Universidad de Sevilla,
PO Box 1065
41080 Seville, Spain
E-mail address: aral@us.es

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