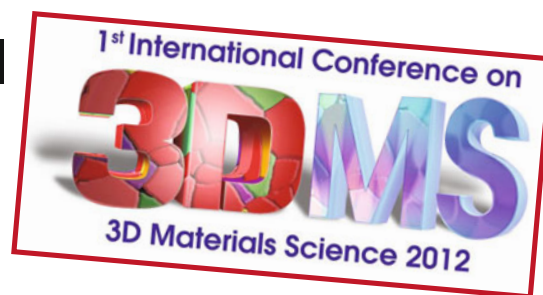


The First International Conference on 3D Materials Science

David Howe and Alexis Lewis



The field of three-dimensional (3D) materials science has been rapidly expanding since the first computerized reconstructions of 3D microstructures were published several years ago. The success of past 3D Materials Science symposia at TMS meetings provided a foundation for the First International Conference on 3D Materials Science, July 8–12, 2012 in Seven Springs, Pennsylvania. The conference attracted nearly 200 attendees representing 20 countries. More than 70 oral presentations and nearly 90 posters were presented. The conference presentations were broken up into 13 sessions. Topic areas and some key themes presented were:

Applications of 3D Experimental Techniques Across Length Scales

- **Destructive Techniques:** These talks focused on the utilization of experimental techniques that consume and/or cause damage to the sample during characterization. Presentations highlighted experimental work that is pushing the boundaries on the resolution and accuracy of 3D microstructural characterization. Experimental techniques discussed included serial sectioning with focused-ion beam microscopy.
- **Nondestructive Techniques:** Advances in nondestructive 3D and four-dimensional (i.e., including time) characterization were highlighted by speakers representing several synchrotron radiation facilities.

Microstructure-Property Relationships in 3D

- **Integration of Experimental Data:** Talks from this session compared

high-resolution 3D microstructural data with tests of physical properties in order to shed light on how the 3D structures of materials influence these properties.

- **Fatigue, Failure and Deformation:** A combination of experimental techniques such as x-ray computed tomography were highlighted, together with modeling techniques such as finite element simulations, to determine how material microstructures influence the physical properties surrounding fatigue, failure, and deformation phenomena.

3D Interfaces and Microstructural Evolution

- **Boundaries and Grain Growth:** The main focus of this session was on the simulation of 3D grain growth in polycrystalline materials systems. Simulation techniques employed included phase-field models and crystal plasticity-based FE simulations. Several talks within this session also included comparison and validation of the outputs from these simulations with experimental data obtained by serial section analyses or x-ray diffraction experiments.
- **Structure and Morphology:** This session brought together talks focused on characterizing and quantifying the crystallographic orientations of grains and interfaces. The polycrystalline systems examined ranged from martensitic steels to ceramics.

Others focused on topics such as image processing of microstructural data and digital representations of 3D mi-

crostructures.

In addition to the oral presentations, poster sessions were both a source of high quality technical content and an excellent venue for more informal discussions for the conference attendees. A student poster contest recognized outstanding effort and quality amongst the student contributors. The first and second place winners were, respectively, John Sosa and Daniel Huber, both of The Ohio State University.

The conference concluded with the session “Future Directions in 3D Materials Science,” which culminated in a panel discussion in which some of the ubiquitous challenges currently facing the 3DMS community, as well as strategies for overcoming these challenges, were discussed. In this discussion the audience participated by laying out the challenges that the 3D community faces, and more significantly, outlining plans for tackling these challenges. Some key issues raised were the ever-expanding need for higher resolution in data collection, standards for error quantification, and the critical importance of data management and sharing. This discussion brought the conference to a close with an eye toward the future. After the success of this first specialty conference, TMS has begun planning for the Second International Conference on 3DMS, to be held in 2014.

To order conference proceedings visit www.wiley.com and search for the International Conference on 3D Materials Science.

David Howe, technical specialist, is with TMS, Warrendale, PA; Alexis Lewis, materials research engineer, is with the Naval Research Laboratory, Washington, D.C. Mr. Howe can be reached at dhowe@tms.org.