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978-1-107-40803-6 - Mechanical Behavior at Small Scales — Experiments and Modeling: Materials Research Society Symposium Proceedings: Volume 1224

Editors: Jun Lou, Erica Lilleodden, Brad L. Boyce, Lei Lu, Peter M. Derlet, Daniel Weygand, Ju Li, Michael Uchic and Eric Le Bourhis

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**MATERIALS RESEARCH SOCIETY  
SYMPOSIUM PROCEEDINGS VOLUME 1224**

**Mechanical Behavior  
at Small Scales —  
Experiments and Modeling**

Symposium held November 30 – December 3, Boston, Massachusetts, U.S.A.

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## PREFACE

Symposia FF: “Mechanical Behavior of Nanomaterials—Experiments and Modeling” and GG: “Plasticity in Confined Volumes— Modeling and Experiments,” were presented Nov. 30–Dec. 4, 2009 at the 2009 MRS Fall Meeting in Boston, Massachusetts. Symposium GG began with a very attractive tutorial on experimental and simulation methods for the study of plasticity in small volumes. The strongly related themes of these two symposia motivated the publication of a single proceedings volume. These two symposia each brought experimentalists and modelers together within a single forum to exchange their ideas about the mechanical behaviour of materials where size, be it microstructural or geometric, plays an important role.

Symposium FF was focused on the understanding of the mechanical behavior of nanostructured materials, such as nanoscale thin films, nanowires, nanotubes, and nanoparticles, as well as nanoporous, nanograin and nanotwinned materials. Such materials with sub-micron length scales are important building blocks for next-generation functional devices and materials systems. In order to help them fulfill their promise, mechanics at small-length scale must be carefully investigated to understand the deformation and failure mechanisms of these material entities.

Symposium GG was focused on understanding how micron and sub-micron external and internal micro-structural length scales control the mechanical behavior, such as strength and ductility, of materials. Modern atomistic and mesoscopic simulation methods have elucidated a diverse range of atomic and meso-scale processes that can contribute to the emergent plasticity of such complex materials, ranging from dislocation dynamics in micron-sized confined volumes, and the interaction between dislocations and grain boundaries in bulk and thin-film nanocrystals, to atomic scale activity associated with grain boundary accommodation processes, as well as shear-transformation zones in metallic glasses. With the development of miniaturized mechanical testing facilities, as well as leading edge ex-situ and in-situ methods, it now becomes experimentally possible to directly probe both the spatial and temporal dynamics of such processes.

The papers herein span a representative range of topics, which have been organized in four general topic areas: nanostructured materials, polymers & composites, simulations & modelling, and microcompression & nanoindentation.

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Brad L. Boyce  
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