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TMS 2023

152nd Annual Meeting & Exhibition

MARCH 19–23, 2023
SAN DIEGO CONVENTION CENTER &
HILTON SAN DIEGO BAYFRONT
SAN DIEGO, CALIFORNIA, USA
#TMSANNUALMEETING

SUBMIT AN ABSTRACT BY JULY 1 FOR THE FOLLOWING TMS2023 SYMPOSIUM:

CHARACTERIZATION

Heterostructured and Gradient Materials (HGM V): New Mechanistic Discoveries Enabling Superior Properties

This is the fifth international symposium that focuses on the fundamental science and technology of heterostructured and gradient materials (HGMs). These include, but are not limited to, heterostructured lamella materials, gradient materials, layered materials, dual-phase materials, harmonic (core-shell) materials, heterostructured composites, etc. HGMs are characterized by large differences in mechanical behaviors and properties among heterostructured zones. The large mechanical incompatibility leads to strong inter-zone interactive coupling. This produces back stresses in the soft zones and forward stresses in the hard ones, which collectively produce hetero-deformation induced (HDI) strengthening. This distribution enhances the yield strength and produces extra strain hardening above conventional dislocation hardening, promoting ductile behavior. This unique deformation behavior is reported to produce a superior combination of high strength and high ductility that is not achievable with either nanostructured or coarse-grained homogeneous materials.

HGMs represent an emerging class of materials that are expected to become a major field of scientific exploration for the materials, mechanics, and physics communities in the coming years. The HGM strategy is not only capable of producing structural materials with unprecedented mechanical properties, but is also effective for developing multifunctional materials. Innovative top-down or bottom-up approaches and material architectures, some of which may be bio-inspired, need to be explored and developed to produce HGMs with superior or disruptive properties. Many fundamental issues still need to be studied by experimentation, analytical modelling, and numerical simulations. Particularly, interface engineering and key interface-related phenomena, such as dispersive strain bands, strain gradients, geometrically necessary dislocations and their interactions with zone boundaries, as well as the emergence and evolution of internal stresses, need to be addressed.

This symposium, and the future biannual symposia to follow, will be a forum for bringing together a diverse group of multidisciplinary researchers to exchange ideas, discuss key issues, and promote industrial technology development for commercial production and applications.

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