

## **Defects and microstructure at the nanoscale and beyond**

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The properties of materials are determined in large part from the nature and interactions of the defects they contain. These defects affect virtually all aspects of material behavior. One is interested both in how finer-scale entities constitute the defects and in how they interact with each other to form structures at coarser scales. One concrete example: properties of isolated dislocations can be understood in terms of atomistic processes, but the dislocations are known to organize into complex structures at larger scales. It is almost certain that full atomic-level detail is not necessary to understand this organization, and a more economical description of the physics should be available.

This mini-symposium will bring together workers utilizing a variety of techniques (ranging from ab-initio molecular dynamics, to continuum techniques such as phase-field methods) from across a broad spectrum of fields interested in a variety of problems relating to defects and microstructure including multi-phase materials; cracks; surfaces, interfaces and grain-boundaries; voids; defects in nanostructures (quantum dots, nanotubes, etc.); and dislocations. For all of these systems, one key question dominates the discussion: which elements of the physics at the fine scales have an impact on the *emergent* behavior at the coarser scales? There is no hope for predictive modeling without addressing these issues. Finding *systematic* solutions to this problem which would be applicable across different systems represents one of the holy grails of materials science.

We invite contributions on numerical modeling and theoretical analysis which address these issues. An auxiliary goal of the mini-symposium is to provide cross-fertilization between work in hard (metals, semi-conductors, etc.) and soft (bio-materials, colloidal and polymeric systems, etc.) systems, and contributions from both fields are encouraged.