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NANOMECHANICS

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ABSTRACT

NANOMECHANICS aims to study fundamental mechanical properties of physical systems at the nanoscale. During the last decade, nanomechanics has emerged on the crossroads of classical mechanics, solid-state physics, statistical mechanics, materials science, and quantum chemistry. As an area of nanoscience, nanomechanics provides a scientific foundation of nanotechnology, i.e., an applied area with a focus on the mechanical properties of engineered nanostructures and nanosystems. Due to smallness of the studied object, nanomechanics also accounts for discreteness of the object, whose size is comparable with the interatomic distances, plurality, but finiteness, of degrees of freedom in the object, thermal fluctuations, entropic effects and quantum effects. These quantum effects determine forces of interaction between individual atoms in physical objects, which are introduced in nanomechanics by means of some averaged mathematical models called interatomic potentials. Subsequent utilization of the interatomic potentials within the classical multibody dynamics provide deterministic mechanical models of nano structures and systems at the atomic scale/resolution. Numerical methods of solution of these models are called molecular dynamics, and sometimes molecular mechanics – especially, in relation to statically equilibrated models. Nondeterministic numerical approaches include Monte-Carlo, Kinetic More-Carlo, and other methods. The topic areas of this mini-symposium on **NANOMECHANICS** include, but are not limited to:

1) Modelling and analysis of nanoscale structures
   - Molecular dynamics simulations and atomistic models
   - Classical continuum mechanics extended to nanoscale
   - Thermal, electrical, magnetic, optical and mechanical characteristics of nanoparticles.
2) Modelling and analysis of nanomaterials
   - Prediction of strength and fracture, damage mechanics and fatigue
   - Multi-scale methods and modelling
   - Experimental testing
3) Applications at nanoscale
   - Applications in biology and medicine, atomic and molecular transportations, in nanosensors and nanodevices
   - Nanotubes, nanoparticles, nanopowders, nanowires, nanorods, nanoribbons, nanoshells, nanocones, nanomembranes, nanocoatings, nanocomposite/nanostructured materials, nanofluids; nanoelectromechanical systems (NEMS).
   - Modelling protein and other polymer chain structures