CONfiGURATIONAL FORCES AND EVOLVING INTERFACES: FROM GRAIN BOUNDARIES TO EPITAXIAL GROWTH

Morton E. Gurtin

Carnegie Mellon University
Pittsburgh PA, 15213
mg0c@andrew.cmu.edu

This talk discusses the use of configurational forces as basic objects in developing theories for evolving interfaces in the presence of deformation and solid-state diffusion. The approach is based on: (i) standard (Newtonian) balance laws for forces and moments together with an *independent balance law for configurational forces;* (ii) atomic balances, one for each atomic species; (iii) a mechanical version of the second law that accounts for temporal changes in free-energy, energy flows due to atomic transport, and power expended by *both standard and configurational forces*; (iv) thermodynamically consistent constitutive relations. To discuss configurational forces within a simple context, the talk begins with the evolution of grain/grain and grain/vapor interfaces; these lead to the beautiful geometric equations usually referred to as motion by curvature and motion by Laplacian of curvature. The final topic concerns the epitaxial growth of an elastic film, allowing for stress and diffusion within the film surface as well as nonequilibrium interactions between the film and the vapor.