



MMAE SEMINAR
WEDNESDAY, MARCH 31, 2004
E-1 BUILDING – CRAWFORD AUDITORIUM
3:30 – 4:30 PM

Professor Rohan Abeyaratne
Massachusetts Institute of Technology
Midwest Mechanics Seminar

Abstract

The Mobility of Phase Boundaries

Certain solids can exist in more than one phase, each phase being characterized by its own distinct crystal structure. A stress-induced phase transformation in a single crystal of such a material occurs by the propagation of one or more sharp interfaces - phase boundaries -- through the specimen. When a material particle crosses such a moving interface it transforms from one phase to another, this being a transition from a metastable state to a more stable state.

According to continuum thermodynamics, the speed of propagation of an interface depends on the associated driving force, but it does not specify the form of this relation. Therefore, the continuum theory, on its own, cannot, for example, explain the fact that in a single crystal of Cu-Al-Ni, some phase boundaries are very easy to move while other are extremely resistant to motion.

In this talk we will review the continuum theory of mobility, and then describe some recent lattice scale modeling efforts that have been carried out in order to understand the kinetics of the transformation process. If time permits, we will also describe a model based on a continuum theory that includes long-range forces.