Phase Transformation and Microstructure Evolution in Systems Subject to Internal and External Stress Fields

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Phase transformations and microstructure evolution under external constraints, as well as the mutual interactions between phase and defect microstructures in elastically inhomogeneous and anisotropic systems will be discussed. In particular, recent advances in developing phase-field models for modeling phase transformations and microstructure evolution in thin films, systems with strong elastic inhomogeneity, and systems with simultaneously evolving defect microstructures, will be described. Specific examples to be presented include effect of substrate constraint on ferroelectric phase transformations and domain structure evolution in thin films, solute segregation and coherent precipitation around static and moving dislocations, dislocation motion under the influence of solute segregation and presence of seconds-phase precipitates, and finally the effect of applied stresses on precipitate morphology and coarsening in coherent two-phase alloys.