Fratzl, Peter; **Penrose, Oliver**; **Lebowitz, Joel L.**

Modeling of phase separation in alloys with coherent elastic misfit. (English) Zbl 0952.74052

J. Stat. Phys. 95, No. 5-6, 1429-1503 (1999).

Summary: Elastic interactions arising from a difference of lattice spacing between two coherent phases can have a strong influence on the phase separation (coarsening) behavior of alloys. If the elastic moduli are different in the two phases, the elastic interactions may accelerate, slow down or even stop the phase separation process. If the material is elastically anisotropic, the precipitates can be shaped like plates or needles instead of spheres and can arrange themselves into highly correlated patterns. Tensions or compressions applied externally to the specimen may have a strong effect on the shapes and arrangement of the precipitates.

In this paper, we review the main theoretical approaches that have been used to model these effects, and we relate them to experimental observations. The theoretical approaches considered are (i) "macroscopic" models treating the two phases as elastic media separated by a sharp interface, (ii) "mesoscopic" models in which the concentration varies continuously across the interface, and (iii) "microscopic" models which use the positions of individual atoms.

MSC:

74N25	Transformations involving diffusion in solids
74-02	Research exposition (monographs, survey articles) pertaining to mechanics of deformable solids
82C24	Interface problems; diffusion-limited aggregation in time-dependent statistical mechanics

Cited in **18** Documents

Keywords:

macroscopic models; mesoscopic models; microscopic models; kinetics of phase separation; quenched alloys; sharp interface model; diffuse interface models; atomic lattice models; elastic interactions

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