Abstract Submitted
for the MAR11 Meeting of
The American Physical Society

Microstructure from ferroelastic transitions using strain pseudospin clock models in two and three dimensions TURAB LOOKMAN, Los Alamos National Laboratory, ROMAIN VASSEUR, Ecole Normale Superieur, Paris, SUBODH SHENOY, School of Physics, University of Hyderabad — We show how microstructure can arise in first-order ferroelastic structural transitions, in two and three spatial dimensions, through a local mean-field approximation of their pseudospin Hamiltonians, that include anisotropic elastic interactions. Such transitions have symmetry-selected physical strains as their order parameters, with Landau free energies that have a single zero-strain "austenite" minimum at high temperatures, and spontaneous-strain "martensite" minima of structural variants at low temperatures. The total free energy also has gradient terms, and power-law anisotropic effective interactions, induced by "no-dislocation" St Venant compatibility constraints. In a reduced description, the strains at Landau minima induce temperature dependent, clocklike Hamiltonians, with strain- pseudospin vectors S pointing to discrete values including zero. We study elastic texturing in five such first-order structural transitions through a local mean-field approximation of their pseudospin Hamiltonians, that include the power-law interactions. The local mean-field solutions in 2D and 3D yield or oriented domain- wall patterns as from continuous-variable strain dynamics, showing the discrete- variable models capture the essential ferroelastic texturings.

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Date submitted: 07 Dec 2010 Electronic form version 1.4