**Strain-mediated Phase Coexistence at Phase Transitions in Epitaxial Films**

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We show that the first-order structural phase transitions in heteroepitaxial films proceed in a way qualitatively different from the same transitions in bulk crystals. Instead of an abrupt transition with a temperature hysteresis inherent to the first-order transition in bulk crystals, the two phases coexist in the film in a large temperature interval with the fraction of the low-temperature phase linearly increasing on cooling and linearly decreasing on heating. The phase coexistence is explained by the restriction on lateral expansion of the film imposed by the substrate. The coexistence is a result of the balance between the free energy released at the phase transformation and the emerging elastic energy.

We study the MnAs epitaxial films on GaAs(001) and (111) and find the phase coexistence in the temperature interval as large as 20°C. We obtain, in detailed x-ray diffraction studies [1-5], the phase fractions, the domain sizes, and their periodicity in the whole coexistence range. We demonstrate, by comparing the observed domain structure with the energy-minimizing one, that the film is close to the equilibrium. We reveal the periodic surface corrugations due to difference in lattice spacings of the two phases.

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**Keywords: phase transitions, phase equilibria, epitaxial layers**