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Symmetry breaking in amorphous solids undergoing martensitic phase transformation - a relation to Landau's theory MICHAEL FISCHLSCHWEIGER, Materials Center Leoben Forschung, EDUARD OBERAIGNER, University of Leoben, Institute of Mechanics — Martensitic phase transformation can be classified as displacive solid -solid phase transformations, where the symmetry of the high temperature phase (austenite) breaks when phase transformation occurs. The martensitic phase (low temperature phase) and its variants are products of symmetry breaking in solids. Based on a quasiparticle statistical mechanics approach the canonical free energy of a representative solid volume element consisting of several quasiparticles (representative mole number) can be derived. The symmetry breaking order parameter of the system is the total strain which is an ensemble mean value in the statistical mechanics concept. In the current theory the order parameter is a macroscopic strain in a sense that the representative volume element stands for the macroscopic level, whereas the lattice parameter changes are considered in the hamiltonian definition of each quasiparticle. Computational results of the developed theory correspond to experimentally observed phenomena in materials undergoing martensitic phase transformation. The present study is focusing the region nearby the phase transformation and shows how the developed theory for describing symmetry breaking and order parameter changes correspond to Landau's phenomenological theory of phase transitions.

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