Magnetic relaxation in a spin-1 Ising model near the second-order phase transition point*

Rıza Erdem

Department of Physics, Gaziosmanpaşa University, Tokat 60250, Turkey

The magnetic relaxation of a spin-1 Ising model with bilinear and biquadratic interactions is formulated within the framework of statistical equilibrium theory and the thermodynamics of irreversible processes. Using a molecular-field expression for the magnetic Gibbs energy, the magnetic Gibbs energy produced in the irreversible process is calculated and time derivatives of the dipolar and quadrupolar order parameters are treated as fluxes conjugate to their appropriate generalized forces in the sense of Onsager theory. The kinetic equations are obtained by introducing kinetic coefficients that satisfy the Onsager relation. By solving these equations an expression is derived for the dynamic or complex magnetic susceptibility. From the reel and imaginary parts of this expression, magnetic dispersion and absorption factor are calculated and analyzed near the second-order phase transition.

* This work was supported by the Turkish Scientific and Technological Research Council (TÜBİTAK), under Grant No: 106T579