

Heisenberg Ferromagnetic monolayer deposited on a non-magnetic bulk substrate – a model

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A model describing a Heisenberg ferromagnetic monolayer (in a magnetic field) interacting with its non-magnetic bulk substrate is formulated. We use a theory known as quantum thermodynamics to show that physical properties of the monolayer are seriously affected by its interaction with the environment. Particularly the influence of the substrate lattice vibrations on the monolayer exchange parameter is depicted. The Gaussian-type orbitals were used to calculate the distance dependence of the exchange parameter and the many-body Green's functions to calculate the temperature dependence of the magnetization and the dispersion relation. For example, it is shown that the Curie temperature of the monolayer alters with the Debye temperature of the substrate. Thus, we state that interaction of ultrathin magnetic films with their environment has to be taken into consideration.

9.7 cm

13.4 cm

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