

Quantum Statistical Calculation of Exchange Bias

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Abstract: The phenomenon of exchange bias of ferromagnetic (FM) films, which are coupled with an antiferromagnetic (AFM) film, is studied by Heisenberg model by use of the many-body Green's function method of quantum statistical theory for the uncompensated case. Exchange bias H_E and coercivity H_C are calculated as functions of the FM film thickness L , temperature, the strength of the exchange interaction across the interface between FM and AFM and the anisotropy of the FM. H_C decreases with increasing L when the FM film is beyond some thickness. The dependence of the exchange bias H_E on the FM film thickness and on temperature is also qualitatively in agreement with experiments.

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Key words: exchange bias, uncompensated case, coercivity, Heisenberg model, many-body Green's function method

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