The influence of magnetostatic interactions in exchange-coupled composite particles

Exchange-coupled composite (ECC) particles are the basic constituents of ECC magnetic recording media. We examine and compare two types of ECC particles: (i) core-shell structures, consisting of a hard-magnetic core and a coaxial soft-magnetic shell and (ii) conventional ECC particles, with a hard-magnetic core topped by a soft cylindrical element. The model we present describes the magnetic response of the two ECC particle types, taking into account all significant magnetic contributions to the energy landscape. Special emphasis is given to the magnetostatic (dipolar) interaction energy. We find that both the switching fields and the zero-field energy barrier depend strongly on the particle geometry. A comparison between the two types reveals that core-shell ECC particles are more effective in switching field reduction, while conventional ECC particles maintain a larger overall figure of merit.

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