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Resistor-network study of tunneling magnetoresistance in ordered arrays of magnetic nanoparticles DIMITRIS KECHRAKOS, KALLIOPI TROHIDOU, Institute of Materials Science, NCSR Demokritos, 15310 Athens, GR
— The tunneling magnetoresistance (TMR) of a hexagonal array of dipolar interacting magnetic nanoparticles is studied using a resistor network model and micromagnetic configurations obtained from Monte Carlo simulations. Analysis of the field-dependent TMR and the corresponding magnetization curve shows that dipolar interparticle interactions suppress the maximum TMR effect, increase or decrease the field-sensitivity depending on the direction of applied field and produce strong dependence of TMR on the direction of applied magnetic field. The peak in TMR for a unipolar sweep of the magnetic field is associated with the critical field for irreversible rotation of the magnetization, rather than the coercive field as commonly interpreted. This behavior is evident in strongly interacting arrays with the magnetic field at a nearly right angle to the array. Under these conditions the difference between the coercive and critical field is maximized. The relation of our simulations to recent TMR measurements in self-assembled Co nanoparticle arrays is discussed.

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