

Calculation of Magnetic Configuration and Resistance for Nanomagnets

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Abstract: Based on a classical Heisenberg lattice model with dipole-dipole interaction and the method of spin dynamic simulation, the magnetic configurations (MC), hysteresis loops (HL) and magnetic resistance (MR) of the nanomagnets with different geometries, such as circle, square and rectangle, are studied for different directions of applied field. In the case of perpendicular field to the plane, the magnetization and MR are reversible and have not hysteresis. When the field is applied in the plane, the HL is irreversible and is qualitatively well agreeable with the current experimental results. The MR loop is also irreversible and appears two peaks distributed at two sides around zero field. The peaks of magnetic resistance are relative to the vortex state or similar configuration. Large easy-axis anisotropy will suppress the MC anisotropy, and the large magnetoresistance effect disappears.

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