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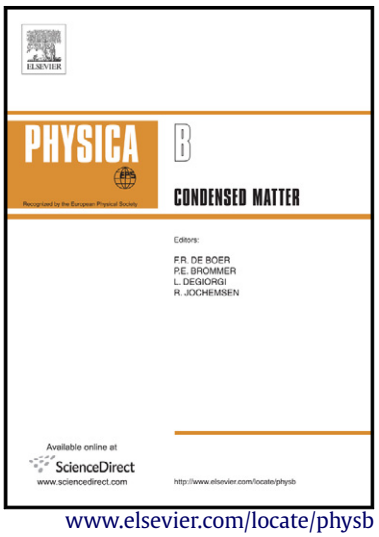

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Determination of the magnetic anisotropy constant of nanoparticles using measurements of the low-temperature heat capacity

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Abstract

At low temperatures, the anisotropy energy can significantly affect heat capacity of a superparamagnetic "ideal gas". At sufficiently low temperatures, when the anisotropy energy of uniaxial magnetic nanoparticles exceeds the energy of thermal fluctuations, the anisotropy energy can be expressed as a sum of the energies of two thermodynamic subsystems (two potential wells). One of these subsystems is composed of magnetic nanoparticles oriented predominantly along the axis of anisotropy, and the other - of particles of opposite orientation. There is a similarity between the considered anisotropy energy and the two-level quantum system. Therefore, the temperature dependence of the magnetic part of the heat capacity (similar to Schottky anomaly) will have a sharp peak. At low temperatures, on the curve of the temperature dependence of the heat capacity, besides a usual T^3 background, a portion with a pronounced maximum is monitored. The relation

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