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A Review of EPR Studies on Magnetization of Nanoparticles of Dilute Magnetic Semiconductors Doped by Transition-Metal Ions

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Abstract

© 2015, Springer-Verlag Wien. This article reviews recent electron paramagnetic resonance (EPR) studies on the magnetic properties of nanoparticles of dilute magnetic oxide semiconductors (DMS) doped with transition-metal ions. These nanoparticles are SnO2 doped with Co^{2+}, Fe^{3+}, Cr^{3+} ions, CeO2 doped with Ni^{2+}, Co^{2+} ions, and ZnO doped with Fe^{3+} ions. The EPR studies reveal that the method of synthesis, surface properties, and size of nanoparticles are important factors that determine the magnetic properties of DMS nanoparticles. In addition, they indicate that ferromagnetic and paramagnetic phases may coexist. The saturation magnetization, as estimated from EPR signal, depends both on the doping level of impurities and annealing temperature. Undoped DMS also exhibit ferromagnetism due to oxygen vacancies. Furthermore, the EPR spectrum depends very sensitively on the size of nanoparticle.

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