MAGNETIC PROPERTIES OF ZnO NANOPARTICLES

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We experimentally show that it is possible to induce room temperature ferromagnetic-like behaviour in ZnO nanoparticles without doping with magnetic impurities but simply inducing an alteration of its electronic configuration. Capping ZnO nanoparticles (˜10nm size) different organic molecules induce an alteration of their electronic configuration that depends on the particular molecule, as evidenced by photoluminescence and X-ray absorption spectroscopies and altering their magnetic properties that varies from diamagnetic to ferromagnetic-like behaviour.

The origin of permanent magnetism in metal oxides semiconductors is explained as due lo localised blocked magnetic moments not necessarily coupled among them. For the case of transition metals as Mn and Ti it was found that double exchange between ions located at interfaces promoted the appearance of local magnetic moments. However, the lack of magnetic percolation indicates that the origin of the permanent magnetism evidenced by the hysteresis loop may be associated with local anisotropy rather than with exchange interactions. It is shown that spin-orbit coupling can give rise to orbital magnetic moments that originates giant anisotropies as large as 0.05 eV. This result can be generalised for compensating charges confined to jump between molecular orbitals on the nearest neighbors of point defects.