

Magnetic dopant atoms in ZnO powders prepared by mechanical work

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The addition of small quantities of magnetic atoms (Mn, Co, Fe and Ni) to wide bandgap semiconductor ZnO may yield room temperature ferromagnetism. However, experimental evidences of the magnetic character are not conclusive. In this work, we present the preparation of massive $Zn_{1-x}M_xO$ (M: Fe and Co) ternary oxides using the mechanical mill. The Fe atom is a particular dopant since it presents two different oxidation states which allow us to vary the starting materials: Fe_2O_3 , α -Fe or FeO, while Co is isovalent to Zn. The influence of different preparation conditions, such as initial concentrations, atmosphere and milling times on final products was investigated. The structure evolution and dopant incorporation in the wurtzite crystalline structure with milling time was analyzed by means of X-ray diffraction, Mössbauer Spectroscopy, Positron Annihilation Spectroscopy. The sample's magnetic character was investigated by measurements in a Quantum Design MPMS-5S superconducting quantum interference device (SQUID) magnetometer.