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**Magnetic and optical properties of Co-doped and Mn-doped ZnO nanocrystalline particles.** ABDEL ALSMADI, B. SALAMEH, Kuwait University, M. SHATNAWI, The Hashimite University, G. ALNAWASHI, The Hashemite University, I. BSOUL, Al al-Bayt University — We carried out a systematic study on the effect of Co doping and Mn doping on the structural, magnetic and optical properties of ZnO nanocrystalline particles, using x-ray diffraction, x-ray photoelectron spectroscopy (XPS), Quantum Design PPMS-9 magnetometry, and Ultra Violet-Visible spectroscopy. The $Zn_{1-x}Co_xO$ and $Zn_{1-x}Mn_xO$ nanoparticles with $0 \leq x \leq 0.1$were successfully prepared by the formal solid-state reaction method. The XPS results and the XRD analysis with full structural Rietveld refinement reveal that both structures have hexagonal wurtzite structure. For all Co-doped ZnO nanoparticles under investigation, the field dependence of the magnetization curves exhibits ferromagnetic behavior with relatively small coercive fields at room temperature. In addition, we found a signature for antiferromagnetic ordering between the Co ions. For the Mn-doped ZnO nanoparticles, we observed ferromagnetic behavior only below 50 K. We also observed a strong correlation between the magnetic and optical behavior of the Co-doped ZnO nanoparticles. Optical diffuse reflectance and absorption spectra exhibit a red shift at room temperature in the absorption band edge with increasing Co-doping. The red shift is attributed to the *sp-d* exchange interaction between free charge carriers in ZnO band and the localized magnetic moments.

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