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Ferromagnetism in colloidal Mn doped ZnO nanocrystals GIL MARKOVICH, TAL MERON, EINAT TIROSH, GABRIEL SHEMER, Tel Aviv University — Surfactant coated colloidal $Zn_{1-x}Mn_xO$ (x=0.04±0.03) nanocrystals of average diameter of 5.5 nm were synthesized using high temperature hydrolysis of Zn(II) and Mn(II) alkoxides in a high boiling point solvent. The magnetic properties of the nanocrystals were measured both for isolated particles diluted in a hydrocarbon matrix and for a nanocrystal powder. Nanocrystals of manganese oxide and ZnO coated with manganese oxide were prepared for comparison to the $Zn_{1-x}Mn_xO$ nanocrystals. We find that the manganese ions primarily substitute zinc ions in the hexagonal ZnO lattice and part of them are ferromagnetically coupled up to room temperature even in isolated non-interacting nanocrystals. The rest of the ions were magnetically disordered or uncoupled. Surprisingly, these small $Zn_{1-x}Mn_xO$ nanocrystals poses relatively large low-temperature magnetic coercivity and relatively high blocking temperature in the isolated form, which indicate large magnetic anisotropy. In the nanocrystal powder the coercive field decreased significantly. This study highlights the advantages of working with non-interacting single domain particles of these intriguing materials.

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