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On the Cubic Phase Stability and Magnetic Properties of Cu-doped ZrO_2 S. THOTA, Physics Dept., IIT Guwahati, India, K. PISANE, S. SINGH, M.S. SEEHRA, Physics Dept., West Virginia University — Magnetic properties and room temperature cubic-phase stability of Cu-doped ZrO_2 nanocrystallites (16 nm size) with various compositions of $Zr_{1-x}Cu_xO_{2-x}$ ($0.01 \leq x \leq 0.25$) are reported. The samples were synthesized at a constant pH = 8 using zirconyl nitrate hydrate and copper acetate monohydrate as precursors and ethanol as a solvent. Thermal analysis shows that the cubic phase is not stable beyond calcination temperature of 500°C for 8 hours in air and a critical composition $x_c \approx 0.10$. For $x > x_c$, monoclinic ZrO_2 and CuO emerge as secondary phases with a shrinking unit-cell volume for increasing Cu content. Against expectations [1], the temperature and magnetic field dependence of magnetization exhibit no signatures of ferromagnetism down to 2 K. Instead, temperature dependence of magnetic susceptibility for all compositions yields Curie-law variation with a magnetic moment $\mu \approx 1.3\mu_B$ per Cu^{2+}, which is somewhat smaller than the expected value of $\mu \approx 1.9\mu_B$ per Cu^{2+}. Electron magnetic resonance studies show a signal near $g \approx 2.1$ due to Cu^{2+} substituting at Zr^{4+} sites with four-line hyperfine splitting from the nuclear spin I = 3/2 of Cu.

[1]. S. Ostanin et al, Phys. Rev. Lett. 98, 016101,(2007)

Mohindar Seehra
Physics Dept., West Virginia University

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