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Effect of Mn^{2+} substitution on the structure and magnetic properties of nanosized $Ni_{(0.5-x)}Mn_xZn_{0.5}Fe_2O_4$ (x = 0, 0.25, 0.35, 0.5) ferrites prepared by co-precipitation method

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Abstract: Nanoparticles of $Ni_{(0.5-x)}Mn_xZn_{0.5}Fe_2O_4$ with stoichiometric proportion, x = 0, 0.25, 0.35, 0.5, were prepared via the chemical co-precipitation process. The structure properties of nanoparticles were investigated by X-ray diffraction (XRD), scanning electron microscopy (SEM) and transmission electron microscopy (TEM). Their magnetic properties were evaluated on a vibrating sample magnetometer (VSM). The XRD patterns showed the formation of single-phased cubic spinel structure for all the annealed samples with no minor phase in nanometer size. Moreover the lattice constant tended to increase with increasing substitution of Mn^{+2} ions without any change in the spinel structure. The TEM images indicated that the nanosized particles were formed after annealing. The magnetic measurements of nanoparticles were done at room temperature and the results showed that all nanoparticles exhibit a typical superparamagnetic behavior with no hysteresis. Moreover, the saturation magnetization increases up to a substitution level of x = 0.25 and then starts to decrease. The observed behavior is attributed to substitute of Mn^{+2} ions into the octahedral sites of the cubic spinel lattice which affected to its sublattice magnetization.

Keywords: *nanoferrite; magnetic nanoparticles; co-precipitation method; magnetic properties.*

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