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Magnetic and Mössbauer studies of Ca_xZn_{1-x }Fe_2O_4 nanoferrites

Tuesday, 26 June 2018 15:00 (2 hours)

A one-step synthesis of Ca_xZn_{1-x }Fe_2O_4 (x=0, 0.5 and 1) nanoferrites and nanocomposites by the glycol-thermal method is reported. The structural, morphological and magnetic properties were studied using XRD, HRTEM/SEM, VSM and Mössbauer spectroscopy. The XRD patterns show a single phase cubic spinel structure of ZnFe_2O_4 at x=0. A composite phase of a spinel and hematite structure of Ca_{0.5}Zn_{0.5}Fe_2O_4/Fe_2O_3 was observed for x=0.5 and CaFe_2O_4/Fe_2O_3 for x=1. The addition of Ca2+ increased the particle size due to large ionic radius of Ca2+ ions. This was also evident from the HRTEM/SEM images. The images show that the particles are almost spherical in shape. The Mössbauer results showed a higher percentage of the α-Fe_2O_3 phase for x=1 and only the presence of Fe3+ ions was detected in all the samples. The small coercivity and high magnetization of the samples reveal the superparamagnetic nature of the samples and the saturation magnetization decreases as the percentage of the α-Fe_2O_3 phase increases.

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