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Growth of ultrafine NiZnCu ferrite and magnetic properties by a sol–gel method

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Abstract

Ultrafine $Ni_{0.65}Zn_{0.35}Cu_{0.1}Fe_{1.9}O_4$ particles are fabricated by a sol–gel method. Magnetic and structural properties of powders are investigated with X-ray diffraction, vibrating sample magnetometer, and Mössbauer spectroscopy. NiZnCu ferrite powders which were fired at and above 823 K have only a single-phase spinel structure and behave ferrimagnetically. Powders annealed at 623 and 723 K have a typical spinel structure and are simultaneously paramagnetic and ferrimagnetic in nature. The formation of nanocrystallized particles is confirmed when NiZnCu ferrite is annealed at 523 K. The magnetic behavior of NiZnCu ferrite powders fired at and above 923 K shows that an increase of the annealing temperature yields a decrease of the coercivity and an increase of the saturation magnetization. The maximum coercivity and the saturation magnetization of NiZnCu ferrite powders are 88 Oe and 73 emu/g, respectively.

Keywords: Sol–gel method; Ferrites; Mössbauer spectroscopy; Vibrating sample magnetometer