

Characterization of Partially-inverted Zinc Ferrite with a Bio-Plasma Treatment

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ZnFe₂O₄ nanoparticles were prepared by using a high-temperature thermal-decomposition method and was investigated by using X-ray diffraction (XRD), high-resolution transmission electron spectroscopy (HR-TEM), MagneTherm, vibrating sample magnetometry (VSM) and Mössbauer spectroscopy. The XRD patterns revealed cubic spinel structures with space group *Fd-3m*. ZnFe₂O₄ nanoparticles were exposed to an argon plasma for 30 min. The self-heating temperature increased up to 37 °C during plasma treatment for 30 min. Magnetic measurements showed that the blocking temperature increased from 72 to 78 K during the plasma treatment. A high saturation magnetization was obtained in the partially-inverted spinel. In order to confirm the cation distribution and the phase transition, we performed Mössbauer measurement. The Mössbauer spectra of ZnFe₂O₄ before and after plasma treatment showed Fe³⁺ valence states at room temperature. Also, the Néel temperature of ZnFe₂O₄ was found to be larger after the plasma treatment.

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