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Synthesis of New Biopolymer-Coated Manganese-Zinc Ferrite Nanocomposites via Coprecipitation Method

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Ferrites are important nanomagnetic materials in chemical industry. Due to their high applicability in pharmaceutical and electronic devices fabrication, these materials have been widely investigated. Amongst, manganese and zinc doped ferrite (Mn/Zn ferrite) nanocomposites have attracted intensive attraction of the researchers because of their relatively high magnetic properties. However, magnetic behavior and Van der Waals forces existed in the Mn/Zn ferrite nanocomposites have make the materials naturally amalgamate, leading to reducing of magnetic properties and limitation in their application. In this research, Mn/Zn ferrite was synthesized via chemical co-precipitation, a relatively simple and economical method. In order to study the effect of zinc content towards the magnetic activity, the materials $Mn_xZn_{1-x}Fe_2O_4$;x= 1.0, 0.8, 0.6, 0.4, 0.2, 0.1 were synthesized at 75°C and pH 11. The samples were characterized by X-ray diffraction (XRD) and Field emission scanning electron microscopy (FESEM) techniques. Results indicated that the prepared $Mn_xZn_{1-x}Fe_2O_4$ were crystallined in spinel cubic structure with particle size ranged 10–19 nm. Besides, the doping of Zn ions into ferrite structure resulted in the reduction of both crystallinity and crystallite size. Further characterizations will be carried out using Transmission electron microscopy (TEM), Fourier transforms Infrared (FTIR) spectrophotocopy, and Vibrating Sample Magnetometry (VSM) techniques. In order to prevent formation of agglomeration among the nanoparticles, coating of Mn/Zn ferrite magnetic nanoparticles using biopolymer such as poly(ethylene glycol) (PEG) and poly(vinyl alcohol) (PVA) will be done. It is believed that both stability and magnetic properties of the modified ferrites will be enhanced significantly after the biopolymer coating.

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