

Preparation and Characterization of Zinc Ferrite Nanospheres in Microemulsion

M. Zhang and X.-Q. An^{C, S}

College of Chemistry and Environment Science, Nanjing Normal University, Nanjing, China
anxueqin@njnu.edu.cn

Magnetic nanoparticles have great potential for applications in modern medical science such as acting as drug carriers for site-specific drug delivery. Fe_3O_4 is a feasible material applied to biomedicine field, due to its better biocompatibility and lower toxicity. But it is adverse to the application to organism, especially to human being, due to its lower saturation magnetism and higher curietemperature. Using Zn^{2+} to substitute Fe^{2+} in Fe_3O_4 may reduce curietemperature and enhance magnetism moment. $\text{Zn}_{0.3}\text{Fe}_{2.7}\text{O}_4$ nanoparticles capped with a layer of AOT have been synthesized in the water-in-heptane reverse microemulsion with AOT as surfactant. The size of the $\text{Zn}_{0.3}\text{Fe}_{2.7}\text{O}_4$ nanoparticles have been well controlled by the molar ratio of water to AOT. Various sizes of $\text{Zn}_{0.3}\text{Fe}_{2.7}\text{O}_4$ nanoparticles (from 3.8 nm to 7.6 nm in diameter) have been obtained in the mediums with different molar ratios of water to AOT (from 15 to 45). X-ray powder diffraction studies have confirmed that the $\text{Zn}_{0.3}\text{Fe}_{2.7}\text{O}_4$ nanoparticles synthesized from the reverse microemulsion have the spinel structure and the average particle sizes have been determined from the broadening of X-ray diffraction peaks by using the Scherrer equation. In addition, Transmission electron microscopy (TEM) has also been used to confirm the nanoparticle size and to determine the particle size distribution. The particle size determined by TEM is fairly consistent with the average size obtained from the peak broadening in X-ray diffraction studies. Temperature and precipitator have been studied as the effect factors on the particles size. The results indicate that the particles size increase with the temperature and vary with precipitator. Acknowledgment. This work was supported by the National Natural Science Foundation of China (No. 20173024, 20273032, 20473035 and 20573056) and the New Technique Foundation of Jiangsu Province, P. R. China (No. BG-2005041).