

IRON OXIDE NANOPARTICLES BY PRECIPITATION FROM FERROUS SOURCE: STRUCTURAL PHASE TRANSFORMATION DEPENDENCE ON SYNTHESIS PARAMETERS AND ANNEALING

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Magnetite (Fe₃O₄) nanoparticles have found extensive scientific and technological applications, such as ferrofluids, data storage materials, photocatalysts, for water splitting under visible light, nanoparticle adsorbents for detoxication of biological fluids or removal of the heavy metals.

Monophasic magnetite monodisperse nanoparticles ~30 nm in diameter were precipitated by NaOH from ferrous salt aqueous solution in air atmosphere. The influence of the solution molarity, precipitator agent drop rate and stirring time on the powder morphology, phase purity and magnetic properties was studied by using SEM, XRD, DTG, XPS, VSM and (FY)XAS analysis. Remarkable influence on grain size, morphology and phase purity was observed. XRD analysis and the comparison of Fe 2p fluorescence yield X-ray absorption spectra to reference compounds[1] shows that it is possible to obtain monophasic Fe₃O₄ or mixture of γ-Fe₂O₃, α-Fe₂O₃ and FeOOH with FeOOH dominance by regulating synthesis parameters. Magnetite nanoparticles shown high saturation magnetization (85.84 emu/g) and composition mainly of magnetite with little or no maghemite phase.

References

1. D. H. Kim, H. J. Lee, G. Kim, Y. S. Koo, J. H. Jung, H. J. Shin, J.-Y. Kim, and J.-S. Kang, *Phys. Rev. B* 79 (2009) 033402.