

SYNTHESIS AND CHARACTERIZATION OF MAGNETITE NANOPARTICLES

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Abstract

Magnetite (Fe_3O_4) nanoparticles are widely studied materials in biotechnology, biomedicine and catalysis [1 - 3]. Fe_3O_4 has interesting magnetic properties. Fe_3O_4 is generally considered to be non-toxic in living organisms. As such, it can be employed in imaging and separation of biological systems. Recently, magnetic nanoparticles have been used in harvesting of marine and fresh water microalgae [4]. Magnetic separation of algal cells from their culture medium by the use of Fe_3O_4 nanoparticles could be a promising method of harvesting, owing to its simple operation, high efficiency and low cost. In the present work, Fe_3O_4 nanoparticles were prepared by mixing aqueous solutions of FeCl_2 and FeCl_3 in molar ratio of 1:2 with aqueous ammonia. The reaction mixture was stirred continuously for 30 min at 353 K under flowing nitrogen atmosphere. The resulting black precipitate was concentrated by centrifugation and washed with distilled water. The prepared magnetite nanoparticles were stored in water. Subsequently, the nanoparticles have been investigated by high resolution scanning electron microscopy and energy dispersive x-ray spectroscopy. The crystal structure and size distribution have been further studied by means of high resolution transmission electron microscopy. Spherical nanoparticles with a diameter of 10 - 20 nm have been found. The prepared nanoparticles are relatively stable upon their storage in aqueous medium. Because of their relative stability, the prepared materials could be used in magnetic separation and microalgae harvesting.

Keywords: Magnetic nanoparticles, magnetite, Fe_3O_4 , SEM, HR TEM

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