IMPACT OF AMINOACID SURFACTANTS ON THE MAGNETIC BEHAVIOR OF HYDROTHERMALLY SYNTHESIZED CoFe2O4 NANOPARTICLES

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Magnetic nanoparticles have been widely investigated for applications in data storage, magneto-optical devices, photocatalysis, and biomedicine due to their size-dependent properties[1][2],[3],[4]. Among ferrite materials, cobalt ferrite ($CoFe_2O_4$) is of particular interest because of its excellent magnetic stability and anisotropy. The structural and magnetic properties of $CoFe_2O_4$ nanoparticles are strongly influenced by particle size, morphology, and surface characteristics, which are governed by the synthesis method. Conventional preparation techniques such as hydrothermal, sol–gel, and co-precipitation methods allow control over nucleation and growth through parameters including temperature, pH, and stirring rate [5], [6], [7]. However, magnetic nanoparticles tend to agglomerate due to high surface energy and magnetic interactions. The use of surfactants effectively reduces aggregation by providing electrostatic repulsion and steric hindrance, while also enabling better control over particle growth and surface properties [4]. In this study, $CoFe_2O_4$ nanoparticles were synthesized via a hydrothermal co-precipitation method with and without amino acids acting as capping agents [2], [8]. The influence of amino acids on the structural and magnetic properties was investigated to improve nanoparticle stability and performance, highlighting their potential use as magnetically recoverable adsorbents and catalysts for wastewater treatment The charecterisation of the sythesised magnetic particles were done usng XRD and TEM.The magnetic measurements were made using VSM. We have mesured the surface area of the particles using BET analysis and the adsorption capabilities are checked by UV spectral analysis on two different organic dyes. We could conclude from our studies that the difference in amino acid surfactats significally influence the particle size, magnetic properties and surface area of the cobalt ferrite nanoparticles. This results are promising in modifying and synthesising nanoparticles of desired magnetism and surface properties.

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Keywords: Magnetic ferrites, Cobalt ferrites, Adsorption, Magnetism

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