

SURFACE MODIFICATION OF γ -Fe₂O₃ NANO PARTICLES AND SECONDARY METAL ION IN CORE-SHELL STRUCTURE**S. Randiligama¹, R. Weerasooriya² and A. Bandara^{1*}**¹*Department of Chemistry, Faculty of Science, University of Peradeniya, Sri Lanka*²*Department of Soil Science, Faculty of Agriculture, University of Peradeniya, Sri Lanka***wmatb@pdn.ac.lk*

Magnetic nanoparticles have gained a great attention due to their potential applications in magnetic separation, sensing, drug delivery, hyperthermia and MRI enhancement. Especially, iron oxide nanoparticles (IONP) have a great feasibility because they are nontoxic and biocompatible. Magnetite (Fe₃O₄) and Maghemite (Fe₂O₃) are the well-known iron oxide nanoparticles which have many applications. In the present study, maghemite (γ -Fe₂O₃) nanoparticles have been synthesized by co-precipitation of Fe(II)/Fe(III) salts in an aqueous medium. As the surface modification of nanoparticles with organic acids or copolymers is very important to prevent aggregation, the surface modification of the synthesized particles was done using succinic acid, suberic acid and glycine. These ligands bind through the carboxylate group via monodentate, bidentate and bridging configurations. Copper (Cu) as a secondary metal, was incorporated into iron oxide core shell particles again by the co-precipitation. Characterization of all synthesized nanoparticles was carried out with diffuse reflectance IR (DRIFTS) spectroscopy and X-ray diffractometry (XRD). Releasing of secondary metal of Cu as a function of time at different pH values was analyzed using Atomic Absorption Spectroscopy (AAS).

Succinic acid has the highest efficiency to bind to the IONP making a core-shell structure. Cu(II) substitution to Succinic acid and suberic acid surface modified IONP occurs successfully in basic pHs with high affinity towards Succinic acid modified IONP. Cu substitution to glycine surface modified IONP was not effective under co-precipitation method. Atomic absorption spectroscopic analysis also showed high stability of Cu(II) in Succinic acid functionalized IONP in basic pHs. IR spectra of the succinic acid coated IONP indicated the bridging configuration for the attached acid. Peak shifts upon the addition of Cu(II) revealed the mono- and bi-dentate configurations for the complexes formed and this clearly indicates the incorporation of Cu(II) into the core-shell structure.