# COMPOSITE MAGNETITE – CHITOSAN OBTAINED BY IN-SITU PROCEDURE

Marcel Ionel POPA[1,3], Gina DODI[2,4], Doina HRITCU[3]

**Abstract.** *A method for preparing magnetic crosslinked chitosan microparticles was developed. The chitosan encapsulated magnetite particles ($Fe_3O_4$) were produced in alkaline conditions by in-situ oxidation of the ferrous ions initially dispersed uniformly within the polysaccharide matrix. The polymer was then crosslinked using glutaraldehyde. The products were characterized regarding their size distribution (by laser diffraction analysis), morphology (TEM), composition (FTIR) and magnetic properties (magnetic susceptibility analysis). The synthesis parameters were optimized for obtaining colloidally stable magnetic microparticles bearing surface amino groups that can subsequently be used for complexing heavy metal ions. The composite particles obtained by the optimum procedure had an average diameter of 40 μm and a saturation magnetization of 24 emu/g, corresponding to about 47% magnetite content.*

**Keywords:** Magnetic particles, chitosan, magnetite, composite

## 1. Introduction

In recent years a lot of research efforts have been focused towards the application of magnetic particles in the field of wastewater treatment due to their response to magnetic force that provides facile separation after metal ion sorption using an external magnetic field [1]. Thus, an efficient, economic and eco-friendly separation of metal ions from wastewater can be achieved using surface modified $Fe_3O_4$ particles with polymers. The use of magnetite-chitosan composite material as a bio-adsorbent for wastewater appears to be a promising solution for metal ion removal. Various technologies for the removal of heavy metals from aqueous solutions have been utilized, such as ion exchange, chemical precipitation, reverse osmosis, membrane separation, nanofiltration and adsorption [2]. Chitosan magnetic composite particulate adsorbents provide multiple advantages, among which the facile separation from the aqueous phase [3,4], followed by re-generation and reuse [5]. Chitosan is a natural polysaccharide that consists of β(1-4) 2-amino-deoxy-D-glucopyranose or N-acetyl-D- glucosamine residues and has

[1]Prof. PhD Academy of Romanian Scientists, Splaiul Independentei 54, 050094, Bucharest, Romania, (e-mail: mipopa@ch.tuiasi.ro)
[2]PhD "Gr.T.Popa" University of Medicine and Pharmacy, Faculty of Pharmacy, Universitatii Street, No. 16, 700115, Iasi, Romania, (e-mail: gianina.dodi@yahoo.co.uk)
[3]PhD „Gheorghe Asachi" Technical University of Iasi, Faculty of Chemical Engineering and Environmental "Cristofor Simionescu" 73 Prof. Dr. Docent D. Mangeron, Iasi, 700050, Romania (e-mail: doina.hritcu@gmail.com)
[4]PhD SCIENT – Research Centre for Instrumental Analysis, Bucharest, Romania