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## The Synthesis and Characterization of Magnetic/ Luminescent Fe<sub>3</sub>O<sub>4</sub>-InP/ZnSe Core-Shell Nanocomposite

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### 1. Introduction

Magnetic luminescent nanoparticles have shown great promise in various biomedical applications namely: contrast agents for magnetic resonance imaging, multifunctional drug carrier system, magnetic separation of cells, cell tracking, immunoassay, and magnetic bioseparation. However most of these nanoparticles are cadmium- based. Indium- phosphide is known to be less toxic than cadmium- based products. This experiment describes the synthesis of a core- shell nanocomposite material, which is composed of an iron oxide superparamagnetic core and an InP/ZnSe quantum dot shell. The magnetic nanoparticles (MNP's) and quantum dots (QD's) were synthesized separately before conjugation could occur. The MNP's were functionalized with a thiol-group allowing the QD shell to bind to the surface of the MNP by the formation of a thiol-metal bond.

### 1. Results

The synthesized nanocomposite was characterized with high- resolution transmission electron microscopy (HR-TEM), energy-dispersive X-ray spectroscopy (EDS), selective electron area diffraction (SAED), scanning electron microscopy (SEM), UV- visible spectroscopy, XRD and photoluminescence. These techniques yielded particle size, morphology, dispersion, and chemical composition including luminescence and fluorescence properties of the as prepared nanoparticles. The TEM micrograph showed crystalline nanoparticles which are monodispersed. These particles would be more useful in the in vivo applications after their solubility is tuned to a desired property. This experiment will continue further by investigating how various capping agents' affects the particles solubility. All the peaks of XRD patterns were analyzed and indexed using ICDD data base, comparing with magnetite standards. The lattice constant  $a$  was found to be 8.330 Å, which was compared with the lattice parameter for the magnetite of 8.39 Å. Further results will be reported including their applications.

### 2. References

- [1] Pedro Tartaj<sup>1</sup>, Mar'ia del Puerto Morales<sup>1</sup>, Sabino Veintemillas-Verdaguer, Teresita Gonz'alez-Carre ño and Carlos J Serna. 2003.
- [2] Shen Wu, Aizhi Sun, Fuqiang Zhai, Jin Wang, Wenhuan Xu, Qian Zhang, Alex A. Volinsky
- [3] Shouheng Sun, Hao Zeng, David B. Robinson, Simone Raoux, Philip M. Rice, Shan X. Wang, and Guanxiong Li

**Are you currently a postgraduate student? (Yes/No)**

Yes

**At what level of studies are you currently? (Hons/MSc/PhD)**

MSc

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