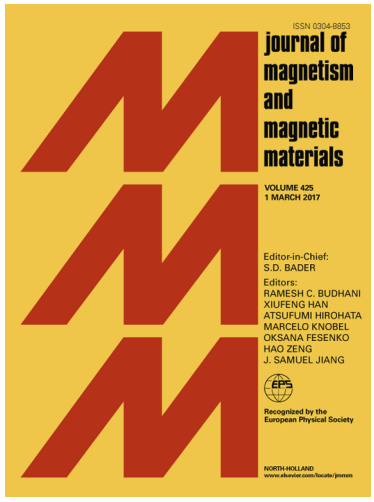

Role of Silver Nanoshells on Structural and Magnetic Behavior of Fe_3O_4 nanoparticles

Pinki Singh, Chandan Upadhyay

PII: S0304-8853(17)33214-6
DOI: https://doi.org/10.1016/j.jmmm.2018.02.075
Reference: MAGMA 63752

To appear in: *Journal of Magnetism and Magnetic Materials*

Received Date: 12 October 2017
Revised Date: 3 January 2018
Accepted Date: 22 February 2018

Please cite this article as: P. Singh, C. Upadhyay, Role of Silver Nanoshells on Structural and Magnetic Behavior of Fe_3O_4 nanoparticles, *Journal of Magnetism and Magnetic Materials* (2018), doi: https://doi.org/10.1016/j.jmmm.2018.02.075

Role of Silver Nanoshells on Structural and Magnetic Behavior of Fe_3O_4 nanoparticles

Pinki Singh*, Chandan Upadhyay

School of Materials Science and Technology, Indian Institute of Technology (Banaras Hindu University), Varanasi, Uttar Pradesh 221005, India

***corresponding author:** psingh.rs.mst13@itbhu.ac.in , cupadhyay.mst@iitbhu.ac.in*

Abstract

The structural and magnetic behavior of monodispersed uncoated Fe_3O_4 nanoparticles (average particle size = 6 nm) and silver coating of mean thickness 1.5 nm and 2 nm prepared in an emulsion was investigated. The structural and magnetic analysis indicated the formation of a tri layer structure comprising of a disordered magnetic layer of diffused core present in between magnetic core and non- magnetic shell. The nanocrystals with thicker nanoshells exhibit superparamagnetic properties showing decrease in blocking temperatures with increasing shell thickness, whereas the particles of larger diameter are ferrimagnetic at room temperature. The value of saturation magnetization are smaller than those obtained for bulk magnetite emphasizing the presence of a disordered spin layer due to unsaturated iron ions at the surface in case of uncoated magnetite nanoparticles and at the interface for coated ones. The spin canting at the interface, surface strain and increased magnetoelastic anisotropy are some other factors influencing the magnetic properties of these nanoparticles.

Highlights

- Uncoated and silver coated magnetite nanoparticles with tuned shell thickness are synthesized as multifunctional materials.
- Trilayer core- diffused magnetically dead layer- diamagnetic shell structure nanoparticles.
- Strong correlations between superparamagnetic blocking temperature, magnetic parameters and shell thickness.

Keywords: Magnetite; Superparamagnetic; Nanoparticles; Surface effects; Saturation magnetization