

## Deposition of gold nuclei on magnetite nanoparticles and growth to a core-shell system

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Magnetic nanoparticles for selective capture of biomolecules in complex mixtures is gaining momentum in bionanotechnology by providing significant advantages over traditional methods of separation<sup>1</sup>. A magnetite-gold core-shell structure would grant researchers with an integrated detection and “gene fishing” platform by means of the detection properties of gold nanoparticle systems combined with a magnetic component<sup>2</sup>.

A deposition-precipitation procedure was employed for formation of gold nuclei on the surface of magnetite nanoparticles. The conditions for deposition of the gold nuclei were studied and were found to be critically dependant on pH and gold concentration. The growth of the gold nuclei on the magnetite to a gold shell layer was achieved by an iterative addition of gold precursor and reducing agent. The growth of the gold layer was followed by TEM (Fig.1), UV-Vis and EDS. Several parameters, such as gold precursor concentration, rate of reagents addition and initial nanoparticle concentration were analysed. Also, different chemical reductants were evaluated for their ability to produce a gold shell. Magnetic properties of the nanoparticles before and after gold coating were analysed by SQUID (Fig. 2).

In addition, we have studied the replacement of the capping agent used in the synthesis by several different thiol capping agents and the replacement was assessed zeta-potential measurements.

### References:

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## Figures:

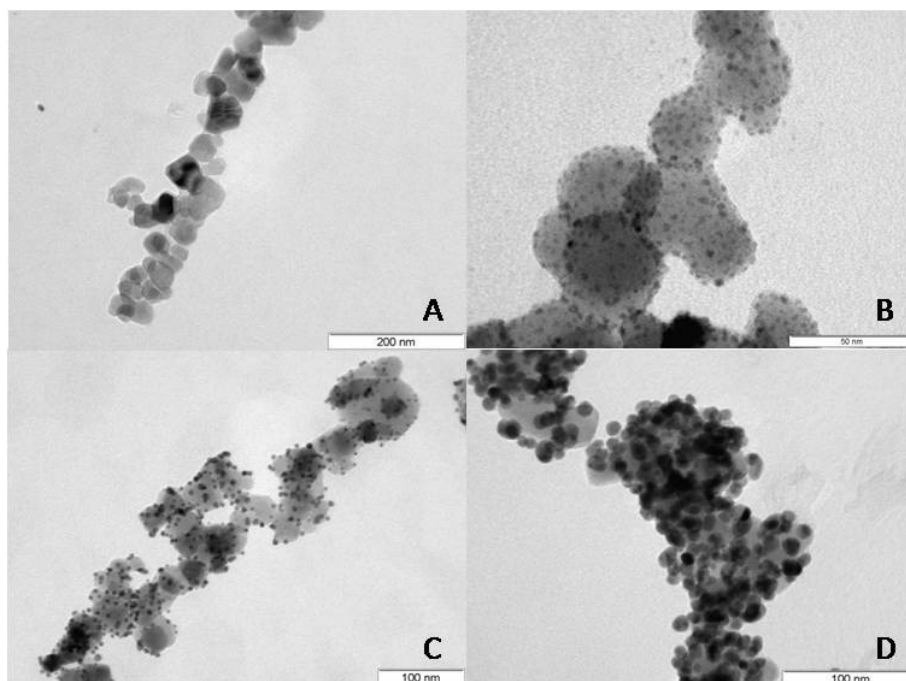


Figure 1 – TEM images of the several steps of the synthesis. A) Images of the original magnetite nanoparticles; B) Magnetite nanoparticles after gold hydroxide priming; C) Magnetite-gold nanoparticles after the 4<sup>th</sup> iterative gold addition; D) Magnetite-gold nanoparticles after the 12<sup>th</sup> iterative gold addition.

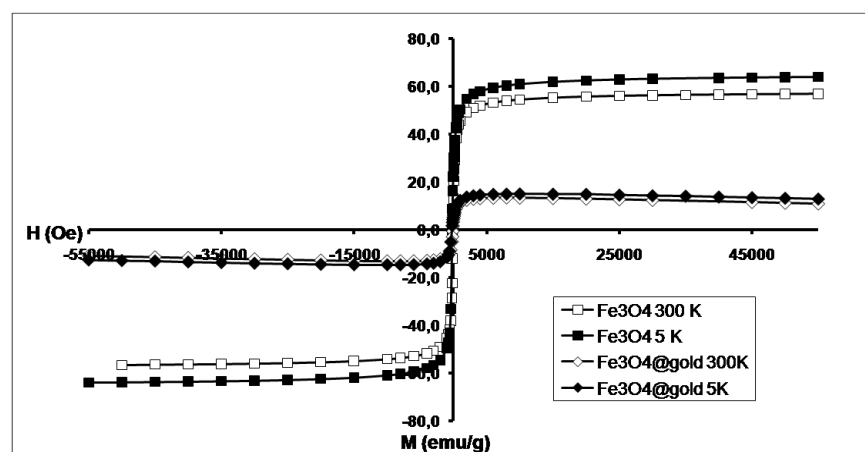


Figure 2 – SQUID measurements of original magnetite nanoparticles and after gold coating at 300K and 5K.

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