Magnetic Properties and Cytotoxicity Study of Iron Oxide Nanoparticles with Gold Layer

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Abstract. In this study, we describe the magnetic properties and cytotoxicity of iron oxide nanoparticles prepared by reverse micelle method and coated by gold shell with average size of 8 nm. Magnetic measurements using SQUID magnetometer confirm the behavior typical for a superparamagnetic system. The quantitative analysis of the real part of susceptibility χ' employing the Néel-Arrhenius and Vogel-Fulcher theoretical models confirms the existence of weak dipolar interactions between particles. Small size of iron oxide nanoparticles and their coating by Au shell caused the existence of magnetic moment that originates in uncompensated surface spins of Fe^{3+}. Magnetic behavior is mainly related to the surface effects (spin canting and different surface to volume spin ratio). Cytotoxicity of the synthesized Fe_2O_3/Au nanoparticles was also evaluated with U87 MG cells and the result shows that the synthesized nanoparticles were not toxic to the cells as determined from cell viability in response to the liquid extract of Fe_2O_3/Au nanoparticles.