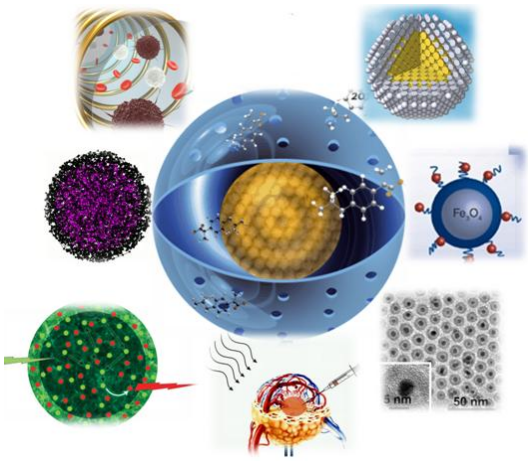
ABSTRACT



This thesis deals with the structural and magnetic characterization of magnetic nanoparticles as well as with their magnetic response under the effect of an external alternating magnetic field.

Magnetic hyperthermia is an alternative approach in cancer treatment whose main goal is to locally heat the area of the cancer tumor, for its containment or to efficiently cure it. This novel cure method uses an external applied field on magnetic nanoparticles, concentrated at the tumor area, thus inducts the release of heat which destroys the tumor cells.

Two kinds of magnetic nanoparticles are presented in this thesis. What distinguishes them, is their growth method. The first group of samples, was created by the evaporation of targets , that consisted of one material in an attempt to create ferrite nanoparticles. The second group of samples created of a target that consisted of two materials in an attempt to create nanoparticles with a core-shell structure. The first step was to analyze the magnetic and structrural characteristics in order to measure the morphology and the magnetic properties of each sample. Afterwards the samples were introduced in alternating (765kHz) magnetic fields of strength 250 and 300 Oe and the thermal response was calculated for all of them. The Specific Loss Power (SLP), a quantitative measure of the thermal response was evaluated and correlated with the structural and magnetical characteristics for each sample in order to find the factors that determine the optimization of the thermal response of magnetic nanoparticles.

The samples of the first group are magnetically weak, while those of the second group demonstrate higher magnetic properties. The particle size for every sample was measured as well, and it varies from 30nm to 60 nm. According to the results of thermal response measurements the sample that seems to be a promising hyperthermia agent is FeCo1 which is and alloy of iron (Fe) and cobalt (Co) and demonstrates remarkable magnetic properties and SLP factor, while its mean size is 35nm.