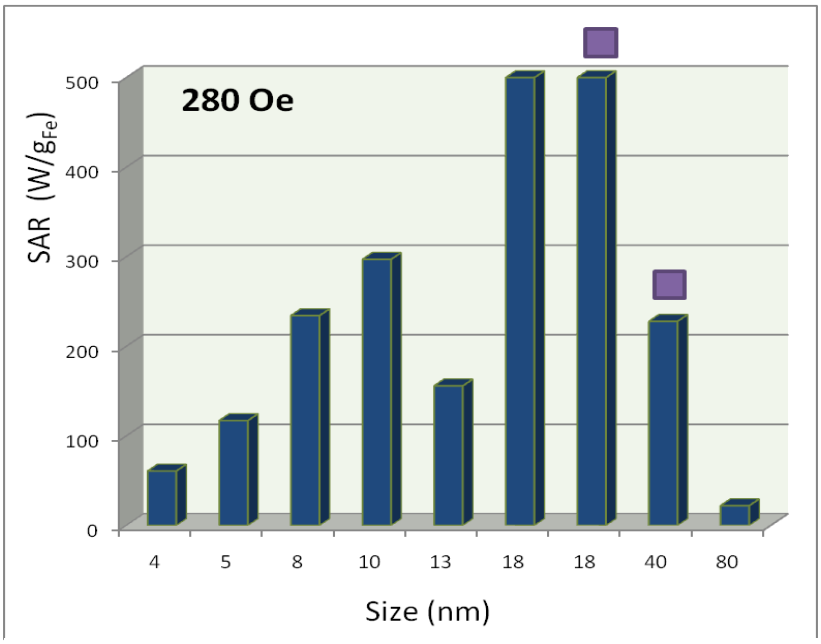
Clinical Application of Magnetic Hyperthermia in Cancer Therapy

Magnetic Hyperthermia is a very promising cure method of cancer, which is performed nowadays in combination with other methods such as chemotherapy and/or radiotherapy. It is a method based on cancer cell local but intense overheating, causing their death and tissue release from the tumor. The use of this method recently reinforced when the systematic synthesis and growth of a variety of new materials, with special characteristics and potentials, was established, such as magnetic iron-oxide nanoparticles (maghemite: γ-Fe_2O_3 and magnetite: Fe_3O_4).

These species of nanoparticles were used for the experiments of this thesis and there is an attempt to obtain the most suitable system of magnetic nanoparticles for magnetic hyperthermia. The iron-oxide nanoparticles with very small sizes (< 50 nm) tend to be superparamagnetic and they are suitable for using in magnetic hyperthermia, due to their property to release heat when an external alternative magnetic field is applied. Several samples with different size, shape, concentration and magnetic characteristics are measured. The target is to determine the structural and magnetic characteristics of such a system and to correlate these features with the heating efficacy in order to find the most suitable system of magnetic nanoparticles for hyperthermia. More precisely, there is examination of the effect of magnetic field, concentration and size on the thermal response of magnetic nanoparticles. Another significant factor under study is the Specific Absorption Rate (SAR), whose results determine the choice of the nanoparticles' system.



Size dependence of Specific Absorption Rate (SAR). Square nanoparticle values are also given for comparison.