This thesis deals with the study of the structural and magnetic characteristic of magnetic nanoparticles, which had been synthesized with the Physical Evaporation Technique and were evaluated as magnetic particle hyperthermia agents. The main goal was the study of thermal response by these materials to the magnetic hyperthermia technique, finding the most suitable against cancer. The specimens under study, are proposed as alternative hyperthermia materials having the core-shell morphology where the core is comprised mainly of metallic Fe and the shell acts as a protector/segregant material.

This thesis consists of three Chapters. In the first Chapter, basic knowledge of Magnetism and Nanoscale are produced, as indispensable for the understanding of the conclusions.

The second Chapter, is devoted to the analysis of the structural and magnetic characterization techniques, as also to the results of this analysis.

Finally, the last Chapter, includes the theory of magnetic hyperthermia technique and the samples’ results. In this chapter there is also a unit devoted to the final conclusions of this thesis. Specifically, the samples are integrated into to categories, which depends of the shell of the nanoparticles. Thus, in the first category there are nanoparticles with iron core and magnesium oxide shell. These specimens show high thermal response and are ideal for biomedical applications because of the low toxicity of the shell. They have high values of saturation magnetization and specific loss power. In the second category, the nanoparticles consist of an iron core and an alternative shell. Therefore, two samples had a shell of titanium oxide which is non-toxic and one sample had tricalcium phosphate, a substitute of bones.

Although these samples do not show high values of magnetization as the former category, in specific combinations enhancement of AC magnetic hyperthermia response was found. Consequently, the incorporation of metallic Fe instead of the standard iron-oxides if properly covered with the adequate shell results to enhancement of magnetic features and thus hyperthermia response. Therefore, by proper adjustment of core size and shell thickness and choice novel multifunctional hyperthermia agents may arise.