Magnetic Hyperthermia experiments with previously characterized Magnetite Nanoparticles.

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Abstract

Magnetite nanoparticles have been widely used because of their applications in magnetic hyperthermia. This technique is based on the exothermic properties of magnetic materials under the influence of an alternating current magnetic field. The localization of magnetic nanoparticles and posterior heating of tumor cells without damaging normal tissues is a promising cancer thermotherapy. Within this scope, firstly we are interested in the preparation of monodispersed nanoparticles with an appropriate capping and different size distributions and secondly, in the measurement of the heat generated by the nanoparticles in terms of the specific absorption rate (SAR). Samples have been obtained by different synthetic methods and have been characterized by transmission electron microscopy and thermogravimetric measurements.

Using a self-designed electromagnetic applicator, the specific absorption rates of the cited nanoparticles have been measured under rf magnetic field. Using the same apparatus, several magnetic hyperthermia experiments have been performed. Different nanoparticle samples were injected into several mice livers while rf-magnetic fields ranging from 600 to 900 kHz were applied to the hole system. The temperature time evolutions in several point of liver as well as in the surrounding medium were measured while magnetic field was applied (Fig. I). The observed temperature increments are discussed and related to the previously characterized properties of magnetite nanoparticles.

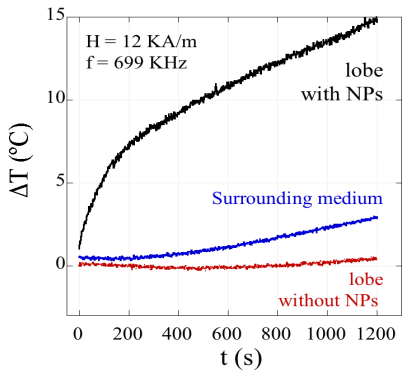

Figure I. Measured temperature evolution in one liver.