

The Measurement of Magnetic Hyperthermia

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Abstract

The phenomenon of magnetic hyperthermia in which nanoparticles are found to generate heat when exposed in solution to rf fields remains one of intense interest due to its potential to be able to reduce malignant and non-malignant tumours in humans. However the general field of study by oncologists and others has not expanded as rapidly as might have been expected. One reason for this is that the exact mechanism of heating remains only partially understood and significantly the ability to control the degree of heating so that the required dosage and conditions to achieve a given clinical outcome can be defined, is not yet available. In this talk the mechanisms by which heat is generated will be reviewed based on a seminal paper published by our group in 2013 (J. Phys. D. Appl. Phys. 46. 312001 (2013)). In this work it was shown that there were two principle sources of heating deriving from hysteresis of the particles at the frequency of measurement and stirring of the liquid by larger particles and aggregates which will not switch in the limited field available. The physics of the heating mechanisms will be reviewed and in particular the origin and factors affecting the hysteresis loss considered. These factors will include not only the particle size distribution but also the origin and distribution of the anisotropy constants. Possible mechanism for controlling both distributions will be considered.