Superposition Of A Static Magnetic Field Orthogonal To An Alternating Magnetic Field And The Heating Of Ferrofluids For Applications In Hyperthermia

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The current methods for treating cancer are radiation and chemotherapy, which could be complemented by methods for controlled release of drugs in order to reduce side effects. The advantage of the hyperthermia treatment is that the amount of drugs used is lower; its elimination from the body is faster and more economical than chemotherapy. Hyperthermia, also known as thermotherapy is based on heating of nanoparticles by the application of an alternating magnetic field. The increase of the temperature depends on the nature and size of the particles, the carrying fluid, the frequency and size of the applied magnetic field. The heating curves of the sample allow determining the quantity which provides the quantification of a given treatment known as specific absorption rate (SAR). In spite of the studies to analyze the diverse influence heating phenomena during hyperthermia treatments, several basic mechanisms responsible of the heating are not well understood. In particular those related to the structural ordering of the nanoparticles require additional investigation. It is known that magnetic particles can be aligned in a fluid using a constant magnetic field. This alignment can be a determining factor in modifying the thermotherapy effects in a given ferrofluid [1]. In this work, the role of a the alignment of the nanoparticles of a ferrofluid using a constant magnetic field superposed with the usually applied high frequency AC magnetic field is studied in ferrofluids made of 10nm iron nanoparticles in two types of fluids, kerosene and agar and allow us to find their respective SAR.

References

[1] L. C. Branquinho, M. S. Carriao, A. S. Costa, N. Zufelato, M. H. Sousa, R. Miotto, R. Ivkov, A. F. Bakuzis. Scientific reports 3, 2887 (2013).