ANISOTROPICALLY SHAPED FERROMAGNETIC PARTICLES FOR HYPERTHERMIA APPLICATIONS

Elina A. Vitol[1,2], Elena A. Rozhkova[2], Valentyn Novosad[1]*
[1]Materials Science Division, [2]Center for Nanoscale Materials,
Argonne National Laboratory, Argonne, IL 60439

Superparamagnetic particles on the order of ten nanometers have been traditionally employed for magnetically-driven hyperthermia [1]. To achieve high efficiency in tumor heating, their applications typically call for large nanoparticle concentrations which could lead to cytotoxic effects. Anisotropically shaped ferromagnetic particles have a great potential for overcoming this limitation. In this work, we report on a different approach for magnetic hyperthermia using lithographically fabricated ferromagnetic microdisks (1 µm diameter, 60 nm thickness). These particles allow for multimodal treatment of cancer cells by utilizing different mechanisms controlling their dynamic behavior, depending on the frequency of the applied *a.c.* magnetic field. At the lower frequency range (~10-60 Hz, 90 Oe), these particles have proven to be instrumental for destruction of cancer cells by mechanically activating apoptotic pathways [2-3]. In the high frequency regime (hundreds of kHz), the microdisks can be employed for inductive heating applications due to the dynamic hysteresis losses, as we show here. For comparison, we also investigate the heating properties of 11 nm Fe_3O_4 nanoparticles encapsulated in polymeric micelles [4] which serve as a superparamagnetic particle-based model system. The specific absorption rates of both particle types will be compared and the results of *in vitro* studies on cultured cancer cells will be presented.

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