

Hyperthermia application of Nano-Size Controlled Superparamagnetic Ni-Ferrite Particles

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Since Gilchrist et.al [1], has been explored the possibilities of treating malignant cancer cells by hyperthermia using both ferromagnetic particles and AC magnetic induction, a huge attraction from both scientific and clinical research groups has been triggered to accelerate the realizations of magnetic mediated hyperthermia (MMH) in a clinical treatments for human patients. The main reason is that it has specific clinical advantages compared to the conventional cancer therapeutic modalities such as restrictive side effects and decreasing risk of collateral organ damages. However, in order to apply this modality to the human patient treatment, a lot of challenges such as particle transportation inside the body, cancer cell differentiation, biocompatibility, optimizations of magnetic properties of particle for hyperthermia, increase of specific absorption rate (SAR), and clarifications of heating mechanism etc., are faced with us to be solved in the very near future.

In this work, in order to comply with the urgent requirements of MMH, we pioneered a new hyperthermia system including new magnetic particles based on superparamagnetic Ni-ferrite nanoparticles and a temperature rising circuit system in order to explore the possibilities of a real hyperthermia treatment for human patients. Magnetic properties, biocompatibilities, hyperthermia temperature rising characteristics, and heating principle of superparamagnetic nanoparticles will be mainly presented in this talk.

1. R.K. Gilchrist et.al., Ann. Surg. 14, 6, 596 (1957).