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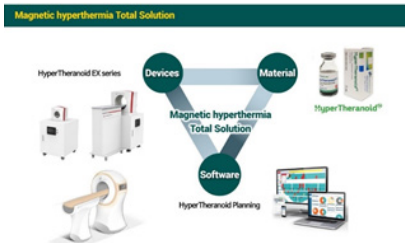
Colossal magnetic heat induction of magnesium doped γ-Fe_2O_3 nanofluids (hypertheranoid™-1) and highly efficient AC magnetic field generator system (Hypertheranoid EX™) for thermoablation of cancers

Magnetic Nanofluid Hyperthermia (MNH) has been recently paid an enormous attraction as a Renaissance of cancer treatment modality particularly, due to its prominently low side effects and high treatment efficacy compared to conventional chemotherapy and radiotherapy. However, insufficient AC magnetic induction heating power at a biological safe range of AC magnetic field (H_{appl} x f_{appl} < 3.0 ~ 5.0 x 10^9 $Am^{-1}s^{-1}$), and highly required *in-vitro* & *in-vivo* biocompatibility as well as biocleanrance with chemical suspension stability of superparamagnetic nanoparticle (SPNP) hyperthermia agents are still remained as critical challenges for successful clinical hyperthermia applications. In addition, an automatically and accurately controllable AC magnetic induction heat generator for mid or large-sized animals including human patients are essentially required for highly efficient hyperthermia in cancer clinics.



Total solution of Magnetic Nanofluid Hyperthermia (MNH) by hypertheranoid™ system to treat solid cancers with exceptionally high treatment efficacy

In this talk, I will present the newly developed highly biocompatible magnesium shallow doped γ -Fe_2O_3 nanofluids (hypertheranoid™-1) with exceptionally high intrinsic loss power (ILP) in a range of 14 nhm^2kg^{-1}, which is a ~100 times higher than that of commercial Fe_3O_4 (Feridex, ILP = 0.15 nhm^2kg^{-1}) at a H_{appl} x f_{appl} = 1.23 x 10^9 $Am^{-1}s^{-1}$, and also report our newly commercialized hyperthereanoid™-EX AC magnetic field generators, which produce automatically controlled precise AC magnetic field, for small animal pilot studies, for mid-size animal cancer treatment for veterinary clinc, and for human patients in cancer clinic. *In-vitro* and *in-vivo* magnetic hyperthermia studies using various hypertheranoid™-1 nanofluids and hyperthereanoid™-EX series are conducted to evaluate the bio-feasibility and bio-availability for preclinical and clinical applications. According to the all the bioavailability testing results, it was obviously verified that the newly developed hyperthereanoid™ system shows promising hyperthermic effects to completely kill the solid cancers.

Speaker Biography

Seongtae Bae received his Ph. D degree in Electrical and Computer Engineering from the University of Minnesota, Minneapolis, USA in 2003. He is currently working as an assistant professor and a director of "Nanobiomagnetics and Bioelectronics Laboratory (NB2L)" in the Department of Electrical Engineering at the University of South Carolina (USC), Columbia, USA. And also, he has a joint appointment with biomedical engineering program in the college of engineering and computing at USC, he was also an associate professor in department of neurosurgery at the Seoul National University (SNU) college of medicine, Seoul, Korea and National University of Singapore (NUS) (Singapore) for 9 years. His current research interests are focused on magnetic nanofluids for cancers, *in vivo* & *in-vitro* magnetic based biosensors/biomems, extremely low frequency nanomagnetic biomedical devices and medical instrumentation for neural engineering (neurodegenerative diseases/ neuromodulation). He is currently members/board member/editorial board member of IEEE Magnetics Society, IEEE Engineering in Medicine and Biology Society, American Physics Society (APS), Korean Society for Nanomedicine, International Society of Hyperthermic Oncology, and EC Ophthalmology.

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