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Magnetic nanoparticles: Application as RF hyperthermia therapy & contrast agent in magnetic resonance imaging

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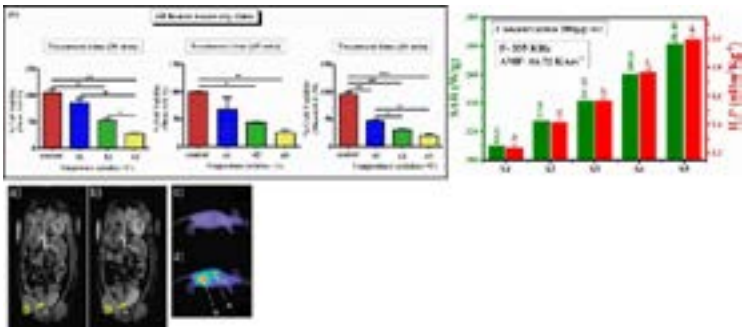
Cancer is one of the biggest curse on humanity, causes almost 8.2 million deaths annually. In past decades, many conventional therapies including radiation and chemotherapy have been employed for the treatment of cancer. However, conventional chemotherapy and radiotherapy methods for cancer treatment are associated with the severe side effect. In comparison to the traditional method, Magnetic Hyperthermia (MHT) is a promising non-invasive way to cure cancer. The localized magnetic materials (act as heating source) into the tumor tissue produce heat by oscillating their magnetic moments, thereby efficiently destroying tumor cells without much damage to surrounding healthy cells. Cancer cells are typically more susceptible to mild heat than the healthy cells because of compactly disorganized blood vessels that reduce blood flow in a tumor which limits the heat dissipation to the surrounding area. Magnetic nanoparticle have been widely used in biomedical applications such as targeted drug delivery, hyperthermia treatment of cancer and magnetic resonance imaging contrast enhancement, based on their inherent magnetic property, high Specific Absorption Rate (SAR) and low cytotoxicity profile. In this work for cancer treatment using MHT, we have used surface modified iron oxide nanoparticles (Fe_3O_4) and Fe_3O_4 decorated graphene oxide. We demonstrated the high colloidal stability and high heating efficiency of surface modified iron oxide nanoparticles (Fe_3O_4) and Fe_3O_4 decorated graphene oxide. We also performed an *in-vitro* hyperthermia experiment in the range of 41 to 43^{0}C for three different time interval to treat cancer cells. Our results revealed maximum cancer cell death occur at 43^{0}C for 60 min of hyperthermia treatment.



Biography

Bijoy K Kuanr received the PhD degree in "Microwave materials & Devices" in Electronic in 1993. He has more than 20 years of research experience in India as well as in various laboratories in Germany and USA. From 1994-96, he joined the Microwave Laboratory of Professor Dr. Guther Nimtz at University of Koeln, Germany as a Post-Doctoral Researcher. From 1999-2001 he worked with Professor Dr. Peter Grünberg - (Nobel Laureate - Physics 2007) as a guest scientist in GMR-Sensor project. In 2002 he joined University of Colorado at Colorado Springs as a senior Researcher till 2013. His main research deals with electromagnetic theory and measurement techniques applied to materials, devices, and circuits at microwave, millimeter-wave.

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