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Magnetic CNTs for selective ablation of cancer cells

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The magnetic fluid hyperthermia can be efficient in treating patients with cancer assuming that the magnetic fluid being a colloidal suspension of magnetic nanoparticles is selectively delivered to the tumor site. By exposing the carried particles to the alternating magnetic field heat energy would be dissipated by the carriers, causing the temperature rise in the tumor's close vicinity making its ablation. The healthy cells can survive temperatures up to 42 °C, but cancer cells undergo apoptosis in therapeutic temperatures of 42-45 °C. Carbon nanotubes (CNTs) are capable of absorbing part of the magnetic field radiation due to van Hove singularities but more effective is to fill them with iron atoms. In this paper we present the results of applying highly Fe doped CNTs as the carriers suspended in buffer fluid creating all together a ferro-fluid. However in between the carbon atoms of CNTs strong van der Waals forces appear. They are the main reason for CNTs' aggregations in suspensions to occur. Therefore, dispersing CNTs is incredibly challenging. In our case the CNTs were dispersed solely in gelatine or in gelatine with SDS (sodium dodecyl sulfate). The fluid was subjected to hyperthermia heating, as well, to simulate the reaction of magnetic CNTs in an alternating magnetic field of radio frequency. The temperature growth characteristic curves will be presented and discussed. The tests performed on CNTs ferronanofluids have shown that it is possible to obtain required heat dissipation in cancer cells.

Biography

Zbigniew Kolacinski has completed his PhD, DSc from Lodz University of Technology and received Professor Title from the President of Poland. He is the Leader of the Plasma Technology Group and the author or co-author of more than 250 papers presented at conferences and published in scientific journals. His book "Thermodynamics of Short Arc Plasma" was edited in English and Chinese. He is a Member of High Power Section and Plasma Chemistry of the Polish Academy of Sciences. He is currently working on hyper thermal selective destruction of cancer cells.

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