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Shape Effect of Magnetic Nanoparticles on Hyperthermia Applications[1] JEOTIKANTA MOHAPATRA, F. ZENG, K. ELKINS, N. POUDYAL, K. GANDHA, J. PING LIU, Department of Physics, University of Texas at Arlington, Arlington, TX 76019, USA — Magnetic Fe_3O_4 nanoparticles (NPs) are extensively studied for their applications in advanced technologies. Incorporation of different transition metal ions and control of their sizes from nanometre to submicron scale are the keys for the magnetic property manipulation. We have investigated an alternative approach to optimize the magnetic properties by tailoring the shape of the NPs based on the observation that anisotropy of the NPs plays a crucial role in defining the magnetic characteristics. To synthesize monodisperse Fe_3O_4 NPs we have modified the conventional thermal decomposition to a 'solventless' synthesis approach where long chain amine/acid acts as reducing and surface functionalizing agent. Various shapes like spheres, rods, octahedrons and cubes are obtained through simple alteration in reaction conditions. Octahedral and cube shaped Fe_3O_4 NPs exhibit bulk magnetization (92 emu/g) value due to the reduced surface spin disorder. These anisotropic NPs serve better in hyperthermia applications compared to the conventional spherical NPs. The cube and octahedron NPs show significantly higher SAR value, making them a potential candidate for hyperthermia treatment.

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Jeotikanta Mohapatra
University of Texas at Arlington

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