

4th International Conference and Exhibition on **Materials Science & Engineering** September 14-16, 2015 Orlando, USA

Synthesis of Fe₃O₄ nanostructures and their applications

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Magnetic nanostructures have been fabricated by wet-chemical routes, such as thermal decomposition and hydrothermal process. For magnetic nanoparticles, we have fabricated spherical Fe₃O₄ nanoparticles. We have also synthesized Fe₃O₄ nanorings and nanodiscs. Because of their vortex domain structure, magnetic nanorings and nanodiscs can be relatively well suspended with suitable surfactant, even if their sizes are much larger than the critical size for super-paramagnetism. These nanorings and nanodiscs possess relatively large magnetic hysteresis loss, which could result in excellent performance for magnetic hyperthermia. We have performed in vivo hyperthermia. The results have demonstrated that magnetic nanorings are promising hyperthermia agents for cancer treatment. Fe₃O₄ nanodiscs could be aligned under magnetic field. This has resulted in a great enhancement of magnetic hyperthermia performance. In addition, these magnetic nanoparticles have shown excellent results for MRI contrast enhancement. In this work, we have also fabricated Fe₃O₄ films with enhanced magnetization.

Biography

Jun Ding obtained his Diploma in Physics from University of Wuppertal in 1986, and PhD from Ruhr University Bochum, Germany in 1990. He has been working on magnetic and nanostructured materials for more than 25 years. He is currently working as a Professor at Department of Materials Science & Engineering, National University of Singapore. He has published over 350 journal papers with a total citation of >9000 and H-Index=52.

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