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γ-Fe_2O_3 superparamagnetic nanoparticles and their applications

Yan Minhao
Southwest University of Science and Technology (SWUST), P. R. China

Recently, large research efforts were focused on the fabrication of inorganic nanoparticles (NPs) and their application in biomedical field. One of the promising biomedical applications of these NPs is their use as agents for tumor hyperthermia. Here, we interested in the fabrication of biofunctionalized NPs γ-Fe_2O_3 for hyperthermia. First, we developed simple protocols for coating nanoparticles by polyelectrolytes (PEs). We then evaluated the stability of these colloidal dispersions in various environments. Then we covalently grafted bioactive peptides to the coating layer of the NPs. These bioactive peptides can target to the specific receptors expressed on the surface of human prostate cancer cells. Local heating induced by applying a rotating magnetic field with high frequency can destroy the tumor tissue. Moreover, these NPs are also used as building blocks of supra-colloidal structures. In this approach, it is as if the NPs were "atoms" and supra-colloidal objects were "molecules" made from these "atoms". We developed an original approach based on the electrostatic complexation between the anionic superparamagnetic NPs with cationic PEs to obtain nanostructured cylindrical aggregates. These rigid wires remained superparamagnetic properties. The co-assemblage between these two species with opposite charges was controlled by a desalting method and extra charges repulsion. Using this method, we can easily control the length, mechanical rigidity and surface charges of these wires. Beyond, we show that this soft-chemistry assembly approach is a general phenomenon independent of the feature of the macromolecular building blocks, opening significant perspectives for the design of multifunctional materials.

Biography

Yan Minhao has completed his PhD from Université du Maine/CNRS (France) and Postdoctoral studies from Université Paris-Diderot/CNRS (France). He was then employed as Researcher with manager status by Nanoscience Foundation, based in the French Alternative Energies and Atomic Energy Commission (CEA France). Afterwards he won the "100 talent" project (Sichuan, China) in 2012. Actually he is the Distinguished Professor in State Key Laboratory Cultivation Base for Nonmetal Composites and Functional Materials, Southwest University of Science and Technology (SWUST). He has published more than 20 papers in reputed journals (*ACS Nano, ACS Applied Materials & Interfaces, Soft Matter,* etc).

yanminhaolemans@yahoo.fr

Humidity sensing investigations on copper ferrite: A comparative study

Richa Srivastava
University of Lucknow, India

Nanostructured Copper Ferrite (sample B1 and B2) were synthesized by chemical precipitation methods using two different precipitating agent i.e., sodium hydroxide and ammonium hydroxide respectively. X- ray diffraction proved the formation of copper ferrites. Crystallite sizes of the materials B1 and B2 were 86 and 14 nm respectively. Surface morphology of the sample B2 reveals that it has more adsorption sites in comparison to B1. Further the Pellets, thick and thin film of materials B1 and B2 were prepared and investigated with the exposition of humidity. Our humidity sensing properties illustrate that thin film prepared from material B2 was most sensitive among all having maximum average sensitivity 46.2 MΩ/%RH. Best sensitivity, less hysteresis and good reproducibility identifies that fabricated humidity sensor (B2) is promising and challenging.

richadolly@rediffmail.com