

DR08

Magnetic Behaviour of Composites Containing Polyacrylate Coated CoFe₂O₄**Hui Liu, Feng Xu, Liangchao Li*, Yuping Wang, and Haizhen Qiu**Zhejiang Key Laboratory for Reactive Chemistry on Solid Surface, Department of Chemistry,
Zhejiang Normal University, Jinhua 321004, People's Republic of China

*Corresponding author. Tel.: +86 579 8228 2384; Fax: +86 579 8228 2489. E-mail address: sky52@zjnu.cn (L. Li).

In the recent years, polyacrylate (PAA) has been paid to the discovery of suitable carriers for controlled drug delivery and biomedical material due to their nontoxic, biocompatible and slower biodegradable properties and requirement of the clinical therapy. Magnetically controlled drug delivery is one of the various possibilities of drug targeting. Ferrofluids or magnetic fluids, consisting of ultrafine magnetic particles or encapsulated magnetic particles, are stable dispersed colloidal suspensions in an organic or aqueous carrier medium. As a result, PAA is considered as a suitable candidate for structural carriers of magnetic materials. CoFe₂O₄ (CFO) was chosen as the core material due to its high magnetostrictivity and relatively high Néel temperature. Our work aims to develop composites of magnetic nanoparticles covered with well-defined hydrophilic polymers so they could be dispersed in aqueous fluids. Hence, the new composite cooperates with the advantages of cobalt ferrite and polyacrylate.

In this article, CoFe₂O₄/polyacrylate (CFO/PAA) nanocomposite with superparamagnetic behavior was synthesized by in situ emulsion polymerization of acrylic acid (AA) monomer in the presence of CFO magnetic fluid with ultrasonic assisted. The obtained samples were characterized using X-ray diffraction (XRD), Fourier transform infrared spectroscopy (FT-IR), transmission electron microscopy (TEM) and vibrating sample magnetometry (VSM). XRD and FTIR spectra confirmed the formation of CFO/PAA nanocomposite. TEM images showed that CFO nanoparticles with the particle sizes of about 12 nm were well dispersed in the polymer matrix. The nanocomposite exhibited superparamagnetic behavior at room temperature under applied magnetic field. The CFO/PAA composite in Ms is less than markedly that of CFO ferrofluids and present superparamagnetic properties. The formation mechanism of CFO/PAA nanocomposite was investigated as well.

This work was supported by the Science and Technology Key Project of Zhejiang Province (No.2006C21080), Xinmiao Talented Person Project of Zhejiang Province (No.2007R40G2030149)

DR09

Fabrication and Magnetic Properties of Electrospun Barium Ferrite (BaFe₁₂O₁₉) Nanostructures**Kiettipong Banlusan^{1*}, Sirapat Pratontep², and Santi Maensiri^{1,3}**¹Department of Physics, Faculty of Science, Khon Kaen University, Khon Kaen, 40002, Thailand²Thai Microelectronic Center (TMEC), Suwiontawong Road Wangtakien District Amphur Muang,
Chachoengsao, 24000, Thailand³Integrated Nanotechnology Research Center (INRC), Khon Kaen University, Khon Kaen, 40002, Thailand

*Corresponding author: Kiettipong Banlusan, e-mail: tg_oo@hotmail.com

Hexagonal barium ferrite (BaFe₁₂O₁₉) nanostructures were fabricated by electrospinning method using a solution that contained poly(vinyl pyrrolidone) (PVP) and Ba and Fe nitrates as metal sources. The as-spun and calcined BaFe₁₂O₁₉/PVP composite samples were characterized by TG-DTA, X-ray diffraction, FT-IR, and SEM, respectively. For comparison, the prepared solution without electrospinning was also calcined and characterized. After calcination the as-spun BaFe₁₂O₁₉/PVP composite fibers (fiber size of 100–600 nm in diameter) at 1000 °C in air for 3 h, BaFe₁₂O₁₉ nanostructures consisting of a fiber structure of packed particles or crystallites with well-developed hexagonal structure were successfully obtained. The crystal structure and morphology of the nanofibers were influenced by the calcination temperature. After calcination at 1000 °C, the nature of nanofibers changed which was possibly due to the reorganization of the BaFe₁₂O₁₉ structure at high temperature, and a fiber structure of packed particles or crystallites was prominent. Crystallite size of the nanoparticles contained in nanofibers was 128 nm. Room temperature magnetization results showed a typical ferromagnetic behavior of the calcined BaFe₁₂O₁₉ sample, having its specific saturation magnetization (M_s) and coercivity (H_c) of 23.17 emu/g and 1718 Oe, respectively.

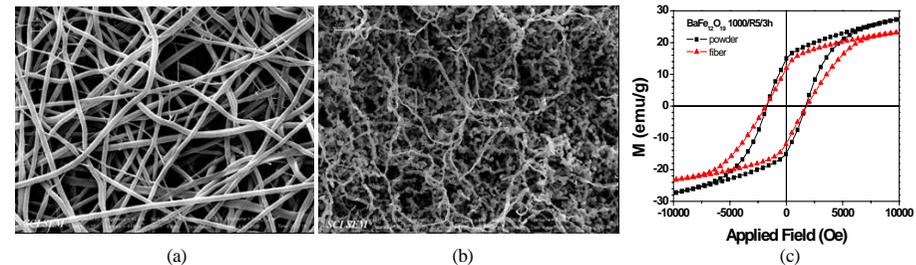


Fig. 1. (a) and (b) SEM images of the as-spun and calcined BaFe₁₂O₁₉/PVP composite samples. (c) The specific magnetizations of the electrospun BaFe₁₂O₁₉/PVP composite and powder samples both calcined in air for 3 h at 1000 °C, as a function of field, measured at 20 °C.