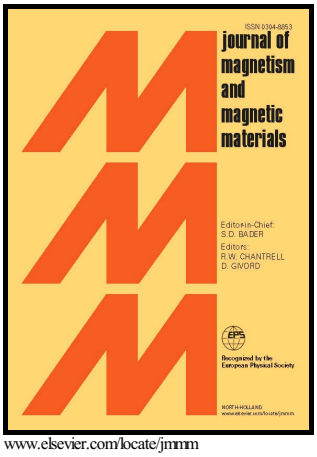

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Ultrasonic assisted rapid synthesis of high uniform super-paramagnetic microspheres with core-shell structure and robust magneto-chromatic ability

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Abstract: Super-paramagnetic core-shell microspheres were synthesized by ultrasonic assisted routine under low ultrasonic irradiation powers. Compared with conventional routine, ultrasonic effect could not only improve the uniformity of the core-shell structure of Fe_3O_4@SiO_2, but shorten the synthesis time in large scale. Owing to their hydrophilicity and high surface charge, the Fe_3O_4@SiO_2 microspheres could be dispersed well in distilled water to form homogeneous colloidal suspension. The suspensions have favorable magneto-chromatic ability that they sensitively exhibit brilliant colorful ribbons by magnetic attraction. The colorful ribbons, which distributed along the magnetic lines,make morphology of the magnetic fields become “visible” to naked eyed. Those colorful ribbons originate from strong magnetic interaction between the microspheres and magnetic fields. Furthermore, the magneto-chromatic performance is reversible as the colorful ribbons vanished rapidly with the removing of magnetic fields. The silica layer effectively enhanced the acid resistance and surface-oxidation resistance of theFe_3O_4@SiO_2 microspheres, so they could exhibit stable magnetic nature and robust magneto-chromatic property in acid environment.

Keywords: Ultra-rapid; Composite; Optical;Super-paramagnetic; Magneto-chromatic

1 Introduction

Among all magnetic materials, the Fe_3O_4 are paid much attention for many technological applications due to its high magnetic moment, high saturation magnetization, spin polarization property, and temperature dependent magnetic