TB03

Coating of Magnetic Particle with Polystyrene and its Magnetic Characteristics

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Recently as one of the important applications of magnetic particles, extensive investigations have been putting in the area of magnetorheological (MR) materials. The MR fluids,which are known as one of the smartest materials because they are transformed from a fluid-like to a solid-like state within milliseconds under an external magnetic field, demonstrate drastic changes in rheological properties. Ferro- and ferrimagnetic materials can be used as a dispersed phase of MR fluids since these particles are easily magnetized under an external magnetic field. However, most magnetic materials, such as carbonyl iron particles and γ-Fe_2O_3 have very serious sedimentation drawbacks and poor redispersion ability due to their large density.

In this work, to resolve these issues, we prepared core-shell structured γ-Fe_2O_3/polystyrene composites via dispersion polymerization. Oleic acid was used as a surfactant with its hydrophilic group modifying the surface of maghemite nanoaprticle, while its hydrophobic group helps connection with the vinyl monomer. Both SEM and TEM images described surface and internalmorphology very clearly, while the TGA data and XRD pattern showed thermal property as well as changed crystallization. The magnetization properties of the fabricated particles were analyzed by using VSM. The magnetic saturation of the γ-Fe_2O_3/polystyrene wasreported to be slightly reduced compared with those of the raw γ-Fe_2O_3 particles.

Furthermore, its MR properties were examined by a rotational rheometer equipped with a magnetic field supplier. Yield stress and flow response (shear stress and shear viscosity) were investigated at magnetic field strengths which were controlled with the change of current. Although the MR properties, such as yield stress and shear viscosity of γ-Fe_2O_3/polystyrene based MR fluids, decreased slightly compared with those of γ-Fe_2O_3 based MR fluids, the sedimentation stability was clearly improved.

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TB04

Preparation and Physical Characterization of Polyacrylamide Coated Magnetite Particles

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Iron oxide particlessuch as magnetite (Fe_3O_4), hematite (α-Fe_2O_3), maghemite (γ-Fe_2O_3) have attracted many interests because of their potential application in various fields including magnetic information storage and magnetic resonance imaging. Furthermore, the magnetic particles have been recently adopted into one of the most useful application of magnetorheological (MR) fluid. MR fluid, which is consisted with magnetic particle suspended in non magnetic medium, can betransformed from fluid-like to solid-like with under external magnetic field by changing the orientation of particle in fluid with different magnetic field strength. This extraordinary rheological property providesthe novel application such as active controllable damper and torque transducers. In order to use the iron oxide particle in MR fluid, the uniform dispersion and the suitable particle size are considered as important properties. The particle density shouldalso match to the medium density for industrial application of MR fluid.

In this study, the magnetic particle was fabricated for MR application by coating magnetite with polyacrylamide using an inverse emulsion polymerization. Physical and chemical properties of the synthesized particles were characterized by Fourier transform infrared spectroscopy (FTIR), vibrating sample magnetometer (VSM), thermogravimetric analyzer (TGA). Its MR fluid was also prepared by dispersing the synthesized magnetic particle in non magnetic medium. Rheological properties of the MR fluid under applied magnetic field strength were investigated by using rotational rheometer.

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