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Pickering emulsion polymerized core-shell structured poly(methyl methacrylate)/ graphene oxide particles and their electrorheological characteristics

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Abstract: Poly(methyl methacrylate)/graphene oxide (PMMA/GO) particles were synthesized via a Pickering emulsion polymerization, in which the GO was used as a solid stabilizer. This process can be considered as an environmentally benign and facile process without using organic surfactant and additional coating process. The core-shell structure and the rough surface of the particles were observed using transmission electron microscopy and scanning electron microscopy. The difference in atomic elements between PMMA/GO and PMMA was characterized using energy-dispersive X-ray spectroscopy. The electrorheological (ER) fluid, which is the suspension of the synthesized particles dispersed in insulating silicone oil, showed the typical behavior under an applied electric field. The ER fluid underwent a phase transition from liquid-like to solid-like behavior in a dynamic oscillation test. The complex viscosity determined by the extended Cox-Merz rule was slightly higher than the shear viscosity in a steady shear condition. Furthermore, the dielectric spectra of the ER fluid were also investigated using an inductance-capacitance-resistance meter, providing their dielectric correlation with the ER fluid performance.

Keywords: Electrorheological; Viscoelasticity; Pickering emulsion; Core-shell; Graphene oxide; Poly(methyl methacrylate)

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