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Electrorheological Properties of Suspensions Prepared from Polystyrene- Block- Polyisoprene Copolymer

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Abstract: Considerable scientific and industrial interest is currently being focused on a class of materials known as electrorheological (ER) fluids, which display remarkable rheological behaviour, being able to convert rapidly and repeatedly from a liquid to solid when an electric field (E) is applied or removed. In this article, the synthesis, characterization, partial hydrolysis and ER properties of polystyrene- block}-polyisoprene copolymer (COP) were investigated. The block copolymer was characterized by GPC, viscosity measurements, ^{1} H-NMR and FTIR spectroscopies, particle size measurements, and elemental analysis. The polystyrene block of the copolymer was partially hydrolyzed by a series of chemical reactions and then converted to a lithium salt by washing with a lithium hydroxide solution. Colloidal suspensions of this polymeric salt were prepared in silicone oil, at a series of concentrations (5-33% m/m). Colloidal stabilities of these suspensions were determined at 20^{o}C and 80^{o}C. Flow times of suspensions were measured under no electric field (E = 0) , and under an applied electric field (E \neq 0) , and ER activity was observed. Further, the effects of solid particle concentration, shear rate (\dot {γ}), electric field strength, addition of a polar promoter and high temperature on ER activities of colloidal suspensions were investigated, and excess shear stresses were determined.

Key Words: Electrorheological fluids, polystyrene- block}-polyisoprene copolymer, colloidal dispersions.

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