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Electric Field Generated Stress Moduli in Polythiophene/Polyisoprene Elastomer Blends
TOEMPHONG PUVANATVATTANA, ANUVAT SIRIVAT, PPC, Chulalongkorn University — The effects of crosslinking ratio and electric field strength on the rheological properties of polyisoprene and polythiophene/polyisoprene (Pth/PI) blendss were investigated as potential electroactive actuator. Electrorheological properties of polyisoprene and blends were measured under the oscillatory shear mode with the applied electric filed strength varying from 0 to 2 kV/mm. The dynamic moduli, G′ and G″, of the pure polyisoprene depend on the crosslinking ratio and the electric filed strength; the storage modulus (G′) increases but the loss modulus (G″) decreases with increasing crosslinking ratio. The storage modulus (G′) and the loss modulus (G″) of the pure polyisoprene fluid exhibit no change with increasing electric field strength. For PI with the crosslinking ratios of 2, 3, 5 and 7 (PI_02, 03, 05 and 07), the storage modulus sensitivity, $\Delta G'/G'_o$, increases with electric field strength and attains maximum values of 10%, 60%, 25%, and 30% at the electric field strength of 2 kV/mm, respectively. The loss modulus (G″) of the PI with the crosslinking ratios of 2 and 3 increases with the electric field, but for the blends of the crosslinking ratios of 5 and 7, it decreases. For the blends of polythiophene with PI at concentrations of 5%, 10% and 20% by vol, G′ and G″ are generally higher than those of pure polyisoprene.

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