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Structural Relaxation of Water-in-Oil Emulsion under Direct Current Electric Field¹ MEHRNOOSH MORADI, VLADIMIR ALVARADO, University of Wyoming — In this study, electrorheology of water-in-oil emulsion is explored in the presence of direct current (DC) electric fields. DC electrorheological (ER) experiments in dynamic mode are performed to study the structural evolution of emulsions from a random configuration to organized microstructures. Critical electric field (CEF), i.e. value of field at which the emulsion structure breakdown occurs, is measured. In this work, all the ER experiments are completed at electric field strength below CEF. Since ER emulsion behavior is controlled by electrical and hydrodynamic forces, structural relaxation of emulsions as a function of electric field strength, dynamic frequency and continuous phase viscosity is investigated. Time evolution of viscosity and electrical current are measured to reflect characteristics of the system microstructure. Also, hysteresis is measured at low electric fields to study the rheological properties restoration after the field has been turned off. The results on the relaxation process show that the electric field induces increase in viscosity as well as electrical current.

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