583c Transient Rheology of a Polypropylene Melt Reinforced with Long and Short Glass Fibers

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In this paper we investigate the transient shear rheology of a polypropylene containing long fibers (initial lengths 6 to 11 mm and L/D > 150) and short fibers (initial lengths of 0.5 mm and L/D < 50). The objectives of this work are to determine the relation of stress growth and relaxation behavior to fiber orientation and interaction and matrix rheology and determine the feasibility of extending Doi's theory for rod-like systems to these materials. A parallel plate rheometer was used as the gap size could be altered to assess the interaction of the fibers with the boundaries imposed by the test fixtures. Samples were prepared with different degrees of initial orientation including random, perpendicular, and parallel to the flow direction. The orientation of the fibers under start up and cessation of shear flow was assessed and compared to predictions of the theory. The interaction of the long fiber fibers with each other seems to require that an additional modification of the theory be used. It is also observed that the presence of the long fibers retards the relaxation processes leading to enhanced viscoelastic effects.