

231d Rheology of Semi-Dilute Suspensions of Polystyrene Ellipsoids at High Peclet Numbers

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In the semi-dilute regime, the contribution of rigid fibers to the bulk stress increases significantly as a result of hydrodynamic interactions between individual fibers. Despite previous investigations, many of the observed rheological phenomena remain unexplained and disputed. The discrepancy between past experiments is due in part to the lack of an ideal system which is free of wall effects, sedimentation, and non-hydrodynamic effects. To alleviate some of these problems, we report on a suspension of neutrally buoyant, prolate spheroids having moderate aspect ratios and nearly monodisperse size and shape. Using a procedure similar to Ho *et al.* [1], we have successfully produced polystyrene ellipsoids with aspect ratios ranging from 1 to ~ 10 . The length scales of these particles are of $O(10)$ μm and the ratios of the rheometer gap to particle lengths are in excess of 50, resulting in the absence of wall effects for the suspensions studied. We have observed the steady state and transient rheology of suspensions containing ellipsoids of three different aspect ratios of 3, 7 and 10, probing concentrations in both the dilute and semi-dilute regimes. Measurements of these suspensions are made for Peclet numbers ranging from 10^2 to 10^6 .

[1] C. Ho, A. Keller, J. Odell, R. Ottewill. Preparation of Monodisperse Ellipsoidal Polystyrene Particles. *Colloid and Polymer Science*. 271: 469-479 (1993).