310b Tracer Microrheology of Polymer Solutions at Elevated Temperature and Pressure

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This paper considers the effect of changing solvent quality on the microrheological properties of polymer solutions in the semi-dilute regime. Diffusing wave spectroscopy (DWS) is utilized to monitor the thermal motion of dispersed particles in polymer solutions. The measured mean squared displacement (MSD) of the particles is used to infer the microrheological properties of the polymer solutions since the MSD is directly proportional to the creep compliance. For the case of aqueous poly (ethylene oxide) (PEO) solutions, the MSD of the tracer particles is shown to change with temperature and pressure variations owing to modification of water hydrogen bonding properties. As a means for interpreting the PEO-water solution results, polystyrene (PS)-tricresyl phosphate and PS-dioctyl phthalate solutions are considered as model good and theta solvent systems respectively. The observed microrheological behavior of these systems is discussed within the context of macroscopic rheological measurements and theoretical descriptions of polymer solution dynamics.