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Porod SAXS Studies of Shear-Induced Droplet Deformation in a Concentrated Immiscible Polymer Blend WESLEY BURGHARDT, KRISTIN BRINKER, Northwestern University — Droplet deformation, break-up and coalescence of immiscible polymer blends under flow is fundamental to understanding the effect of processing on ultimate blend properties, as well as the excess rheological properties associated with deformation of the multiphase structure. Rheo-optical methods have frequently been employed to gain insight into these processes, but in most cases, optical methods are restricted to quite dilute concentrations, owing to concerns of high turbidity and multiple scattering. Here we explore used of time-resolved synchrotron small-angle x-ray scattering as an alternative method to study multiphase materials under shear. Typical blend droplet sizes of $\sim$ 1 micron are large relative to length scales typically probed by SAXS; however, the wide-angle limit of small-angle scattering (i.e. the Porod regime) is directly sensitive to interfacial structure of multiphase materials and, when rendered anisotropic by shear flow, provides direct insights into the deformation and orientation of interface. We report scattering studies in the flow-gradient plane of a polystyrene/poly(methyl methacrylate) blend, which is approximately viscosity matched, to step-strain deformations. Postulating that each droplet is deformed to a geometrically similar shape, data are analyzed in the context of a model of Porod scattering from ellipsoids.

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