Nanoscale optical probes of polymer dynamics in confined geometry

Michael D. Barnes
Chemical and Analytical Sciences Division
Oak Ridge National Laboratory
Oak Ridge, Tennessee 37831-6142

In the last couple of years, we have developed coherent light scattering techniques for probing dynamics of polymer-blend and polymer-composite systems in spherical particles generated from microdroplets of dilute polymer solution. Two-dimensional optical diffraction - a tool that has long been used for size characterization of liquid droplets - provides a new way to probe polymer nanocomposites and polymer blends on a mass scale of a few picograms and a length scale comparable to the diameter of a single polymer molecule. We have used this technique to probe phase-separation, material composition and properties, polymer diffusion, and polymer-electrolyte interactions. A new route for producing homogeneous nanocomposites and polymer blends with specifically tunable material properties.

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