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Morphology of polymer/LC composites. R.S. Justice¹, T.J. Bunning², R.A. Vaia², D.W. Schaefer¹, ¹Univ. of Cincinnati, Dept. of Chemical & Materials Engineering, P.O. Box 210012, Cincinnati, OH 45221-0012, USA, ²Air Force Research Laboratory, Materials & Manufacturing Directorate, 3005 P. St., Bldg 651, WPAFB, OH 45433-7702, USA.

Polymer dispersed liquid crystals (PDLCs) are of technological importance in the development of switchable windows, electro-optic shutters, displays, and switchable gratings. Using photo-initiated polymerization of an initially homogenous mixture containing reactive monomers and liquid crystal molecules, a two-phase product is produced whose optical properties depend on the composition and polymerization protocol.

Using ultra small angle x-ray scattering we find nanoscale domains whose morphology depends on either 1) the liquid crystal concentration, 2) the components of the initial monomer syrup, or 3) the intensity of the curing radiation. We find that the domain size depends strongly on the liquid crystal concentration, but weakly on the other processing parameters. In some cases, two length scales are observed in the morphology. From the limiting Porod slope, we observe a crossover from mass to surface fractal character with liquid crystal concentration. Because of the fractal character of the domains, invariant analysis proved inconclusive.