Spherulites for Polar Dye Organization

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Melts of D-sorbitol form remarkably transmissive, radially-symmetric, polycrystalline spherulites. Recent reports by Yu suggest that these structures arise from concomitant crystallization of two polymorphs at room temperature.[1] Spherulites grown at higher temperatures consist of a single polymorph. There is considerable interest in the material science community to generate polar order in achiral optically responsive molecules for use in high-speed electrooptic modulators. As the propagating crystal interface of the spherulites invariably orients dyes dissolved in the melt, we seized upon the opportunity to utilize these structures as an entirely new method for generating polar media.

DAST, a well known non-linear optical dye, is highly soluble in the sorbitol melt and readily oriented by the spherulite matrix. Characterization of the linear and non-linear optical properties of these materials includes linear birefringence and dichroism imaging, polarized absorption, and second harmonic generation microscopy. Dyed spherulites exhibit pronounced absorption anisotropies (dichroic ratios > 3), as well as second harmonic generation nearly 70 times that of the undyed samples. Effects of polymorph fractionation on growth and optical properties will also be discussed.

[1] Yu L., *Cryst. Growth Des*., 2003, 967.

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