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Anisotropic Bicontinuous Nanoporous Materials with Controlled Pore Sizes from Randomly End-linked Copolymer Networks.[1] DI ZENG, RYAN HAYWARD, Univ of Mass - Amherst — Anisotropic nanoporous materials are of interest for a variety of applications including light-weight structural materials, filtration membranes, and photonic structures. We have studied the microphase separation of randomly end-linked copolymer networks (RECNs), as a robust method to generate anisotropic porous materials. Specifically, end-linking of telechelic acrylate terminated polystyrene (PS) and poly(D, L-lactide) (PLA) strands with a tetrafunctional thiol crosslinker, followed by solvent removal, induces microphase separation into bicontinuous morphologies across a wide range of composition. Stretching these crosslinked networks above the glass transition temperatures of the constituent polymers provides a simple way to introduce anisotropy, yielding continuous but anisotropic pores following etching of the PLA phase in alkaline solution. Small angle X-ray scattering (SAXS) shows a progressive increase in anisotropy with applied strain, while both SAXS and transmission electron microscopy (TEM) suggest that the primary pore size remains unchanged, at a value determined by the molecular weight of the telechelic polymer strands.

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