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Tailoring Co-continuous Nanostructured Morphologies in Polymer Blends LE LI, SUNG-WOO HONG, XIAOBO SHEN, RYAN HAYWARD, THOMAS RUSSELL, University of Massachusetts Amherst — We describe a simple approach to prepare thin films of polymer mixtures with co-continuous morphologies having characteristic length scales down to tens of nanometers based on spinodal phase separation. The degree of immiscibility between polystyrene (PS) and poly(2-vinylpyridine) (P2VP) is tuned by incorporating styrene monomers into the P2VP backbone to yield a random copolymer, thereby tailoring the nonfavorable interactions between the two components. The size scale of the co-continuous morphology is controlled by varying the molecular weights of the components and the film thickness. This strategy is shown to be robust in that the process involves a simple solution-casting; the co-continuity of the morphology occurs provided the solvent dissolves both components; and the co-continuous morphology is insensitive to the substrate surface chemistry. Porous membranes with continuous channels and gradient co-continuous structures can also be generated from the phase separated blend films.

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