

Abstract Submitted
for the MAR15 Meeting of
The American Physical Society

Controlling Structure in Sulfonated Block Copolymer Membranes PHUC TRUONG, GILA STEIN, Univ of Houston, JOE STRZALKA, Argonne National Lab — In many ionic block copolymer systems, the strong incompatibility between ionic and non-ionic segments will trap non-equilibrium structures in the film, making it difficult to engineer the optimal domain sizes and transport pathways. The goal of this work is to establish a framework for controlling the solid-state structure of sulfonated pentablock copolymer membranes. They have ABCBA block sequence, where A is poly(*t*-butyl styrene), B is poly(hydrogenated isoprene), and C is poly(styrene sulfonate). To process into films, the polymer is dissolved in toluene/*n*-propanol solvent mixtures, where the solvent proportions and the polymer loading were both varied. Solution-state structure was measured with small angle X-ray scattering (SAXS). We detected micelles with radii that depend on the solvent composition and polymer loading. Film structure was measured with grazing-incidence SAXS, which shows (i) domain periodicity is constant throughout film thickness; (ii) domain periodicity depends on solvent composition and polymer loading, and approximately matches the micelle radii in solutions. The solid-state packing is consistent with a hard sphere structure factor. Results suggest that solid-state structure can be tuned by manipulating the solution-state self-assembly.

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Date submitted: 21 Nov 2014

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