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Effects of wet-dry cycling on structure and performance of sulfonated pentablock copolymer membranes. PHUC TRUONG, Univ of Houston, GILA STEIN, The University of Tennessee, Knoxville, HALEH ARDEBILI, MEJDI KAMMOUN, Univ of Houston — Membranes based on sulfonated block copolymers have shown potential for water purification, but the structure and performance of these materials have not been studied after soaking in water and drying in air. In this work, we investigate the structure, mechanics, and transport properties of solution-cast sulfonated pentablock copolymer membranes as a function of wet-dry cycling, where one cycle is defined as a 24 hour soak in de-ionized water followed by a 24 hour drying period at 50% RH. The as-prepared membrane is comprised of disordered micellar domains with sulfonated styrene cores and ethylene-propylene/t-butyl styrene coronas. This initial state can be stretched under tension to 50% elongation, absorbs up to 20 wt% water at 55% RH, exhibits proton conductivity of 0.003 mS/cm, and water vapor transport rates of 0.5 kg/m^2/day. After the first cycle, the sulfonated domains are merged into a near-continuous network, and the membranes exhibit enhanced modulus, stress at break and yield stress. With further cycling, the domains continue merging into a continuous network, and transport properties are unchanged. However, at cycle 6, the water uptake declines to 6 wt%, and the films become very brittle with only 5% elongation.

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