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Fabrication of nanoporous block copolymer films using highly selective solvents and non-solvent extraction CHANGHUAI YE, BRYAN VOGT, The University of Akron — Nanoporous polymeric films with high porosity are necessary for some applications, such as anti-reflective coating. A simple and relatively environmental benign method is developed to fabricate nanoporous block copolymer thin film with tunable porosity up to 69% based on selective solvent swelling of the majority phase and subsequent rapid extraction with a miscible non-solvent (water). Poly(butylnorbornene)-block-poly(hydroxyhexafluoroisopropyl norbornene) (BuHFA) is used to generate these porous thin films due to its high T_g (>300 C) and the selectivity of primary alcohols towards HFA. The porosity of these nanoporous films is highly dependent on the solvent quality for HFA. The modulus of the as-prepared nanoporous BuHFA thin films with the porosity from 0% to 69% was investigated by surface wrinkling and a scaling law of modulus versus density was obtained. These nanoporous thin films act as anti-reflective coatings and an increase in transmittance from approximately 92% to 99.1% (average for the full range of visible light) was obtained for double-side coated glass slides. This methodology is simple and highly tunable; extension to other block copolymer systems is likely possible if sufficient solubility contrast between segments exists.

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