Abstract Submitted
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Scattering and Physical Aging in High-Free-Volume Polymeric Glasses[1] AMANDA G. MCDERMOTT, Pennsylvania State University, PETER M. BUDD, University of Manchester, NEIL B. MCKEOWN, Cardiff University, CORAY M. COLINA, JAMES RUNT, Pennsylvania State University — Polymers of intrinsic microporosity (PIMs) form glassy, rigid membranes featuring a large concentration of pores smaller than 1 nm, large internal surface area, and high gas permeability and selectivity. Porosity in these materials—equivalent to free volume—arises from an unusual chain structure combining rigid segments with sites of contortion. Like other glasses, PIMs are subject to physical aging, which reduces the permeability of films over time. Although it is possible to derive useful information such as surface areas and pore sizes from the scattering patterns of many porous materials, scattering from PIMs includes some unusual features. A robust interpretation of these features is presented with support from molecular dynamics simulations. The sensitivity of PIM SAXS/WAXS patterns to time, temperature and film thickness is shown to be qualitatively consistent with physical aging. Models for extracting quantitative information about changes in the sizes and volume fraction of pores are also discussed.

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