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Squeezing a gel to establish network structure-transport property relationships EDWIN CHAN, NICHOLE NADERMANN, Material Science and Engineering Division, National Institute of Standards and Technology, Gaithersburg, MD, 20899, USA., KELLY MCLEOD, GREG TEW, Department of Polymer Science and Engineering, University of Massachusetts at Amherst, Amherst, MA 01003, USA — Gels are used in many applications, ranging from drug delivery to water purification, where regulating transport of a particular permeant is critical. The structure of the gel determines its transport properties but developing the gel structure-transport property relationships often require multiple measurement techniques. In this work, we demonstrate poroelastic relaxation indentation (PRI) as a single measurement tool to establish the relationships between the polymer network structure and the transport properties of well-defined hydrogel networks synthesized via a thiol-norbornene click reaction of poly(ethylene glycol) (PEG) chains. We use PRI to quantify the mechanical and transport properties of a series of "click" hydrogels with different crosslink densities. By applying various thermodynamic network swelling models to the describe the mechanical response of these gels as measured from PRI, we are able to extract thermodynamic parameters of these hydrogels including the Flory chi parameter and the mesh size. We validate our approach by comparing the thermodynamic parameters obtained from PRI with results from neutrons scattering studies of the same series of hydrogels.

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