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A Poroelastic Approach for Quantifying Gel Network Properties

EDWIN CHAN, NICHOLE NADERMANN, KATIE FELDMAN, ERIC DAVIS,
NIST - Natl Inst of Stds Tech — The unique chemical and structural properties of polymer gels has led to the application of these materials in various membrane-based technologies where selective transport is critical to device performance. Characterizing the chemical and structural properties of a gel is critical to understanding its transport behavior. yet quantifying these properties is nontrivial as it typically requires multiple measurement techniques. In this talk, we demonstrate poroelastic relaxation indentation (PRI) as a single measurement tool to characterize the swelling, mechanical and transport properties of model poly(ethylene glycol)-based hydrogel systems. By applying the appropriate thermodynamic polymer network model and the linear theory of poroelasticity, we are able to use the results from PRI to extract the thermodynamic parameters, elastic modulus, water permeability and mesh size of these gels. We validate these results with small angle neutron scattering to illustrate the applicability of the PRI measurement technique for studying these membrane-like materials.

Edwin Chan
NIST - Natl Inst of Stds
Tech

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