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Indentation of polydimethylsiloxane submerged in organic solvents YUHANG HU, Harvard University, XIN CHEN, GEORGE WHITESIDES, JOOST VLASSAK, ZHIGANG SUO — This study uses a method based on indentation to characterize a polydimethylsiloxane (PDMS) elastomer submerged in an organic solvent (decane, heptane, pentane, or cyclohexane). An indenter is pressed into a disk of a swollen elastomer to a fixed depth, and the force on the indenter is recorded as a function of time. By examining how the relaxation time scales with the radius of contact, one can differentiate the poroelastic behavior from the viscoelastic behavior. By matching the relaxation curve measured experimentally to that derived from the theory of poroelasticity, one can identify elastic constants and permeability. The measured elastic constants are interpreted within the Flory-Huggins theory. The measured permeabilities indicate that the solvents migrate in PDMS by diffusion, rather than by convection. This work confirms that indentation is a reliable and convenient method to characterize swollen elastomers.

Yuhang Hu
Harvard University

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