

Abstract Submitted
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Determining Local Mechanical Properties of Soft Materials with Cavitation Rheology¹ JESSICA ZIMBERLIN, NAOMI SANABRIA-DELONG, GREGORY TEW, ALFRED CROSBY, University of Massachusetts — To guide the development of tissue scaffolds and the characterization of naturally heterogeneous biological tissues, we have developed a method to determine the local modulus at an arbitrary point within a soft material. The method involves growing a spherical cavity at the tip of a syringe needle and monitoring the pressure of the cavity at the onset of a mechanical instability. This critical pressure is directly related to the local modulus of the material, which can be measured on length scales similar to size of a single biological cell. Using model hydrogel, materials, we demonstrate the ability for this technique to quantify the local stiffness of hydrogel networks and its relation to the macroscopic stiffness as measured by shear rheometry. In addition to heterogeneities in equilibrium hydrogel networks, we quantify differences in local stiffness during the gelation of hydrogels. Lastly, we consider the influence of surface energy on the onset of cavitation by using different injected agents to induce the instability.

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