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Patterns in swelling hydrogels CHRIS MACMINN, Department of Engineering Science, University of Oxford, THIBAUT BERTRAND, Department of Mechanical Engineering and Materials Science, Yale University, JORGE PEIX-INHO, Laboratoire Ondes et Milieux Complexes, CNRS & Université de Normandie, SHOMEER MUKHOPADHYAY, Department of Geology and Geophysics, Yale University — Swelling is a process in which a porous material spontaneously grows by absorbing additional pore fluid. Polymeric hydrogels are highly deformable materials that can experience very large volume changes during swelling. This allows a small amount of dry gel to absorb a large amount of fluid, making gels extremely useful in applications from moisture control to drug delivery. However, a well-known consequence of these extreme volume changes is the emergence of a striking morphological instability. We study the transient mechanics of this instability here by combining a theoretical model with a series of simple experiments, focusing on the extent to which this instability can be controlled by manipulating the rate of swelling.

Chris MacMinn
Department of Engineering Science, University of Oxford

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