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Dynamics of self-oscillating polymer gels under boundary constraints. VICTOR YASHIN, ANNA BALAZS, Department of Chemical Engineering, University of Pittsburgh, Pittsburgh, PA 15261. — Swollen polymer gels, which respond to an on-going oscillatory chemical reaction by rhythmic variations in their size and shape, might serve as chemical-to-mechanical energy transducers. Polymer gels participating in the Belousov-Zhabotinsky reaction (BZ gels) swell and deswell in response to the reduction-oxidation changes of a metal catalyst, which is linked to the polymer. The BZ gels are unique because they exhibit the autonomous oscillations without a precise external control. To serve as a chemomechanical transducer, a self-oscillating gel must be encased and fixed at a surface; this imposes boundary constraints on the gel dynamics. We perform computer simulations of the pattern formation and shape changes in 2D rectangular BZ gels subjected to the boundary constraints. Dynamics of the self-oscillating gel is simulated using the lattice-string model approach. We demonstrate that the developed dynamic patterns depend on whether the gel is expanded or contracted near the boundary, and on the sample dimensions. We also calculate the forces that the self-oscillating gel exerts on the surface.

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