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Pattern formation in heterogeneous self-oscillating polymer gels. VICTOR YASHIN, ANNA BALAZS, Department of Chemical Engineering, University of Pittsburgh, Pittsburgh, PA 15261. — The chemical reaction and deformations are inherently coupled in the chemo-responsive polymer gels that participate in the Belousov-Zhabotinsky reaction (BZ gels). Chemical oscillations due to the BZ reaction cause variations in the gel's size and shape because of the hydrating effect of the oxidized metal-ion catalyst linked to the polymer. Physical and chemical patterning of self-oscillating gels would facilitate creating active materials that exhibit desirable spatiotemporal behavior. The heterogeneous self-oscillating gels might be designed to respond to external stimuli by switching between pre-programmed dynamic patterns. We explore these potentialities through modeling 2D dynamics of the structurally heterogeneous BZ gels. We start by considering the effects of a spatially non-uniform crosslink density, volume fraction of polymer, and catalyst distribution on the domain of the oscillatory regime. Then, the propagation of the swelling-deswelling waves through the structurally patterned gels is simulated using the gel lattice-spring model approach. We demonstrate and discuss how the spatial organization of the heterogeneous gel affects the origination and propagation of waves.

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