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Inscribing dynamical patterns within heterogeneous self-oscillating gels. ANNA C. BALAZS, VICTOR V. YASHIN, Chemical Engineering Department, University of Pittsburgh, Pittsburgh, PA 15261, SEIICHI SUZUKI, RYO YOSHIDA, Department of Materials Engineering, Graduate School of Engineering, The University of Tokyo, Tokyo, 113-8656, Japan — Grafting the ruthenium catalyst to the network of swollen chemo-responsive polymer gel creates a new class of materials, which exhibit the autonomous, coupled chemical and mechanical oscillations induced by the ongoing Belousov-Zhabotinsky (BZ) reaction. The mechanical oscillations occur due to the hydrating effect of the oxidized Ru that causes the gel to swell and de-swell repeatedly. It was predicted previously that compartmentalization of BZ gels in a nonresponsive gel matrix would enable a researcher to create gel-based devices with the functionality inscribed by the configuration of the Ru-containing patches. Recently, the heterogeneous gels were fabricated that encompass the disk-shaped BZ patches. It was demonstrated experimentally for the first time that the direction of propagation of the chemo-mechanical waves in an array of the BZ patches can be controlled by varying the ruthenium content and size of the patches. Here, we present the results of computational modeling of such heterogeneous self-oscillating gels. We discuss how the catalyst concentration, patch size, and inter- patch distance affect the synchronization of oscillations in the neighboring BZ gels, and how the synchronization effects can be utilized to control the dynamical behavior of the entire system.

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