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Traveling Waves in a Reactive Polymer Gel VICTOR V. YASHIN, ANNA C. BALAZS, Department of Chemical and Petroleum Engineering, University of Pittsburgh, Pittsburgh, PA 15261. — We consider a theoretical model of a polymer gel, which exhibits a swelling-deswelling behavior in response to the Belousov-Zhabotinsky (BZ) reaction. The BZ reaction generates periodic redox changes of a metal catalyst, and a wide variety of spatiotemporal structures have been observed in the course of the BZ reaction in solution. If the catalyst is covalently bonded to a responsive hydrogel soaked in a solution containing the rest of the BZ reagents, then the metal redox changes may cause variations in the gel volume. The self-oscillation of the gel volume and the traveling chemical waves accompanied by the local swelling have been experimentally observed by Yoshida and co-workers. Here, we present a simplified theoretical description of a hydrogel with the BZ reaction. The description is based on the Oregonator model of the BZ reaction, and on the two-fluid model of the gel dynamics. The formulated model is applied to studying one-dimensional wave trains in the reactive gel. We focus on the dispersion law as it reflects the inherent coupling between the chemical and mechanical degrees of freedom.

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