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Diffusion-induced spontaneous pattern formation on gelation surfaces HIROAKI KATSURAGI, University of Pennsylvania, Kyushu University — Polymer gels make various kinds of surface patterns, which are typical non-equilibrium phenomena, under the volume phase transition. Mechanical instabilities due to swelling or shrinking of polymer gels play an essential role in such pattern formations. However, there is no report on diffusion-induced spontaneous pattern formation in polymer gels. Here we report the diffusion-induced (not caused by the mechanical instability) macroscopic pattern formation on gelation surfaces. We experimented on two-dimensional poly-acrylamide gelation that is governed by free radical polymerization. Gel slabs were made on Petri-dishes with free upper surface boundary condition. Then, random and straight stripe patterns (surface deformations) were observed, depending on gelation conditions. We consider a reaction-diffusion dynamics to describe this pattern formation. Acrylamide is considered as an activator and oxygen works as an inhibitor in the gelation reaction-diffusion system. We found the scaling relation between the characteristic wavelength and the gelation time. This scaling is consistent with the reaction-diffusion dynamics.

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