Laboratory and numerical experiments on the pattern formation in a diffusion-precipitation system

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In a diffusion-precipitaion system (2I+Pb=PbI2), a pattern transition occurs depending on agar concentration.In the present study, we made a laboratory experiment and a computer simulation in order to understand factors controlling the transition.For periodic patterns which were obtained from both the laboratory experiment and the computer simulation, we measured p value defined in "spacing-low" (Xn=X0pn), where Xn is the distance of the n-th band from the contact. From the comparison between results of laboratory and numerical experiments, we conclude that an agar concentration affects the supersaturation that is needed to precipitate, and this effect of agar concentration causes a pattern transition.

In a diffusion-precipitaion system (2I+Pb=PbI2), a pattern transition occurs depending on agar concentration. In higher agar concentration, a periodic precipitation (Liesegang band) forms. In lower agar concentration, tree-like crystal aggregates form. In the intermediate agar concentration, a periodic precipitation and tree-like crystal aggregates coexist. In the present study, we made a laboratory experiment and a computer simulation in order to understand factors controlling the transition.

In the laboratory experiment, KI concentration and agar concentration were varied. In computer simulation, the reaction is modeled based on the Ostwald supersaturation theory and diffusion is treated by a random walk of particles. The model reproduces the periodic pattern in the Liesegang band. For periodic patterns which were obtained from both the laboratory experiment and the computer simulation, we measured p value defined in "spacing-low" (Xn=X0pn), where Xn is the distance of the n-th band from the contact. From the comparison between results of laboratory and numerical experiments, we conclude that an agar concentration affects the supersaturation that is needed to precipitate, and this effect of agar concentration causes a pattern transition.