水酸化アルミニウムの沈殿形成速度と沈殿バンドの伝播

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Precipitation formation rate of aluminum hydroxide and propagation speed of precipitation bands

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It is known that spatiotemporal precipitate patterns are generated by a chemical reaction of aluminum ion and hydroxide ion. In this system, the propagation of band of precipitate is observed in a gel including aluminum ion with adding an aqueous solution of hydroxide ion. Additionally, the spiral shaped defects are formed on the precipitate bands, and it travels on the band with time [1]. The mechanism of spatiotemporal behaviors originates from precipitation reaction and re-dissolution reaction forming complex ions of aluminum hydroxide [2].

In this study, to eliminate the effect of gel, the reaction solutions were put into a narrow space covered with two glass plates where the solutions are hard to mix due to the friction prevent the convection flow. As a result, the formation and propagation of precipitation bands were observed, and it was confirmed that the state and propagation speed of the precipitation bands depended on the concentrations. In addition, the rate of chemical reaction was estimated using flow system without diffusion. Based on the experimental results, we will discuss the mechanism of propagation of the bands based on the rate of chemical reaction.

Keywords : Propagation rate of precipitation bands, Reaction rate, Precipitation and redissolution reaction, aluminum hydroxide

アルミニウムイオンを含むゲルの上に水酸化ナトリウム水溶液を加えると、特定の濃度においてゲル中を下向きに伝播する沈殿物のバンドが生成され、そこに螺旋状のパターンが形成されることが知られている[1]。この螺旋状のパターンができるメカニズムについて、水酸化アルミニウムが過剰な水酸化物イオンと反応して錯イオンを形成する（再溶解）することによるものだと考えられている[2]。

沈殿バンド形成の溶液濃度依存性を幅広い濃度領域で調べるため、ゲルを使用せずに、狭い隙間で反応溶液を接触させることで沈殿バンドの伝播を観察した。その結果、沈殿バンドの状態および伝播速度の反応物濃度依存性を明らかにした。さらに、拡散を伴わないフロー系で反応速度を評価する実験を合わせて行った。本発表では、これらの結果を踏まえて、化学反応速度に基づいた沈殿バンドの伝播現象について議論する。

References

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