液滴運動を誘発する界面張力ダイナミクス

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Dynamics of Interfacial Tension Concerning to Self-Propelled Motion of Droplet (*Graduate School of Advanced Mathematical Sciences, Meiji University*; *MIMS, Meiji University*)
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It is known that a small droplet of bromine aqueous solution spontaneously moves within a squalane solution of monoolein (MO) under appropriate conditions. The droplet motion is driven by brominating reaction of MO on the oil/aqueous interface (Fig. 1a). In order to quantitatively discuss the mechanism of such droplet motion, physicochemical parameters concerning to interfacial dynamics must be estimated. Here, we measured time series of interfacial tension with different chemical conditions of the aqueous phase. The experimental results were analyzed using a mathematical model for the interfacial dynamics (Fig. 1b), and physicochemical parameters such as desorption rate and reaction constant of interfacial chemical reaction were estimated (Fig. 1c,d). Based on those experimental estimations, we will suggest a simple mechanism for the droplet motion.
Keywords : Interfacial tension, Far from equilibrium condition, Self-propelled droplet

モノオレイン(MO)を界面活性剤として含むスクアラン油相中に臭素水溶液の微小液滴を浮かべると自発的に運動する。これは油水界面に吸着した MO が水溶液中の臭素と反応して臭素化 MO を生成する化学反応と、それに伴う界面張力変化に起因すると言われている（Fig. 1a, b）。しかし、この機構の定量的な評価はまだ行われていない。そこで、界面張力の時間変化を計測し、その時系列データを解析することで、界面ダイナミクスに関わる種々の物理化学変数を定量的に評価した（Fig. 1c, d）。これらのデータに基づいて、液滴運動の機構を定量的に議論することが可能になった。

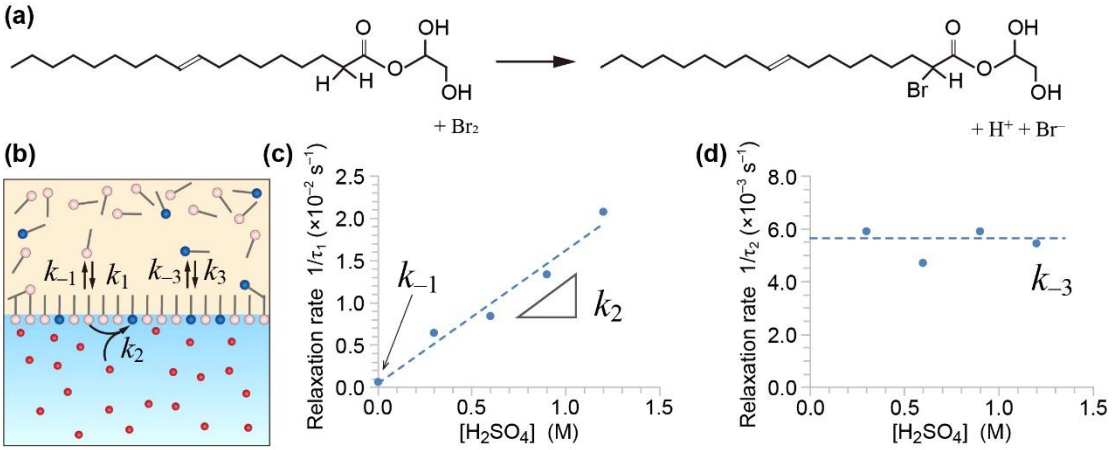

Figure 1. **(a)** Brominating reaction of MO. **(b)** Illustration of interfacial dynamics. **(c, d)** Relaxation rate of interfacial tension depending on $[H_2SO_4]$ in (c) short time and (d) long time.

1) N. J. Suematsu, K. Saikusa, T. Nagata, and S. Izumi, *Langmuir* **2019**, 25, 11601-11607.