Self-Propelled Droplets for Extracting Rare-Earth Metal Ions

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Supporting Video:

Video 1. Typical directed motion of a self-propelled droplet containing 100 mM DEHPA in the phosphate buffer solution in the presence of Dy^{3+}.

Video 2. Typical directed motion of a self-propelled droplet containing 100 mM DEHPA in the phosphate buffer solution in the presence of Gd^{3+}.

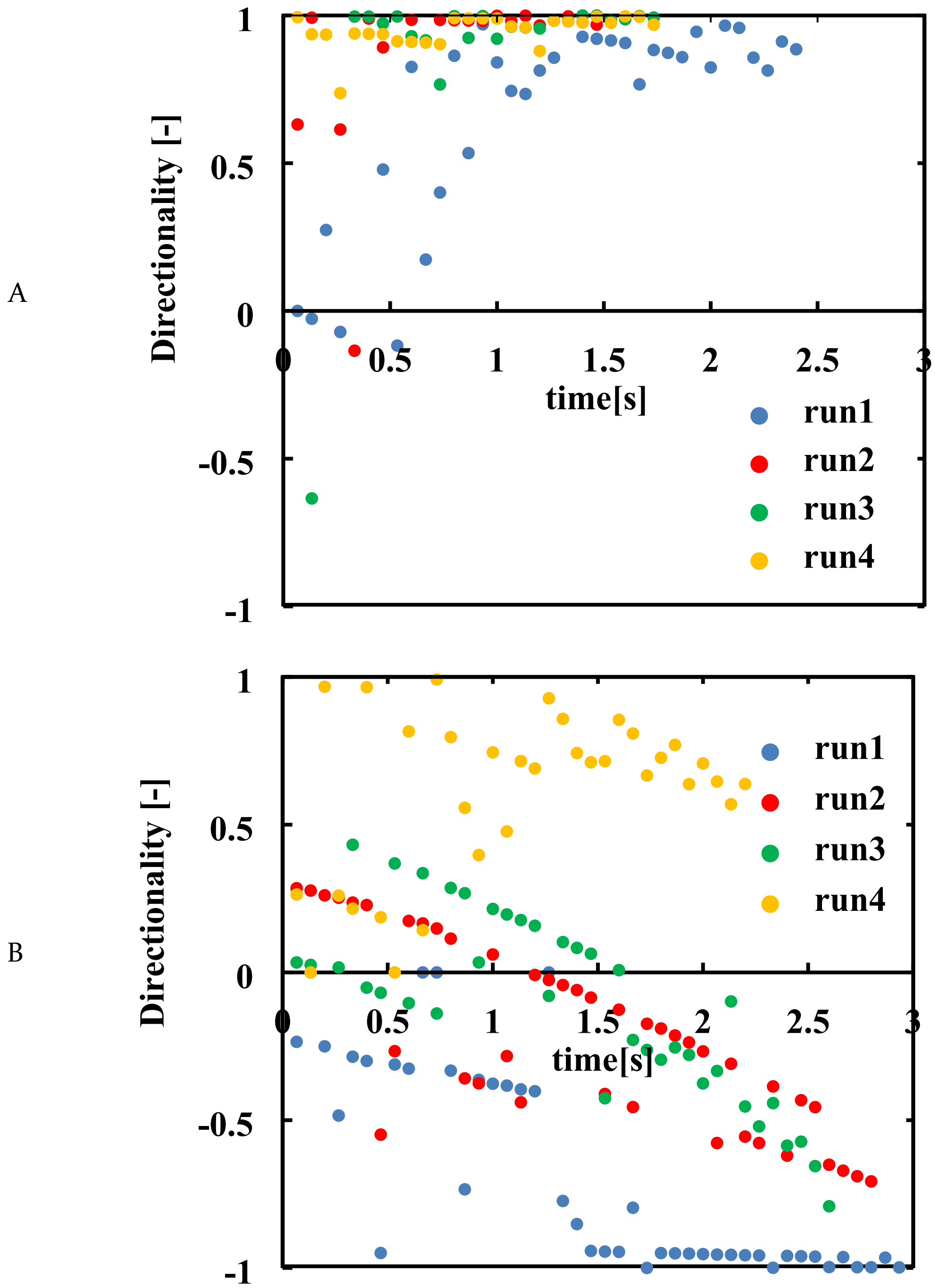

Figure S1. Time evolution of directionality until self-propelled droplets reached the target gel or a wall surface of Petri dish in the presence of (A) Dy^{3+} and (B) Y^{3+}.

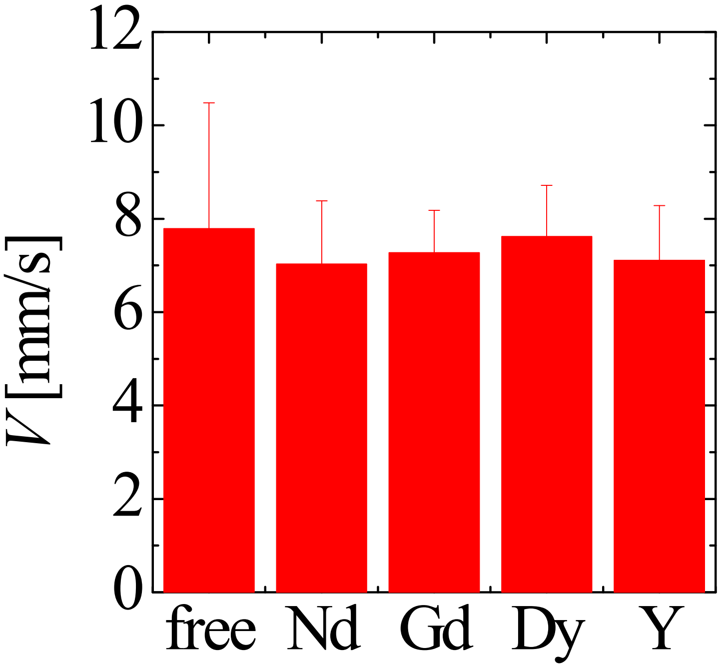

Figure S2. The average speed of droplet motion in the various metal ion systems until the droplets collide with the gel or wall surface of Petri dish. The error bar represents a standard deviation.

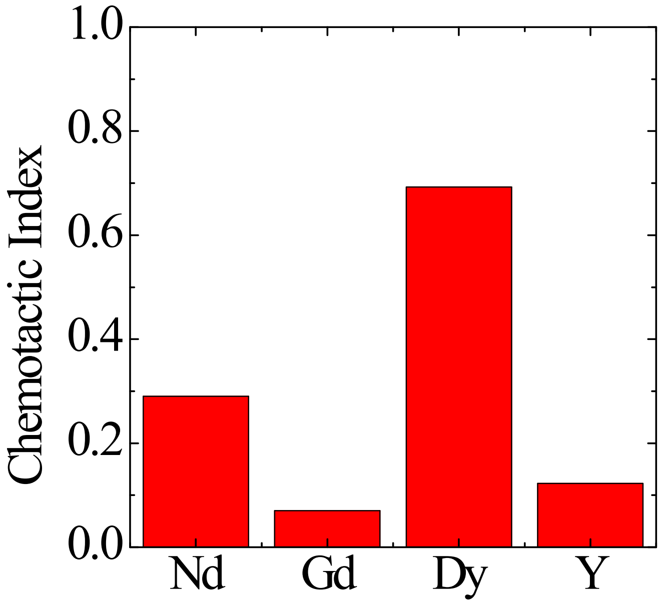

Figure S3. Chemotactic index in various metal ion systems. Chemotactic index was calculated as the ratio of the directionality larger than 0.5 (corresponding to $-60° < \theta < 60°$) and the total directionality.

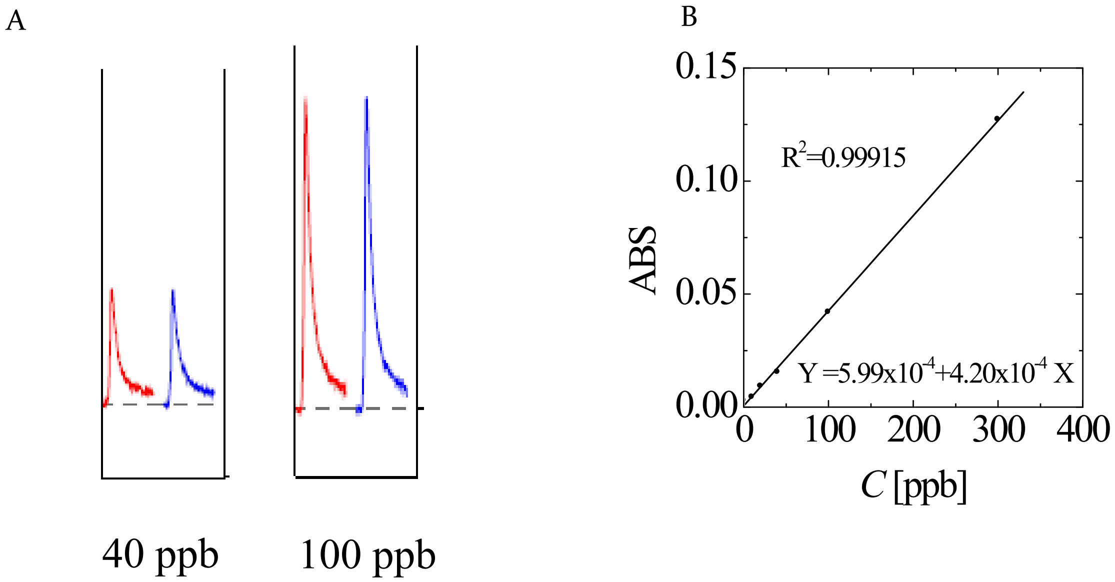

Figure S4. (A) Typical adsorption spectrum of dysprosium in a standard solution at 40ppb and 100 ppb at absorption wavelength of 404.6 nm. (B) Calibration curve between absorption of peak height and dysprosium concentration.

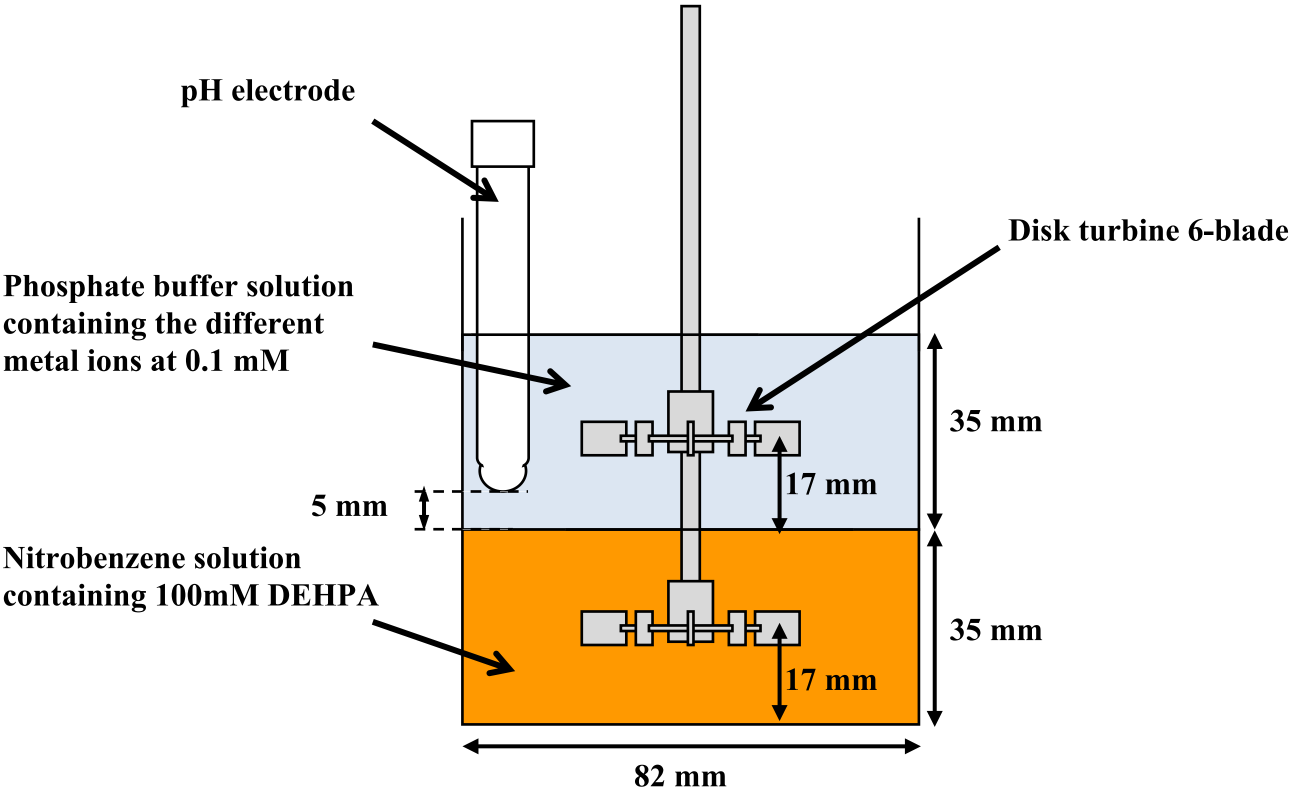

Figure S5. Experimental setup for measuring pH in the phosphate buffer solution containing the different metal ions at 0.1 mM contacting with nitrobenzene solution containing 100 mM DEHPA. First we poured 150 mL nitrobenzene solution into a cylindrical tank with an inner diameter of 82 mm and then gently poured 150 mL phosphate buffer solution. After about 100 s of pouring the buffer solution, we monitored a change in pH by pH electrode (DDK-TOA Corporation, MM-60R) introduced at 5 mm above the bottom the buffer solution. Two stirring blades were set at 17 mm above the bottom of each phases and the stirring speed is 50 rpm.