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1. 概要(Summary)

Our aim is to perform microrheology measurements on the dense phase of active colloids. We use Janus gold-platinum microspheres dispersed in a water bath. Upon adding a solution of hydrogen peroxyde, these particles become self-propelled due to self-difussiophoresis and self-electrophoresis. Since the particles are heavy, they do not leave the bottom surface and their motion is 2D. A large silica bead is used as a probe particle. Looking at the response of the probe in two cases, passive and active colloids, we aim to extract and compare their rheological properties.

2. 実験(Experimental)

【利用した主な装置】

高密度汎用スパッタリング装置

【実験方法】

To fabricate the Janus particles, we deposit gold microspheres (1.6 μm in diameter) on one side of glass slides. We then deposit platinum that covers one half of the microspheres. Platinum deposition was done in Takeda clean room by Eric Lebrasseur. We used the sputtering method and created a 35 nm layer on the glass slides. Finally, the gold-platinum particles were detached from the glass slides and purified before performing the experiment.

In the dense phase of the Janus colloids in water, we put one silica bead (14 μm in diameter) and trapped it by optical tweezers at the lowest laser power (Fig. 1). We performed a sinusoidal motion on the bead surrounded by the Janus particles. The experiment was performed once on this suspension in water (passive colloids) and then the hydrogen peroxyde was slightly introduced to make the Janus colloids become active.

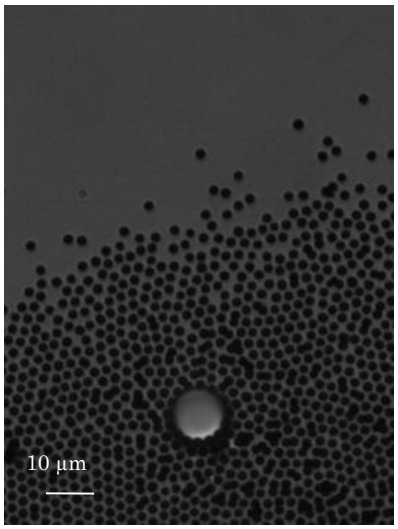

Fig. 1. Trapped silica bead in the Janus colloids suspension. The cell is slightly tilted in order to confine the particles and create the dense phase.

3. 結果と考察(Results and Discussion)

We analyze the rheology of the system using Large Oscillatory Strain methodology. The output (position of the probe inside the trap) is divided by the input (position of the trap) in Fourier space. The response is linear in both cases and more elastic than viscous. The active case is slightly more elastic than the passive case. We also access to the trajectories of the colloids, which provides us local information on how the force exerted by the probe affects active particles.

4. その他・特記事項（Others）

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5. 論文・学会発表（Publication/Presentation）

None

6. 関連特許（Patent）

None