

Dial-type measurements of colloid capillarity using optical laser tweezers

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The colloidal particles irreversibly adsorb to the fluid interface. The intensity of the repulsion and attraction is amplified compared to the case when the same particles are dispersed in a single phase. Note that the repulsion and the attraction are due to electrostatics and capillarity, respectively. Particularly, when the particles are chemically and/or geometrically anisotropic, the strength of the capillary attraction is dominant. As a result, the particles dispersed at the interface form aggregates. In our previous study, Lim et al. quantitatively measured the capillary interaction between ellipsoid particles at an oil-water interface using the trap-release method. When two particles approached each other over a long-range distance, the capillary force between them was found to decrease by r^{-4} . However, in the short range separation they were rotated to have low energy configurations, and it was therefore hard to quantitatively measure the capillary force. In this study, we devised a dial-type measurement method using optical laser tweezers, and quantitatively studied the heterogeneity of capillary interactions between the ellipsoid particles at both range separations.