

Direct Measurements of Pair Interactions between PMMA Microspheres in a Low Dielectric Constant Medium using Optical Laser Tweezers

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PMMA particles dispersed in non-polar solvents are a well-known colloid system to understand charging mechanisms of particles in non- or low-polar solvents. We use optical laser tweezers to quantitatively measure pair interaction forces between sterically-stabilized PMMA particles dispersed in cyclohexyl bromide with a moderate dielectric constant ($\epsilon \sim 7.9$). The refractive indices of PMMA particles and CHB, however, are almost identical to each other, and therefore, the particles are invisible that cannot be trapped by optical laser tweezers. To trap the particles and measure their interaction forces, appropriate amounts of decane is added to medium to lower the refractive index of the continuous phase. We find that as decane content decreases, the magnitude of electrostatic repulsions increases. In addition, the PMMA interparticle interaction forces in a pure CHB condition can be extrapolated at decane content zero.