Interpretation of unusual electrostatic attractions of colloidal particles using optical laser tweezers

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we use the time-sharing optical laser tweezer apparatus to investigate the unusual electrostatic attraction between colloidal particles. When dielectric microspheres immersed at the fluid-fluid interface, they exhibit attractive and repulsive interactions. This occurrence arises due to the dissociation of the opposite sign surface charges, the formation of electrical dipoles around the particles trapped at the interface. We suggest that counterions around dielectric colloidal particles scattered in an aqueous media generate a double layer that is polarizable by an external field, resulting in an induced dipole. We measure the dipole-induced dipole electrostatic interactions as well as the counterions relocation time in order to provide the attractive force that can overcome the double layer interaction and thermal fluctuation. This work can explore dipole-induced dipole interactions investigated at different salt concentrations, and critical holding distances. The permanent dipole responsible for generation of an induced dipole and the resulting attraction were validated.