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Formation of synthetic structures with micron size silica beads using optical tweezer JEREMY CURTIS, ADAM SHULMAN, SAMUEL ELROD, DANIEL ERENSO — Colloidal particles, such as silica, are particles having size ranging between several nanometers and several millimeters and can be suspended in a liquid. Because of their tunability, in size, shape, as well as in chemical composition, and their ability to self-assemble they find applications in the development of advanced materials like photonic crystals. Typically, colloids self-assemble into face centered cubic or body centered cubic structures which determines their optical and electrical properties. The control over the structures of one-component colloids using array of optical tweezers, without changing the liquid chemical composition, is limited. If we cut off the laser, then the colloids will eventually lose their new structure. However, by changing the chemical composition of the liquid in which the colloids are suspended in and using optical tweezers, it is possible to assemble the colloids in a new stable structure which possibly results in new optical and electrical properties. In this work, we have demonstrated that micron-size silica beads can in fact be arranged in desired synthetic structure using an optical tweezer in a saline buffered solution. In a 3.1 micron silica colloids suspended in water we added the right concentration of NaCl to form a solution in which silica beads brought close to one another can bind by an adhesive electrostatic force without drifting away due to their thermal energy. Then by trapping and dragging one bead at a time using an optical tweezer, we have arranged the silica beads in one- and two-dimensional structures.

Jeremy Curtis

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