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Hologram Fabrication for Assembling Nano Composite Materials

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Poster Presentation 8

HOLOGRAM FABRICATION FOR ASSEMBLING
NANOCOMPOSITE MATERIALS

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We have developed a technique which uses laser light to assemble large numbers of micro-particles in a highly-controllable way. Here, we discuss the mechanisms behind our use of visible light to levitate and translate physical objects. This technology, called optical tweezing, has existed for over a decade – but has previously been limited to trapping one or two particles at a time. Our addition of holographic techniques has extended these capabilities significantly, allowing for the simultaneous manipulation of large numbers of colloidal particles into any (user-defined) configuration.

We have successfully demonstrated the complete implementation of holographic optical tweezers. We can digitize any image and convert it to a “calculated hologram” via an algorithm of iterative approximation. We then fabricate a transmission hologram which is a physical manifestation of this calculation. In our optical apparatus, the holographic image is then transformed into an array of optical tweezers which trap colloid into the desired structure. So far as we know, the method we have developed is the only means of *fully configuring* the assembly of particles in solution. Applications are envisioned in many different disciplines including biology and chemistry.