Abstract Submitted
for the MAR10 Meeting of
The American Physical Society

Optical control of nano-particles and colloidal architectures[1] HECTOR MIRELES[2], Cal Poly Pomona, ANGEL MARTINEZ, CU-Boulder, IVAN SMALYUKH — Controlled structural assembly of micro- and nano-sized particles is essential for many technologies, ranging from optical metamaterials to photovoltaic devices. We demonstrate a low-intensity "opto-elastic" method of manipulating micron- and submicron- sized particles suspended within a nematic liquid crystal. By optically controlling a surface monolayer of an azobenzene based dye, we manipulate the surface boundary conditions and liquid crystal director in the sample bulk to form domains of uniform alignment. Large elastic deformations are thus generated at the interface between adjacent domains with different director orientations. By exploiting elastic forces acting on the particles near the misalignment walls, we manipulate micron and sub-micron-sized particles such as melamine resin polymer microspheres and silver nano-rods. This method of "opto-elastic" manipulation requires light intensities three orders of magnitude smaller than in the case of laser tweezers utilizing optical gradient forces and enables massively-parallel manipulation of multiple particles on the scales of millimeters and centimeters.

[1]Partial support for this sabbatical work made possible by the Institute for Complex Adaptive Matter (ICAM).
[2]Currently on sabbatical at CU-Boulder

Hector Mireles
Cal Poly Pomona

Date submitted: 07 Dec 2009 Electronic form version 1.4