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Hybrid Opto-electric Manipulation of Macromolecules STEVE WERELEY, Purdue University — Recently our research group has developed an innovative method for capturing, concentrating, manipulating and sorting populations of micro- and nanometer-scaled entities-particles, cells, macro-molecules, etc. These populations range from individual particles to thousands of particles (Lab-on-a-Chip, 2008; Microfluidics and Nanofluidics, 2008) while the sizes range from microns to nanometers. This novel technique combines features of optical trapping and dielectrophoresis in an innovative, dynamic way using a simple parallel plate electrode configuration. Transparent electrodes comprised of Indium Tin Oxide (ITO) on glass substrates are used to generate an electric field in the fluid while at the same time allowing light into and out of the fluid. Near-IR optical illumination causes subtle localized heating, creating an electric permittivity gradient that in turn drives a microscopic toroidal vortex. The vortex efficiently transports particles to a preferred location, usually the surface of the electrode. Recent advances have extended have allowed us to apply this technique to macromolecules (DNA, proteins) as well as nanoscale particles (quantum dots, nanowires and PSL particles).

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