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Optoelectrokinetic trapping of Gold Nanoparticles for SERS Applications AVANISH MISHRA, RAVIRAJ THAKUR, School of Mechanical Engineering, Purdue University, West Lafayette, Indiana, 47906, STUART WILLIAMS, Department of Mechanical Engineering, University of Louisville, Louisville, Kentucky 40292, ALOKE KUMAR, Oak Ridge National Laboratory, Oak Ridge, TN 37831-6445, STEVE WERELEY, School of Mechanical Engineering, Purdue University, West Lafayette, Indiana, 47906 — Gold or Silver nanoparticle based Microfluidic Surface Enhanced Raman Spectroscopy (SERS) provides an excellent platform for sensitive chemical and biomolecular detection. Microfluidic SERS requires metal nanoparticles to be accumulated in a controlled manner. In this work, we present an active optoelectrokinetic method for patterning gold nanoparticles on a planar electrode surface. This technique consists of two indium tin oxide (ITO) electrodes across which an AC electric field is applied. Gold nanocolloidal solution is filled between the electrodes. Projection of an infrared (1064 nm) laser beam on one of the electrode surfaces causes a perturbation in electrical conductivity and permittivity of the fluid which in turn creates microscopic flow instability and an electrothermal vortex is generated. The electrothermal vortex traps gold nanoparticles and brings them closer to the electrode surface by hydrodynamic drag force where nanoparticles are trapped by particle-electrode interactions. This leads to an accumulation of gold nanoparticles at the site of illumination which can be used as a SERS hot spot.

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