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SERS-Active Nanoinjector for Intracellular Spectroscopy ELINA VITOL, Drexel University, ZULFIYA ORYNBAYEVA, MICHAEL BOUCHARD, JANE AZIZKHAN-CLIFFORD, GARY FRIEDMAN, YURY GOGOTSI, KECK INSTITUTE FOR ATTOFLUIDIC NANOTUBE-BASED PROBES TEAM — We developed a multifunctional nanopipette which allows simultaneous cell injection and intacellular surface-enhanced Raman spectroscopy (SERS) analysis. SERS spectra contain the characteristic frequencies of molecular bond vibrations. This is a unique method for studying cell biochemistry and physiology on a single organelle level. Unlike the fluorescence spectroscopy, it does not require any specific staining. The principle of SERS is based on very large electromagnetic field enhancement localized around a nano-rough metallic surface. Gold colloids are widely used SERS substrates. Previously, the colloidal nanoparticles were introduced into a cell by the mechanism of endocytosis. The disadvantage of this method is the uncontrollable aggregation and distribution of gold nanoparticles inside a cell which causes a significant uncertainty in the origin of the acquired data. At the same time, the nanoparticle uptake is irreversible. We present a SERS-active nanoinjector, coated with gold nanoparticles, which enables selective signal acquisition from any point-of-interest inside a cell. The nanoinjector provides a highly localized SERS signal with sub-nanometer resolution in real time.

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