Abstract:

Taking advantage of the processing techniques developed for the IC industry, microfluidics enables the development of systems that control sub-microliter volumes of fluids with unprecedented precision. By using combinations of miscible and immiscible fluid phases (e.g., water/oil, gas/liquid) in microfluidic devices we create controlled interfaces on which we can limit or enhance the transport of chemical species, exploring effects that may not be attainable using traditional methods. Surface enhanced Raman spectroscopy (SERS) is a powerful spectroscopic technique that exploits plasmonic effects to enhance light scattering of molecular bond vibrations, with the potential to detect and identify even single molecules. By controlling the interactions of plasmonic silver nanoparticles and analyte molecules in microfluidic devices we can not only optimize systems for chemical detection via SERS but also explore the relevant physics, gaining insight into how these phenomena occur. In my talk I will present my experimental work on using controlled microfluidic interfaces for chemical detection, and an application of this research for the detection of methamphetamine in saliva.