Surface-enhanced Raman scattering based biosensors

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Abstract

Over the years, colloidal plasmonic nanoparticles have emerged as important building blocks of modern nanoscience and nanotechnology to deal with a wide range of applications including electronics, energy, medicine, catalysis, biosensing, imaging and therapy. The unique optical properties of plasmonic nanostructures have led to the development of routes to synthesize metal nanoparticles with tailored size and morphology as well as to assemble them in a control maner. Assemblies of metal nanoparticles often exhibit collective properties, which are highly enhanced over those of the individual particles.
Surface-enhanced Raman scattering (SERS) spectroscopy is an ultrasensitive analytical technique that can be applied non-invasively for the detection and imaging of a wide range of biomolecules. SERS allows identification of the specific spectral fingerprint of a probe analyte in contact with a plasmonic nanostructure and its sensitivity can go as far as the single-molecule level. Importantly, SERS offers multiplexing capability, requires no sample preparation and provides high spatial resolution.
In this communication, we report the fabrication of different SERS-active platforms based on plasmonic nanoparticles/assemblies for biosensing (either label-free or indirect).1-3 Among others, we present the fabrication and performance of plasmonic microfluidic chips for label-free and ultrasensitive detection and a lateral flow immunoassay for the ultrasensitive detection of penumolysin employing plasmonic SERRS tag as labelled probe.

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