Built-in Noble Metal Nanoarrays in Integrated Optofluidic Devices for Surface-Enhanced Raman Spectroscopy

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Surface-enhanced Raman spectroscopy (SERS) has been widely investigated because of its high sensitivity and specificity for molecular detection. Noble metal nanoarrays that have patterned "Hot spots", which shows extremely intense local electromagnetic fields, can be used as a SERS-active substrates. Long-range effect for metal nanoarrays are important to get large enhancement of Raman signal. Colloidal lithography is a robust method for fabricating regularly ordered nanostructures in a controlled and reproducible way using spontaneous assembly of colloidal particles. SERS enhancement characteristics could be tuned by changing the materials or conditions for fabrication of metal nanoarrays. In this study, we prepared nanostructures of photo resist (PR) thin film with different shapes and spacings fabricated via colloidal lithography. Then, metallic nanoarrays with high density hot spots were created by deposition of noble metals such as gold (Au) and silver (Ag). The enhancement on Raman signal and tunability of metal nanostructures were confirmed by the SERS spectra of SERS-active molecules on metal nanoarrays.