

Highly sensitive SERS platform composed of hollow polypyrrole nanohorn for proteolytic biosensor

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Since sensitive detection platforms make an early diagnosis of several diseases, It have recently gathered more interest. However, developed detection platforms so far have the limitations of high cost and low sensitivity. To overcome these limitations, surface enhanced Raman spectroscopy (SERS) based ultrasensitive detection platform was fabricated by using SERS active hollow polypyrrole (hPP) nanohorn and peptide-functionalized gold nanoparticles (AuNPs). In this SERS active platform, silver was deposited on the inside and outside of the hPP nanohorn surface(Ag/hPP/Ag). To enhance the signal and skip additional steps for the biomolecular detection, peptide-functionalized AuNPs were modified with Raman dye to immobilize on the Ag/hPP/Ag nanohorn. The Raman signal of caspase-3, which is a diagnostic marker of several diseases such as cancer and neurodegenerative diseases was enhanced, due to the fabricated SERS-sensitive platform. Also, this platform achieves a broad detection range from 10 pg/ml to 10 µg/ml. In conclusion, fabricated detection platform can be widely applied for early diagnosis of several diseases and sensitive detection of proteolytic biomarkers.