

Bacteriophage-template assembly of gold nanoparticles into nanoraspberry structure for plasmonic application

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For real-world application of surface enhanced Raman scattering (SERS), developing sensitive and reproducible plasmonic substrate is a major issue for many researchers. Biomolecular templates such as nucleic acids and proteins draw interest in recent studies due to their predictable and designable structures in nanoscale. This major advantage of biotemplate as a nanoscale building block is exploited to make complex structure with high reproducibility, crucial for plasmonic application. In this work, bacteriophage MS2 was used as template for a highly-ordered assembly of gold nanoparticles into a plasmonic 'nanoraspberry' structure. Surface lysine groups were functionalized with linker to regularly orient the gold nanoparticles, which makes reproducible plasmonic hot spots and hence SERS enhancement. To prove the structure can be applied to biomedical field, the nanoraspberry structure was utilized for detecting miR-16 as a model analyte. The result showed highly reproducible signal with high sensitivity, indicating nanoraspberry structure as a promising SERS substrate.