Electronic Supplementary Information for

Three-dimensional Au nanoparticle-monolayer graphene-Ag hexagon nanoarray structure for high-performance surface-enhanced Raman scattering

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Fig. S1 AFM images of (a) Ag HNAs and (b) 1LG-Ag HNA structures, respectively. The right side of each picture shows the cross-section along the white lines on the left. The lattice periods of Ag HNAs are both 175 nm.



Fig. S2 AFM images of (a) Ag HNAs and (b) Au NP-Ag HNA structures, respectively. The right side of each picture shows the cross-section along the white lines on the left. The lattice periods of Ag HNAs are both 175 nm.



Fig. S3 Normalized electric field intensity distributions in the xy plane for Ag HNAs with five different lattice periods. The lattice period of Ag HNAs is (a) 210 nm, (b) 186 nm, (c) 164 nm, (d) 151 nm and (e) 140 nm, respectively. The right side of each picture plots the electric field intensity magnitude along the green dotted lines on the left.



Fig. S4 SEM images of (a) 1LG-Ag HNA and (b) Au NP-1LG-Ag HNA structures, respectively. The lattice periods of Ag HNAs are both 186 nm.



Fig. S5 AFM image of Au NP-1LG-Ag HNA structure. The right images show the cross-sections along the white lines on the left. The lattice period of Ag HNAs is 140 nm.



Fig.S6 SERS spectra of single layer graphene for the structures of (a) 1LG-Si,(b) 1LG-Au NP, (c) 1LG-Ag HNA and (d) Au NP-1LG-Ag HNA, respectively.



Fig.S7 SERS spectra of 10⁻⁸ M R6G on Au NP-1LG-Ag HNA structure collected from 60 random spots.



Fig. S8 SERS spectrum of 10⁻¹³ M R6G on Au NP-1LG-Ag HNA structure. The red star (*) marks the G peak of graphene.