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Supporting Information

Polymer-Based SERS-Active Substrate with Gyroid-Structured Gold Multibranches

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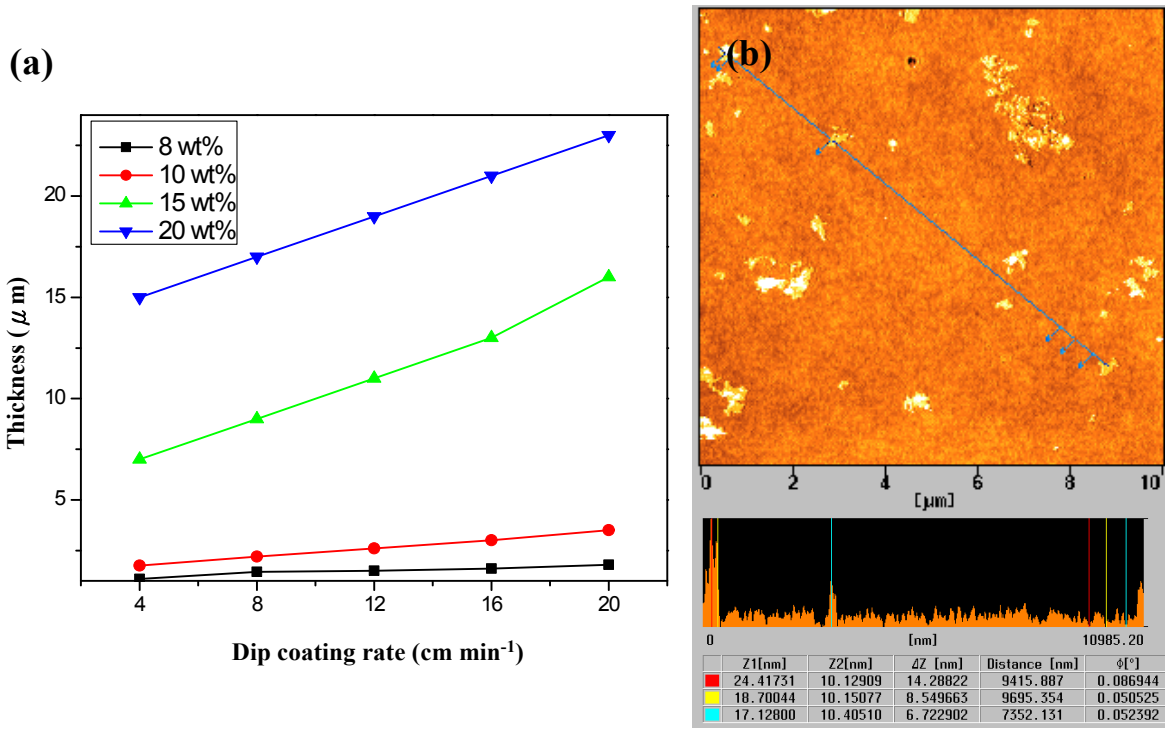

Figure S1. (a) Fabrication of micrometer-thick PS-PLLA films *via* dip coating by controlling solution concentration and dip-coating rate. The testing samples were prepared on a Quartz substrate by dip coating from PS-PLLA in 1,1,2-trichloroethane solution. (b) Tapping-mode SPM phase image of the micrometer-thick PS-PLLA film with a thickness of 20 μm. The inset shows the roughness along the blue line of the thin-film surface. The roughness of the selected surface with area of 10 μm × 10 μm is about 15 nm ($\triangle Z < 15$ nm), providing smooth and uniform surface of thin-film samples.

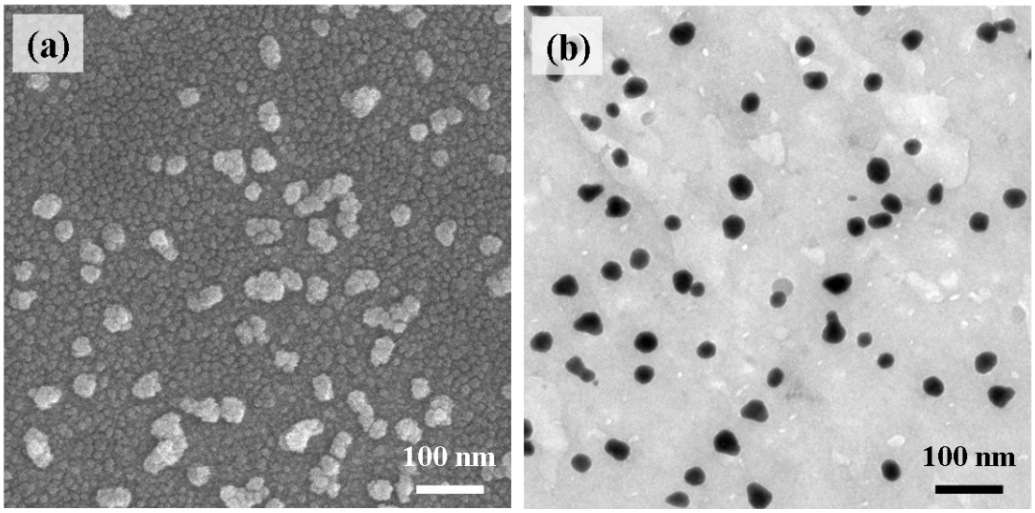

Figure S2. Au NPs from low Au ion concentration (e.g. 100 ppm $HAuCl_4$ in methanol): (a) FESEM images of Au NPs dispersed on Quartz. (b) TEM images of Au NPs from controlled nucleation process of Au. The diameter of Au NPs is approximately 28 nm in average.

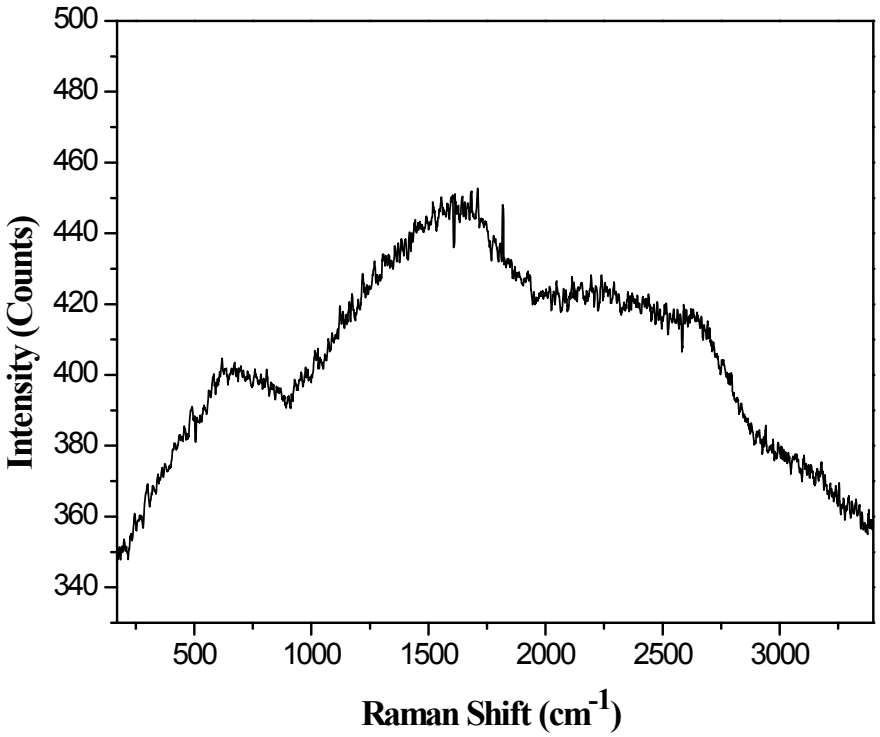

Figure S3. SERS spectra of the PS-based SERS-active substrates composed with multibranched Au without dye molecules.

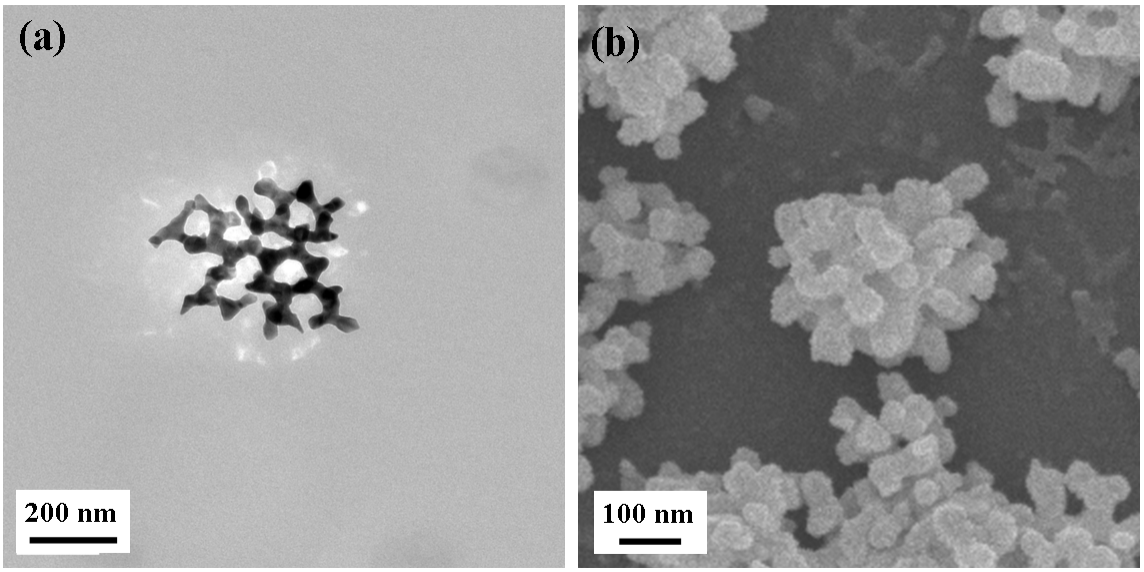

Figure S4. (a) TEM images of the well-defined gyroid-structured Au multibranches in the PS matrix; (b) FESEM microscopy images of gyroid-structured Au multibranches from PS/Au nanohybrids after removal of PS template.[1]

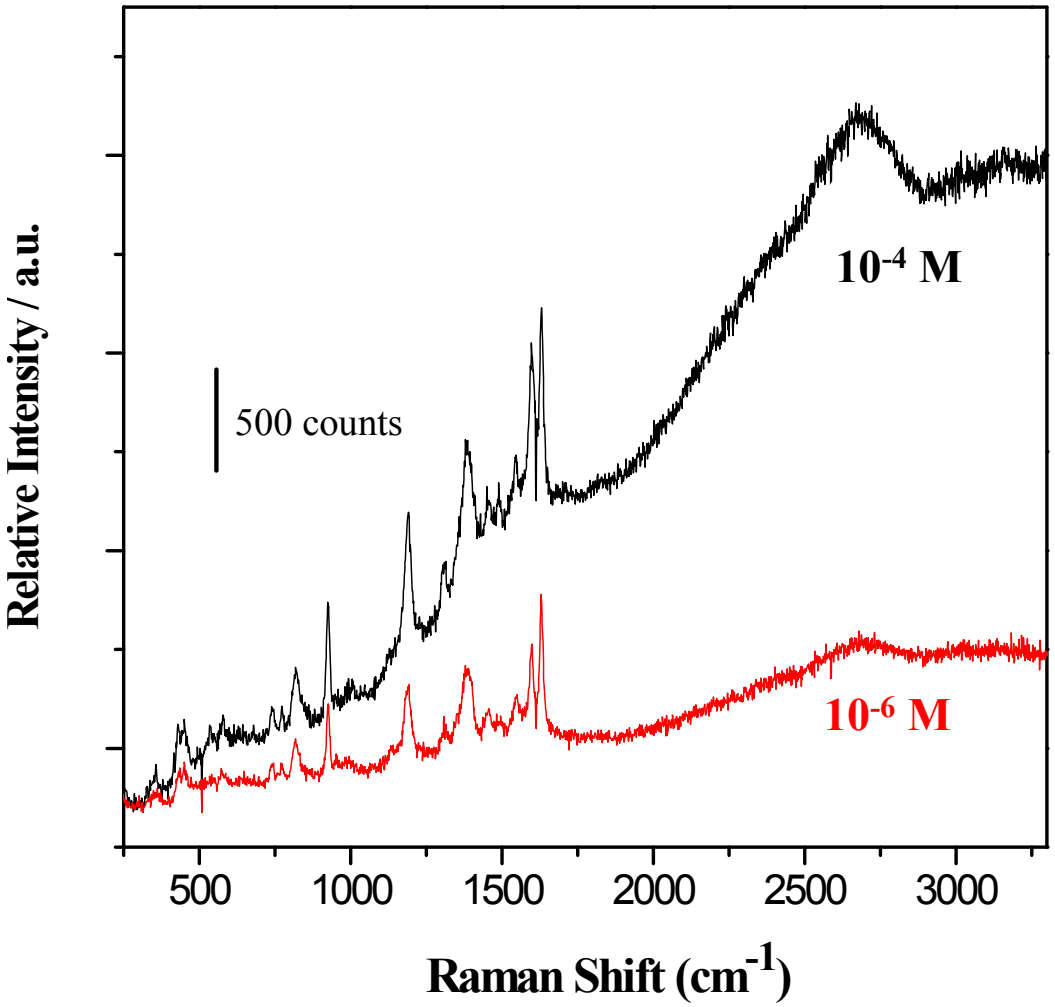

Figure S5. SERS spectra of different concentrations of CV molecules adsorbed on the 3D SERS-active substrates.

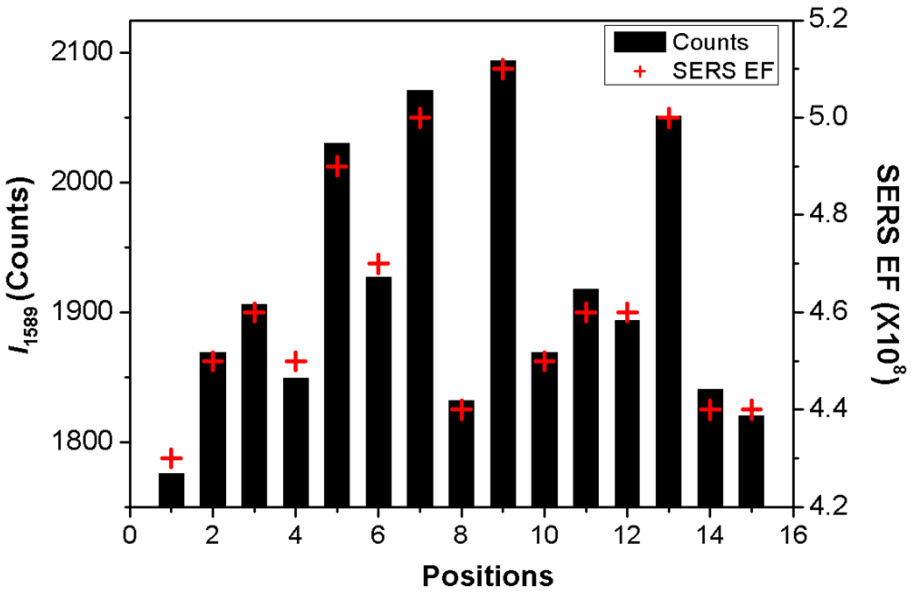

Figure S6. The I_{1589} (counts) of average EF of SERS from the corresponding 15 individual SERS measurements of **Figure 6a**. The average EF of the 3D SERS-active substrate can be determined as approximately in the order of 10^8.

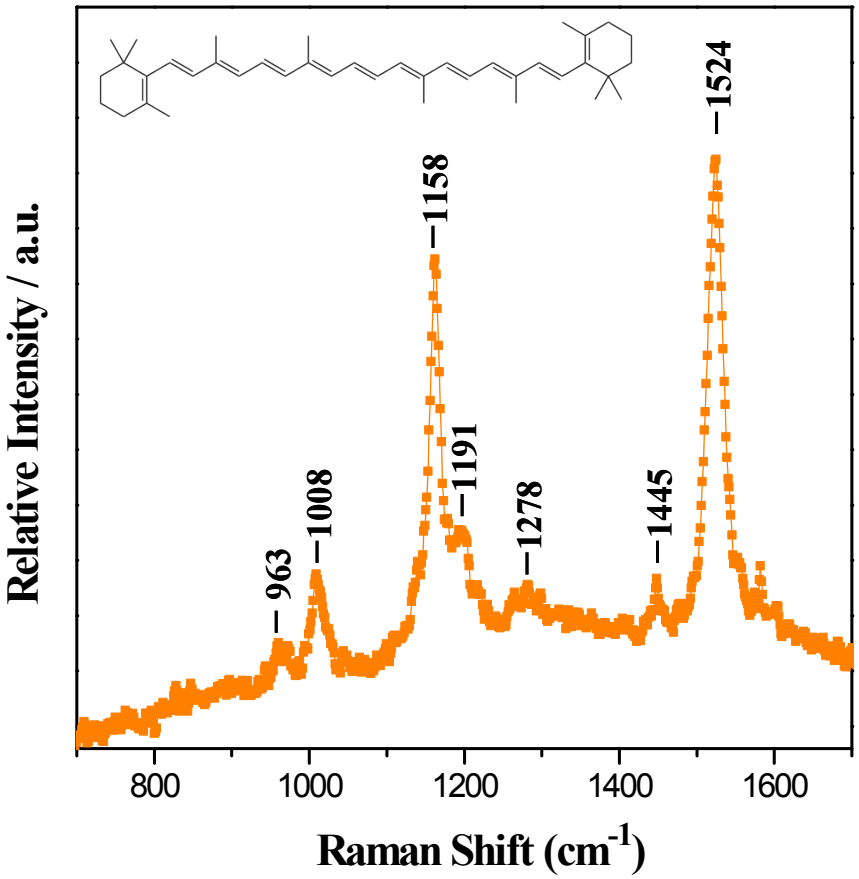

Figure S7. SERS spectra of β-carotene molecules on the surface of 3D SERS-active substrate to give SERS peaks at 963, 1008, 1158, 1191, 1278, 1445, and 1524 cm^{-1}

Reference

1. H. Y. Hsueh, H. Y. Chen, Y. C. Hung, Y. C. Ling, S. Gwo, R. M. Ho, *Adv. Mater*. 2013, **25**, 1780.