Electronic Supplementary Material (ESI) for Nanoscale.

Electronic Supplementary Information

for

SERS activity with tenfold detection limit optimization on a type of nanoporous AAO-based complex multilayer substrate

by

Chaofan Sui, Kaige Wang, Shuang Wang, Junying Ren, Xiaohong Bai and Jintao Bai

S1. Spectra of R6G collected on Si wafer and SERS-active substrate for EFs calculation.

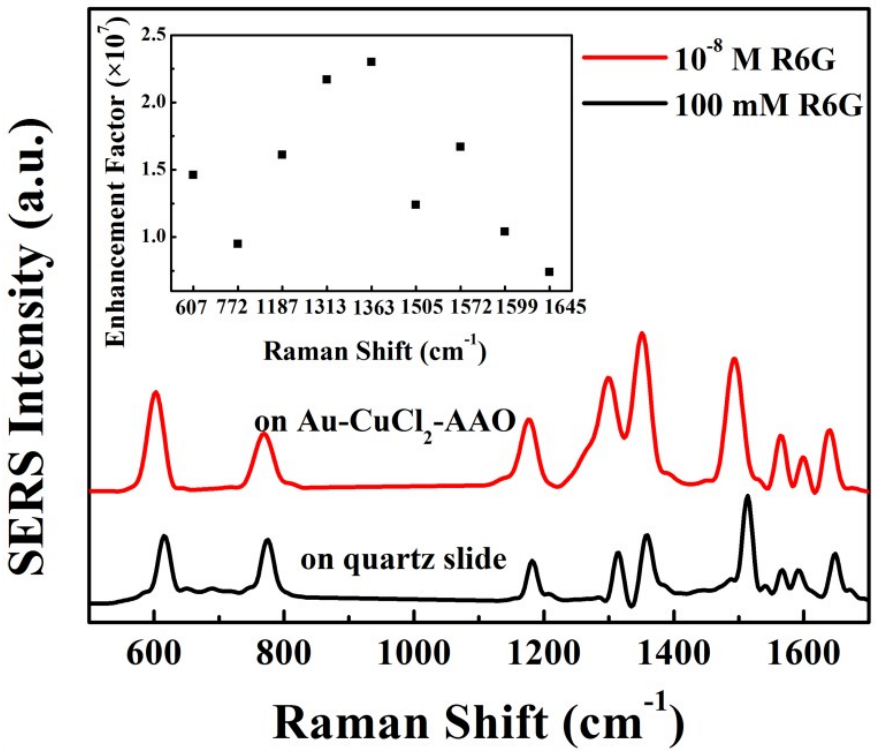

Fig. S3 Enhancement factor (EF) of the 25 nm gold layer coated $CuCl_2$-AAO substrate with a measured Raman spectrum of 100 mM R6G recorded on quartz slide as a reference. The EFs (see the inset) at each characteristic peaks were evaluated.

The scientific fomula for enhancement factors commonly used in confocal microscopy Raman spectroscopy systems is:

$$EF = \frac{I_{surf} / N_{surf}}{I_{bulk} / N_{bulk}}, \tag{1}$$

$$\bar{N} = C \cdot V \cdot N_A \cdot \frac{S_2}{S_1}, \tag{2}$$

Where I, N, C, V, N_A, S_1 and S_2 represent the intensity of characteristic peak, total number of molecules able to be irridiated by laser, concentration of probe solution, drop volume, Avogadro's number, drop size and irradiated area of laser, respectively. In our system, except for concentration and molecule number, other parameters were precisely controlled to be constant. On the primise of these conditions, therefore, the ratio of molecule number is equal to ratio of R6G concentration, EFs for each characteristic peak could be calculated according to the deformation of formula (1):

$$EF = \frac{I_{SERS}/C_{SERS}}{I_{Raman}/C_{Raman}}, \quad (3)$$

where I and C represent intensity and concentration, respectively.

S2. Evaluation of surface area and roughness factor via AFM images.

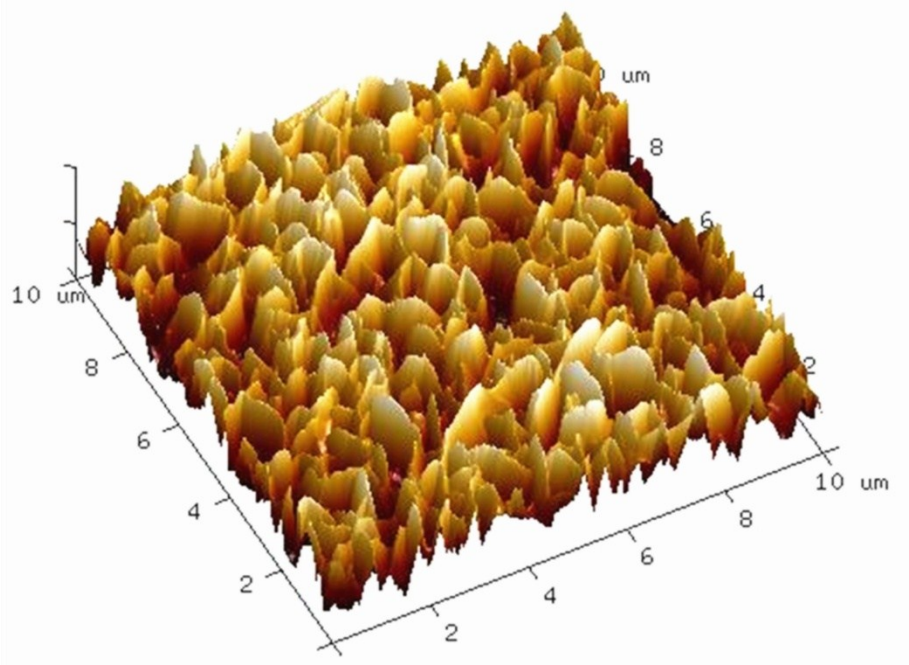

Fig. S2 AFM images of Au-$CuCl_2$-AAO substrate.

The surface area of Au-$CuCl_2$-AAO substrate was measured to be 209 μm^2 at 100 μm^2 projected area by AFM analysis software (NanoScope Analysis, Bruker). The roughness factor was evaluated to be 2.09.