Supporting Information

**Graphene oxide coated popcorn-like Ag nanoparticles for reliable sensitive SERS detection of drug residues**

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**Figure S1**. SEM image of Ag/Cu hybrid without using of Sn2+.



**Figure S2**. SEM image of Ag nanoparticles on Cu substrate prepared with 1 min reaction time.



**Figure S3**. Raman intensity of CV at 1174 cm-1 as a function of the reaction times.

**Calculation of SERS enhancement factor (EF)**

To quantify the enhancement contribution from graphene, we calculated the enhancement factor (EF) based on the following formula:

EF = (ISERS /IBULK)×(NBULK /NSERS )

where ISERS and IBULK represent the intensities of SERS and normal Raman scattering, whereas NSERS andNBULK, respectively, denote the numbers of corresponding CV molecules effectively excited by a laser beam. According to the above formula, the EF for the AgNPs/Cu substrate is calculated to be 1.56 × 105. Similarly, the EF is calculated to be 1.20 × 106 for the GO/AgNPs/Cu substrate. As a result, the EF for the GO/AgNPs/Cu substrate shows a 7.69-fold enhancement compared to the AgNPs/Cu substrate.

NBULK = (Laser spot area/Diffusion area) \* (NA \* VolumeBULK \* ConcentrationBULK)

NSERS = (Laser spot area/Substrate area) \* (NA \* VolumeSERS \* ConcentrationSERS)

Diffusion area=π(d/2)2=0.5027cm2

Substrate area=0.09cm2

VolumeBULK =VolumeSERS

ConcentrationBULK = 106 \* ConcentrationSERS

NBULK /NSERS= (0.09/0.5027)×106=1.79×105

I = intensity of the 1174 cm-1 peak

IBULK=599 a.u.

ISERS,Ag =521 a.u.

ISERS,Ag /IBULK=0.87

EFAg = (ISERS /IBULK)×(NBULK /NSERS ) = 1.56×105

ISERS,GO/Ag =4015 a.u.

ISERS,GO/Ag /IBULK=6.70

EFGO/Ag= (ISERS /IBULK)×(NBULK /NSERS ) = 1.20×106

The EF for the GO/AgNPs/Cu substrate shows a 7.7-fold enhancement compared to the AgNPs/Cu substrate