

## Supporting Information

### **Quantitative Analysis of Multiplex-Components and Double Strand DNA by Wide-Range Surface-Enhanced Raman Spectroscopy Based on Ordered Ag/Si Nanowire Arrays**

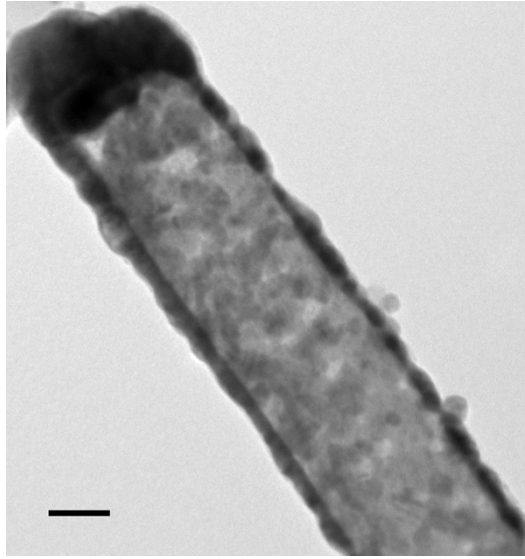
**Yingqi Zhao<sup>a</sup>, Jian-An Huang<sup>a</sup>, Zhenyu Zhang<sup>a</sup>, Xianfeng Chen<sup>\*a</sup>, Wenjun Zhang<sup>\*a</sup>**

Center of Super-Diamond and Advanced Films (COSDAF) and Department of Physics and Materials Science, City University of Hong Kong, Hong Kong SAR

*\*Corresponding authors, Email: [apwjzh@cityu.edu.hk](mailto:apwjzh@cityu.edu.hk) and [xianfeng.chen@cityu.edu.hk](mailto:xianfeng.chen@cityu.edu.hk)*

### TEM Image of Ag/SiNW

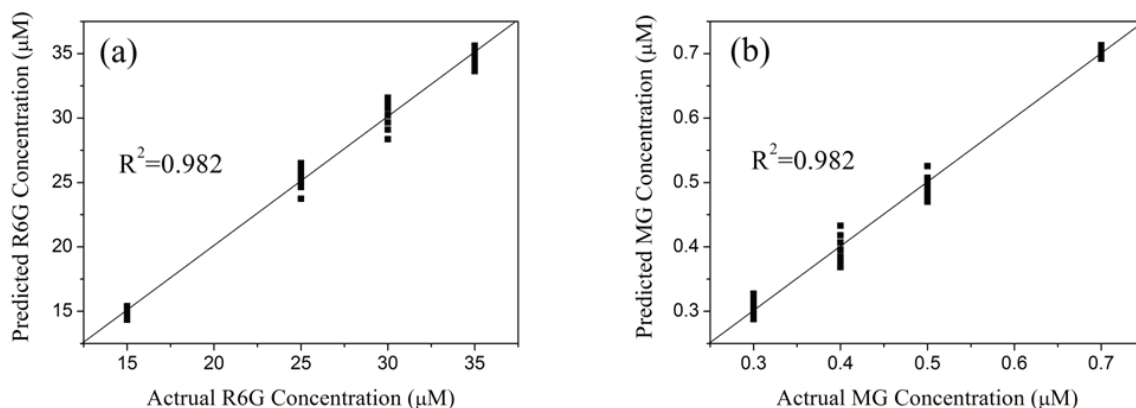
From the TEM image of Ag/SiNW, the Ag layer surrounding the SiNW could be well distinguished. The thickness of Ag layer is  $13 \pm 4$ nm. The variation of Ag layer thickness is due to surface roughness.



**Figure S1.** TEM image of Ag layer coated SiNW. The scale bar is 50nm.

## Partial Least Square Regression Analysis

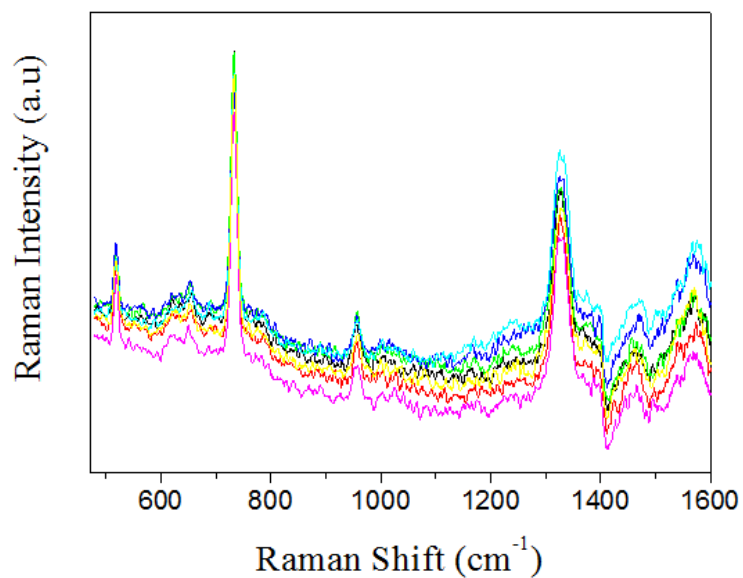
Root mean square error of calibration (RMSEC) was used to optimize the PLS model. For 3 loading factors, RMSEC reached its minimum value. If the factors increased, RMSEC increased again and indicated an over fitting. Figure 5c and 5d shows the predicted values versus actual ones of R6G and MG using leave-one-out cross-validation with 3 loading vectors. The measurement of R6G from 15 to 35  $\mu\text{M}$  yielded RMSEP of 0.722  $\mu\text{M}$  and predicted  $R^2$  of 0.982. The measurement of MG at range from 0.3 to 0.7  $\mu\text{M}$  yields RMSEP of 0.014  $\mu\text{M}$  and predicted  $R^2$  of 0.982.



**Figure S2.** Partial least square regression analysis of the R6G and MG mixture. The predicted values versus actual ones of (c) R6G and (d) MG using leave-one-out cross-validation with 3 loading vectors.

### SERS Spectra of dsDNA

The DNA used in our experiment is natural sourced double strand (dsDNA) with molecular weight of 50000 – 100000 Daltons and estimated chain length about 25-50nm (average molecular weight of a nucleotide pair in dsDNA is 660 Daltons each nucleotide pair is 0.33 nm long on average). The SERS Spectra of 100 $\mu$ M dsDNA is shown below.



**Figure S3.** Raman spectra of dsDNA of 100 $\mu$ M, the 7 spectra were randomly selected from mapping data on Ag/SiNW.