Supporting Information for

Surface Ligand Modified Silver Nanoparticles-based SERS Sensing Platform for Ultrasensitive Detection of Thiram Pesticide in Green Tea Leaf: Roles of Coating Agents on Sensing Performance

Dong Thi Linh[a,b], Quan-Doan Mai[a,*], Dao Thi Nguyet Nga[a], Nguyen Tuan Anh[a], Hoang Van Tuan[a], Ha Anh Nguyen[a,**], Xuan Hoa Vu[c], Anh-Tuan Le[a,d,***]

[a]*Phenikaa University Nano Institute (PHENA), Phenikaa University, Hanoi 12116, Vietnam*

[b] *Faculty of Fundamental Sciences, Thai Nguyen University of Technology, 666 3/2 road, Thai Nguyen city 24000, Vietnam*

[c]*Institute of Science and Technology, TNU-University of Sciences, Tan Thinh ward, Thai Nguyen city 24000, Vietnam*

[d]*Faculty of Materials Science and Engineering (MSE), Phenikaa University, Hanoi 12116, Vietnam*

Corresponding authors:

*doan.maiquan@phenikaa-uni.edu.vn (Q.D. Mai)

**anh.nguyenha@phenikaa-uni.edu.vn (H.A.Nguyen)

**tuan.leanh@phenikaa-uni.edu.vn (A.T.Le)

Calculation of limit of detection (LOD)

The standard curve of linear detecting range was given as:

$$Y = A + B \times Log(X) \quad (1)$$

where A and B are intercept and slope of regression equation obtained through the plot of the logarithmic SERS intensity (Y) – logarithmic concentration (X).

The LOD is calculated using the following equation [1]:

$$LOD = 10^{\left[(Y_{blank} + 3SD)/Y_{blank} - A\right]/B} \quad (2)$$

where Y_{blank} and SD are the SERS signal and the standard deviation of blank sample, respectively.

SD is calculated via the well-known formula:

$$SD = \sqrt{\frac{1}{n-1} \times \sum_{i}^{n} (x_i - x_{average})^2} \quad (3)$$

where x_i if the "i" sample of the series of measurements, $x_{average}$ is the average value of SERS signal obtained from the blank sample repeated n times.

Calculation of relative standard deviation (RSD)

The RSD value of repeatability and reproducibility is calculated via the well-known formula:

$$\text{RSD} = \frac{SD \times 100}{x_{average}} \quad (4)$$

where SD is the standard deviation that calculates using equation 4 and $x_{average}$ is the average value of SERS signal obtained from each measurement.

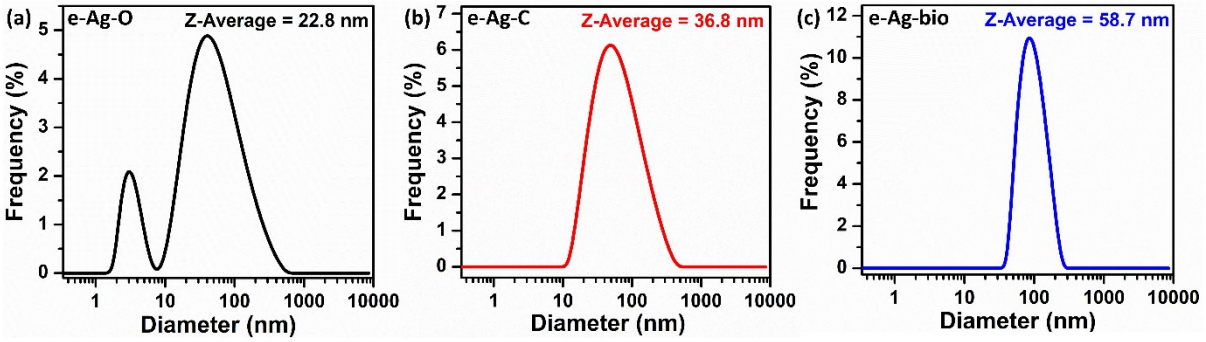

Figure S1: DLS measurements of (a) e-Ag-O, (b) e-Ag-C and (c) e-Ag-bio.

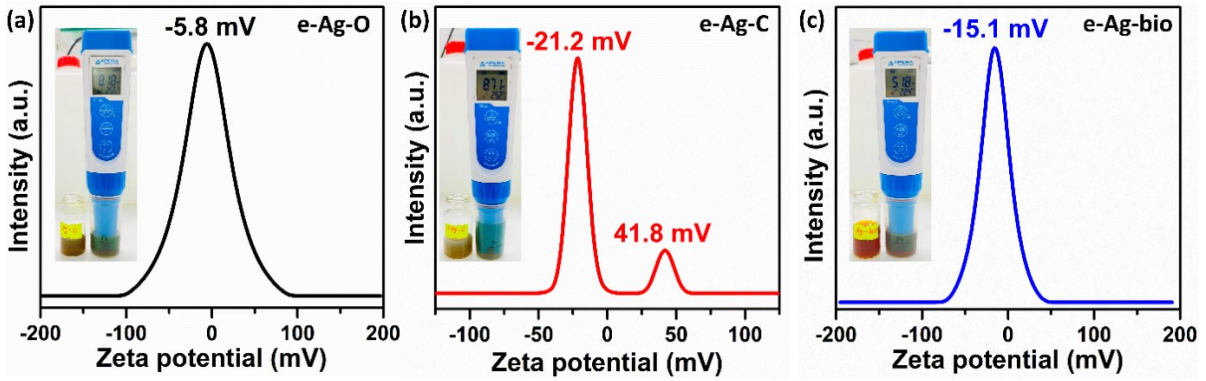

Figure S2: Zeta potential of (a) e-Ag-O, (b) e-Ag-C and (c) e-Ag-bio. Inset the pH values of three samples.

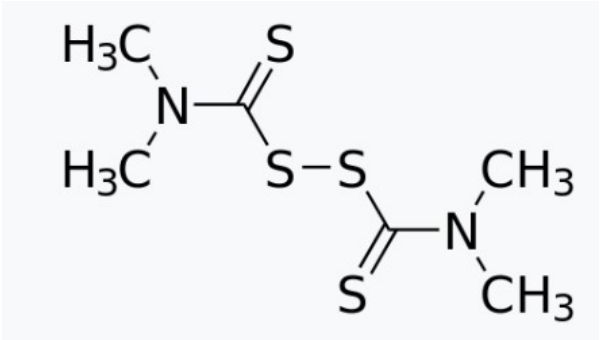

Figure S3: The molecular structure of thiram

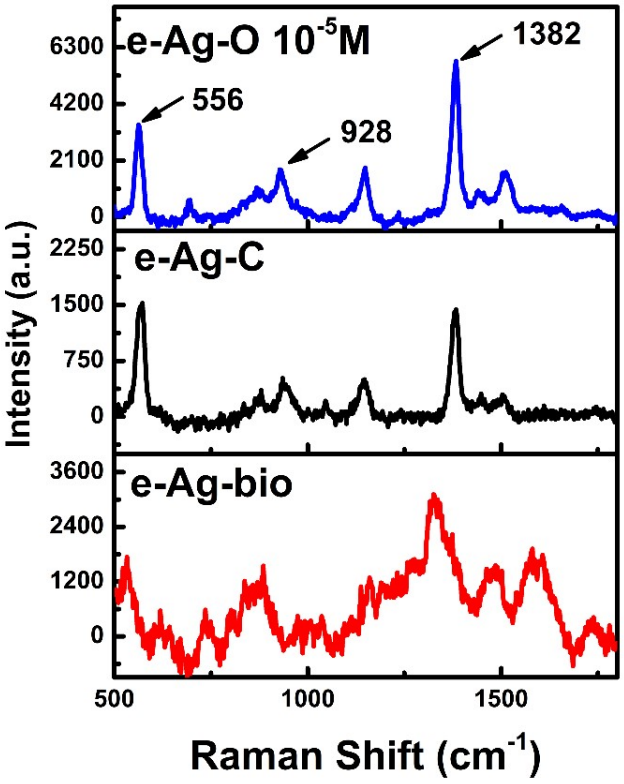

Figure S4: SERS spectra of thiram at concentration 10^{-5} M with three kinds of e-Ag substrates

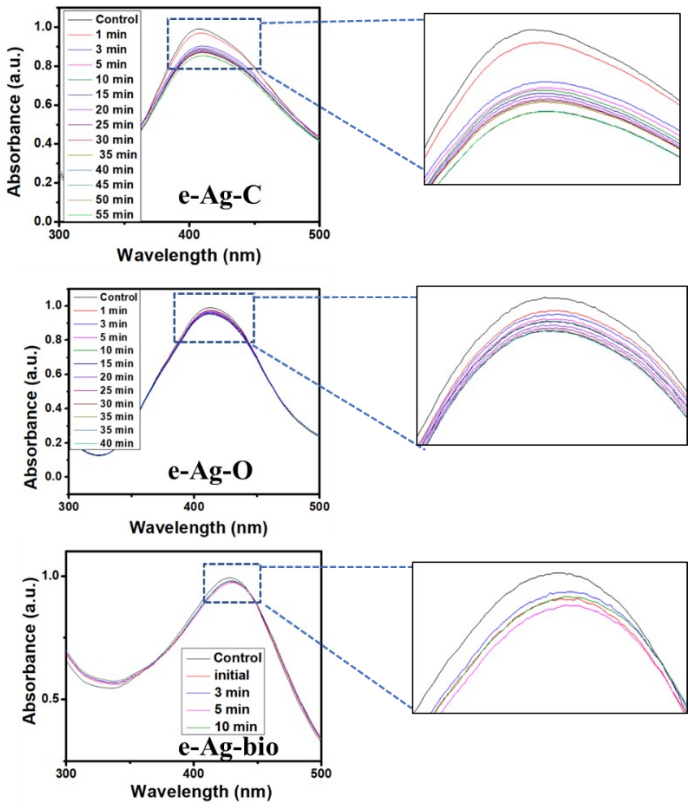

Figure S5: Absorption spectra of a mixture of thiram solution and e-Ag-O solution over an incubation period of 55 min

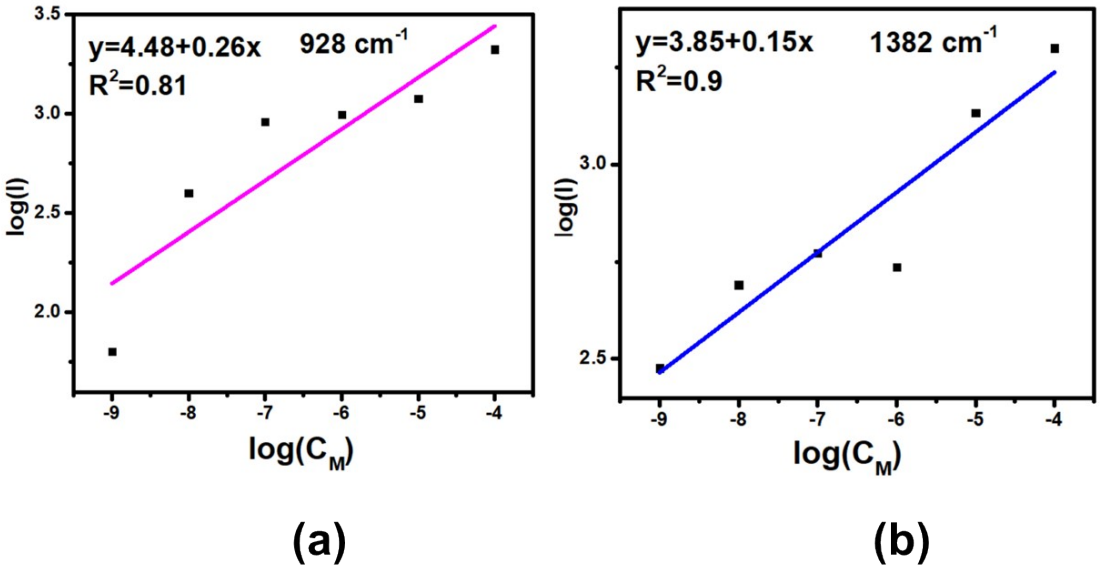

Figure S6: Linear response at (a) 928 cm^{-1}, (b) 1382 cm^{-1} of thiram with concentration range from 10^{-4} M to 10^{-9} M

(1) Chen, R.; Shi, H.; Meng, X.; Su, Y.; Wang, H.; He, Y. Dual-Amplification Strategy-Based SERS Chip for Sensitive and Reproducible Detection of DNA Methyltransferase Activity in Human Serum. *Anal. Chem.* **2019**, *91* (5), 3597–3603. https://doi.org/10.1021/acs.analchem.8b05595.