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# Supporting Information

for

# Biomimetic synthesis of Ag-coated glasswing butterfly arrays as ultra-sensitive SERS substrates for efficient trace detection of pesticides

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## Additional theoretical and experimental information

1 Enhancement factor (EF) calculation.

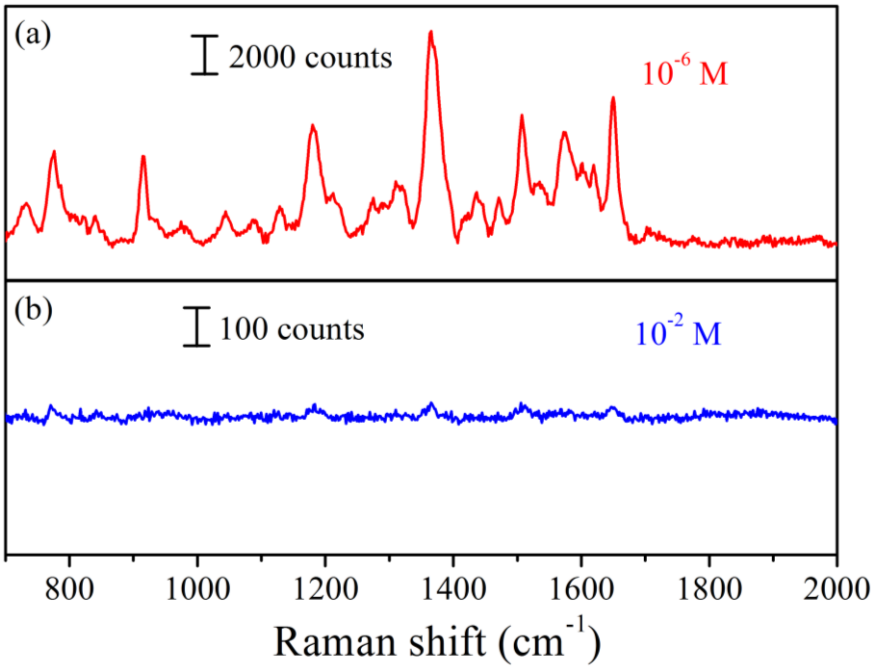


**Figure S1:** (a) SERS spectrum of $10^{-6}$ M CV solution acquired from Ag-G.b.-20 substrate. (b) Normal Raman spectrum of $10^{-2}$ M CV solution.

2 The calculated EF was by the following equation(1) [1]:

$$G_{SERS} = \left| \frac{E_{loc}(\omega)}{E_{inc}(\omega)} \right|^4 \quad (1)$$

where the $E_{loc}(\omega)$ and $E_{inc}(\omega)$ represent to the E and $E_0$ in the 3D-FDTD simulation, respectively.

3 The RSD value was calculated according to the following equation (2) [2]:

$$RSD = \frac{\sqrt{\sum_{i=1}^{n} \left( I_i - \bar{I} \right)^2}}{\bar{I}} \quad (2)$$

where the $\bar{I}$ represents the average intensity of the Raman signal, $n$ is the number of the measured spectrum, $I_i$ is the Raman intensity of each spectrum at a characteristic peak.

4 Point-by-point reproducibility of Ag-G.b.-20 substrate.

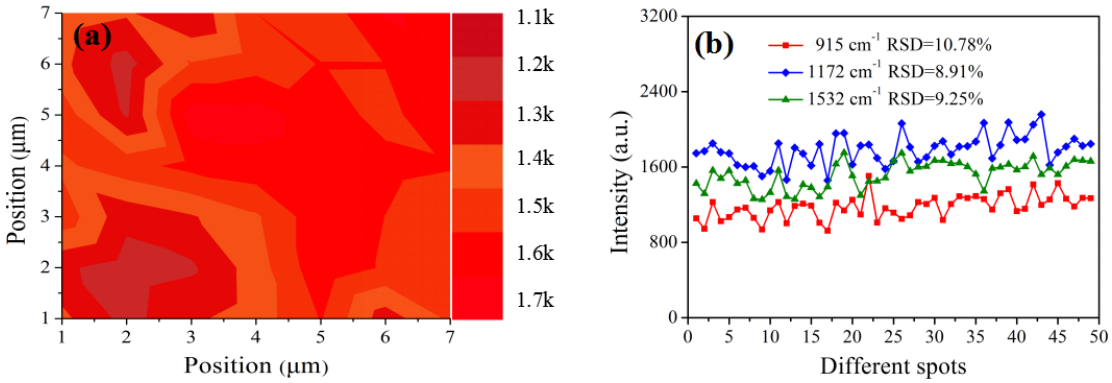


**Figure S2:** (a) Raman mapping of the 1532 $cm^{-1}$ peak. (b) The RSD of Raman intensities of 915, 1172 and 1532 $cm^{-1}$ ($C_{CV}$=$10^{-7}$ M) for an area of 7 μm ×7 μm on a Ag-G.b.-20 substrate.

5 The concentration converted from mg-to-ml to mass-to-area ratio:

In our experiment, the detection of $10^{-10}$ mg/ml acephate was based on 10 μL acephate ethanol solution adsorbed on the Ag-G.b.-20 substrate with a cover area of approximately 0.5 $cm^2$. By unit conversion, $10^{-10}$ mg/ml was approximately equaled to $2\times10^{-6}$ ng $cm^{-2}$. Meanwhile, the concentration converted from mass-to-area ratio to mg per kilogram was roughly calculated according to the reported work [3].

**Table S1:** Linear relationships between acephate concentrations ($10^{-5}$ mg $mL^{-1}$-$10^{-10}$ mg $mL^{-1}$) and Raman intensities at characteristic peaks of acephate.

| Peak/$cm^{-1}$ | Linear function | $R^2$ |
|---|---|---|
| 1078 | y=0.179x+6.155 | 0.986 |
| 1185 | y=0.170x+5.990 | 0.966 |
| 1576 | y=0.170x+6.851 | 0.961 |

6 RSD values of 1185 and 1576 $cm^{-1}$ of acephate.

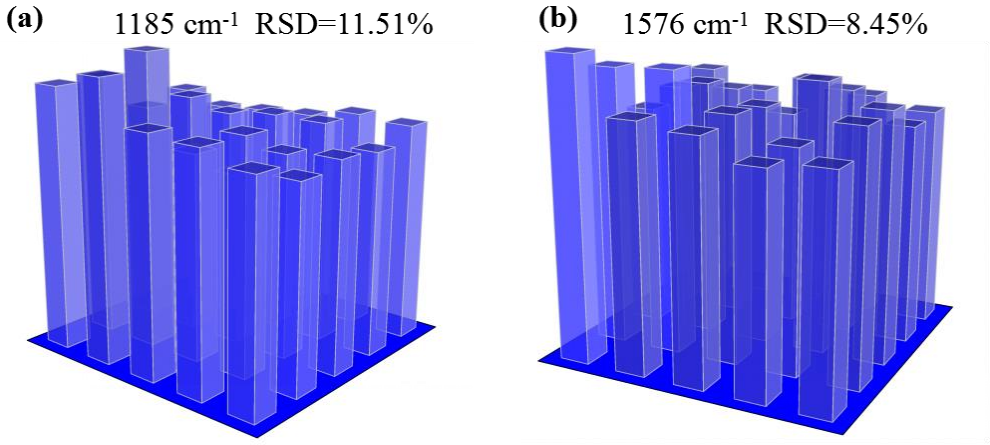


**Figure S3:** The corresponding intensity distributions at 1185 and 1576 $cm^{-1}$ of $10^{-8}$ mg/ml acephate molecules from 25 Raman spectra.

**References**

1. García-Vidal, F. J.; Pendry, J. B. *Phys. Rev. Lett.* **1996**, 77, 1163-1166.
2. Parsons, H. M.; Ekman, D. R.; Collette, T. W.; Viant, M. R. *Analyst* **2009**, 134, 478-485.
3. Liu, B. H.; Han, G. M.; Zhang, Z. P.; Liu, R. Y.; Jiang, C. L.; Wang, S. H.; Han, M. Y. *Anal. Chem.* **2012**, 84, 255-261.