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The Charge Transfer Effect on SERS in a Gold-decorated Surface Defect Anatase Nanosheet/ Methylene Blue (MB) system

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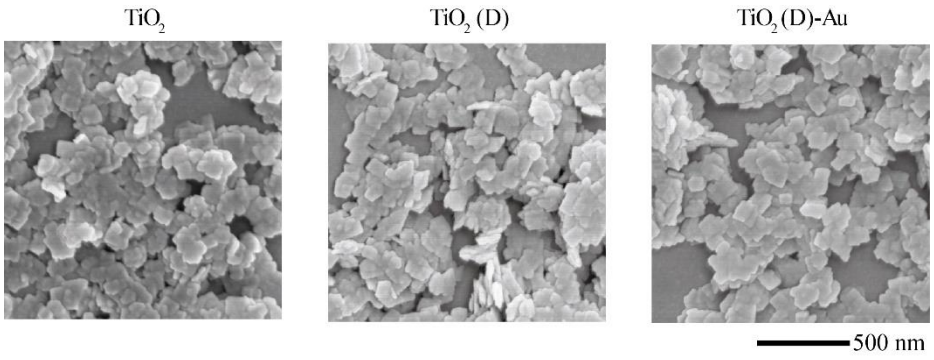
S1 The morphology of anatase nanosheets on silicon wafers



Supplementary Figure 1 SEM images of TiO_2, TiO_2(D) and TiO_2(D)-Au on silicon wafers.

S2 Calculation of enhancement factor.

The EF was calculated following the formula[s1]:

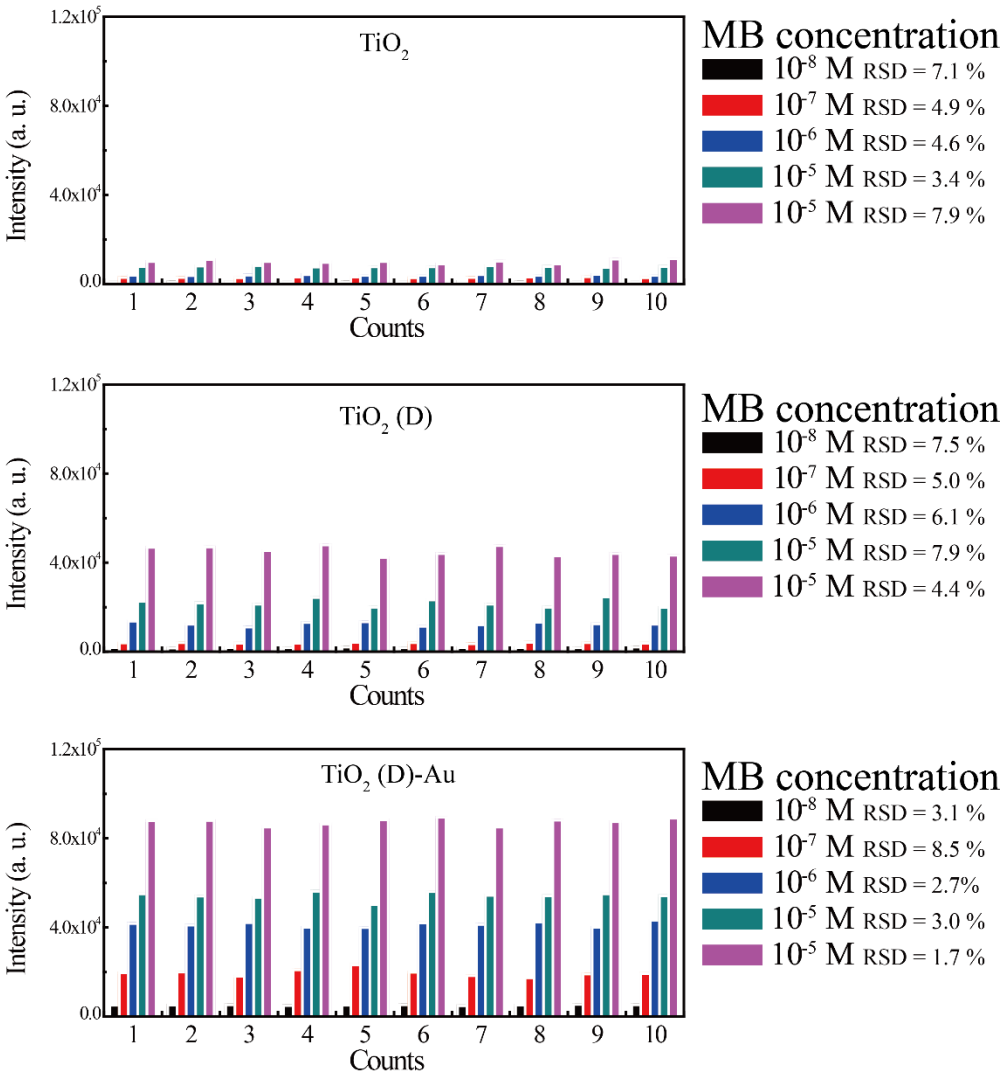
$$EF = (I_{SERS}/N_{SERS})/(I_{bulk}/N_{bulk}) \quad (1)$$

$$N_{SERS} = CVN_A A_{Raman}/A_{sub} \quad (2)$$

$$N_{bulk} = \rho h N_A A_{Raman}/M \quad (3)$$

Here, I_{SERS} and I_{bulk} were the intensities of the selected Raman Peak in SERS (Supplementary Figure 2) and non-SERS spectra (Supplementary Figure 3), and N_{SERS} and N_{bulk} were the average number of MB molecules in the scattering area for SERS and non-SERS measurement. The intensities of Raman were obtained by taking average of 10 spots on one sample. The I_{bulk} as reference was got using MB (0.05 M) dispersed on Si wafer at the same condition following SERS sample preparation. The N_{SERS} can be estimated using equation (2) with the molar concentration of the analyte solution (C), volume of the droplet (V), Avogadro constant (N_A) and the laser spot area (A_{Raman}, 1 μm in diameter). The N_{bulk}

can be calculated using equation (3). The confocal depth (h) of the laser beam is 21 μm and M is the molecular weight, ρ is the density of bulk MB.



upplementary Figure 2 the intensity of peak 1621 cm^{-1} on different SERS substrates with 10 different areas for each sample.

Reference

S1. Cong, S.;Yuan, Y.;Chen, Z.;Hou, J.;Yang, M.;Su, Y.;Zhang, Y.;Li, L.;Li, Q.; Geng, F. Noble metal-comparable SERS enhancement from semiconducting metal oxides by making oxygen vacancies. *Nature communications* **2015**, *6*, 1-7.