Supporting information

In-situ monitoring of Quorum Sensing signalling molecules by a SERS chip with array micro-chambers

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1. Preparation and characterization of gold and silver colloids

Gold nanoparticles colloid was prepared by trisodium citrate reduction method. Chloroauric acid solution with a volume of 100mL and a concentration of 0.001% was added to a conical flask, and then heated in a constant temperature with magnetic. When the solution was boiling, trisodium citrate aqueous solution with a concentration of 1% and a volume of 8 mL was immediately added. The solution stop heating once the color of solution changed wine red. The prepared gold nanoparticles colloid was naturally cooled to room temperature and stored in 4℃ away from light.

Silver nanoparticles colloid was prepared by microwave method. Silver nitrate solution with a volume of 100mL and a concentration of 0.001mol/L was added to a conical flask. Subsequently added 6mL trisodium citrate aqueous solution with a concentration of 0.018mol/L to the conical flask and mixed well. The conical flask was placed on a microwave oven and heated at low rank for 15min. The prepared silver colloid was with the color of gray and stored in 4℃away from light.

The absorption spectra of the prepared gold and silver nanoparticles colloid were measured by UV-vis spectrometer with the wavelength range of 300~700nm. The morphology of nanoparticles in colloid was characterized by scanning electron microscopy (SEM). Fig.S1 showed the absorption spectrum of gold and silver nanoparticles colloid. The absorption peak of gold nanoparticles colloid was 512nm, and silver nanoparticles colloid had an absorption peak at 416 nm, which was consistent with the results reported in other literature. As shown in Fig.S2, the shape of gold nanoparticles was regular spherical particles, and the size was about 20nm. The size of spherical silver nanoparticles was about 50 nm.

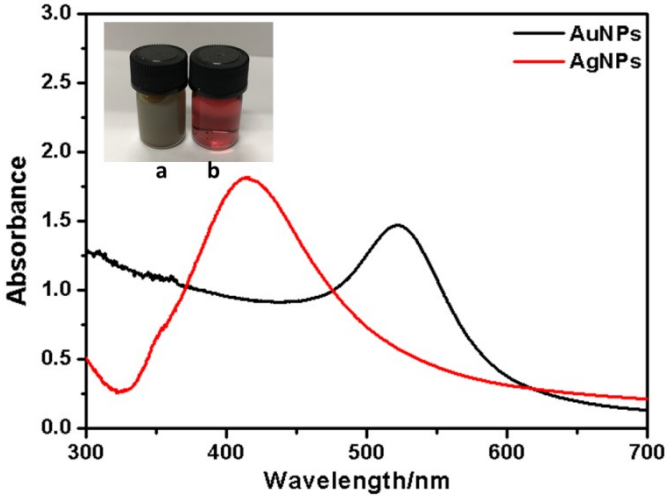

Fig.S1The absorption spectra of (a) silver nanoparticles colloid (b)gold nanoparticles colloid.

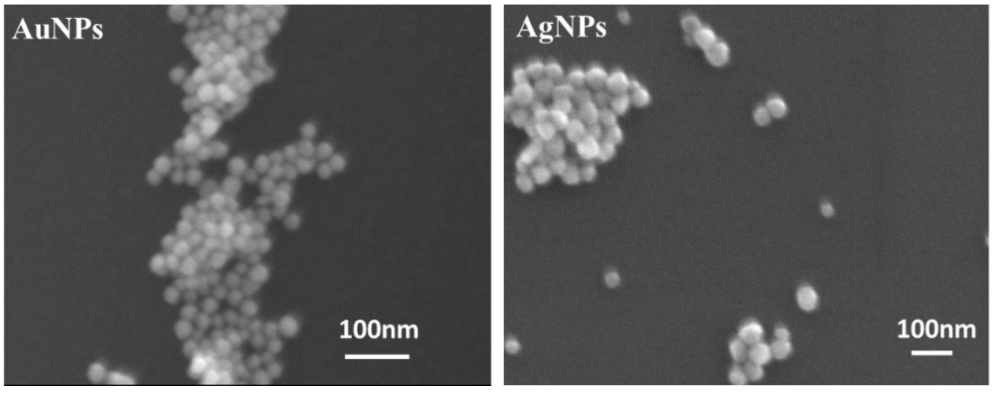

Fig.S2 Morphology characterization of silver and gold nanoparticles by SEM

2. The SERS detection from the front and back of the Nano-silver SERS substrate

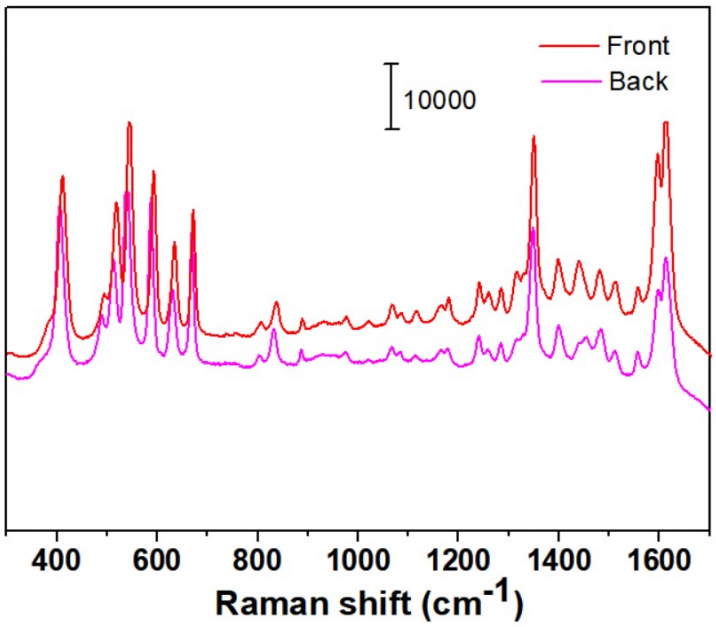

Fig.S3 the SERS spectra of pyocyanine at the concentration of 10^{-4}M collected from the from the front and back on the Nano-silver SERS substrate

3. Minimum inhibitory concentration (MIC) of anti-bacterial drugs

MIC was the minimum dose concentration of drugs to inhibit bacterial growth. The MICs of ceftazidime, curcumin and tannic acid against *Pseudomonas aeruginosa* were tested in 96 well plates by double dilution method. Firstly, added 200μL bacterial solution to each well of the 96-well plate, then injected different concentrations of anti-bacterial drugs into each well. The 96-well plates was placed in the incubator with constant temperature at 37 ℃ for 18h. The growth of *Pseudomonas aeruginosa* was observed to investigate the growth state of bacteria cells. The MICs of ceftazidime, curcumin and tannic acid against *Pseudomonas aeruginosa* were determined to be 4μg/mL、100 μg/mL、128 μg/mL according to the turbidity of the bacterial solution.

4. Reproducibility of SERS substrate

SERS spectra of pyocyanine molecule with a concentration of 10^{-5}mol/L were collected randomly at 10 different positions to investigate the reproducibility of the prepared SERS substrate. As were seen from Fig. S3, the shape and position of SERS spectra of pyocyanine molecule was consistent and the intensity of characteristic peak fluctuated lightly. The peak intensity of pyocyanine molecule at 1350 cm^{-1} was

counted, and the RSD was lower 10%. It was illustrated that the stability of the prepared substrates was satisfied. The characteristic Raman peaks of pyocyanine molecule were at 409 cm^{-1}, 490 cm^{-1}, 509 cm^{-1}, 539 cm^{-1}, 593 cm^{-1}, 635 cm^{-1}, 670 cm^{-1}, 834 cm^{-1}, 1171 cm^{-1}, 1350 cm^{-1}, 1591 cm^{-1} and 1614 cm^{-1}. The peak assignment of pyocyanine molecule was described in detail in table S1.

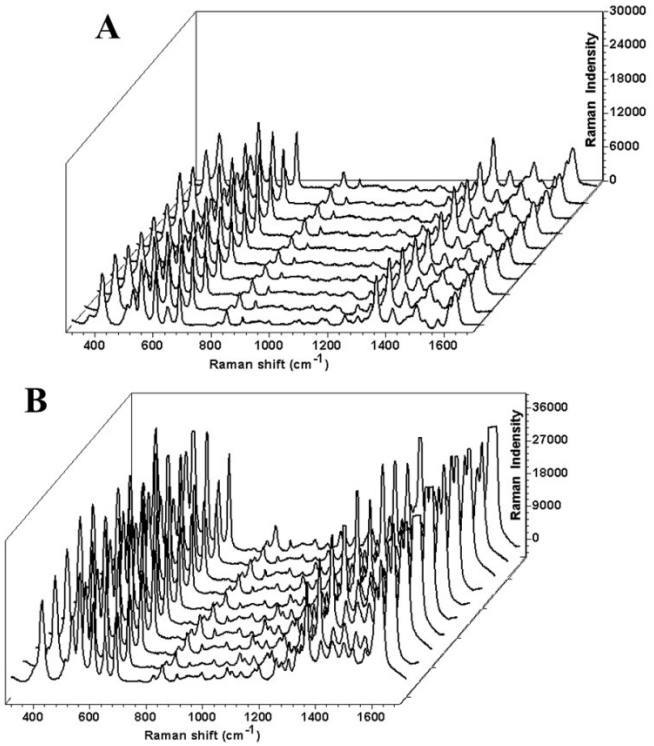

Fig. S4 The collected SERS spectra of pyocyanin on (a) gold SERS substrate and (b) silver SERS substrate at 10 randomly spots.

Table S1 The Raman shifts of pyocyanin and peaks assignments

Raman shift/cm^{-1}	Band assignment
409 cm^{-1}	ring deformation
490 cm^{-1}	ring deformation
509 cm^{-1}	ring deformation
539cm^{-1}	ring deformation
593 cm^{-1}	ring deformation
635 cm^{-1}	ring deformation
670cm^{-1}	ring deformation

1171cm^{-1}	$N–CH_3$ wagging
1350 cm^{-1}	C-N stretching
1591cm^{-1}	C-C stretch vibration
1614 cm^{-1}	C-C stretch vibration, ring stretching