

Bacteria-template synthesized silver microspheres with hollow and porous structures as excellent SERS substrate

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Supporting Information

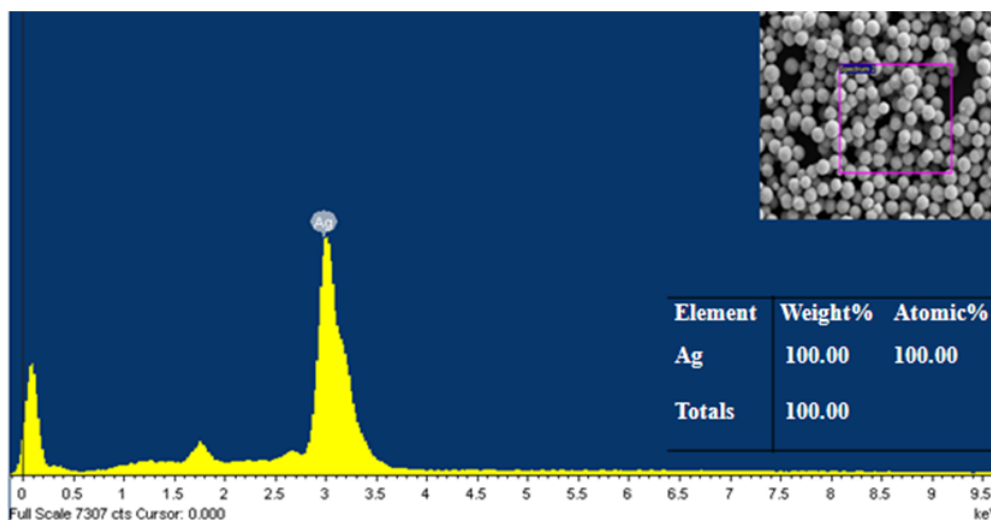


Fig. S1 EDS analyses of hollow silver microspheres after 2h ultrasound treatment. The bacteria residues have been completely removed.

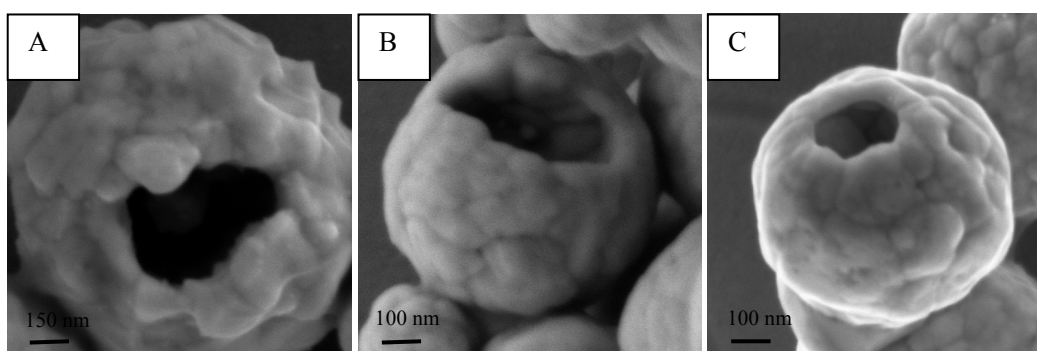


Fig. S2 SEM images of different shell thickness of silver microspheres by changing the concentrations of precursor. (A) $\text{AgNO}_3=0.1$ M, the average thickness is 200 nm; (B) $\text{AgNO}_3=0.01$ M, the average thickness is 150 nm; (C) $\text{AgNO}_3=0.005$ M, the average thickness is 100 nm.

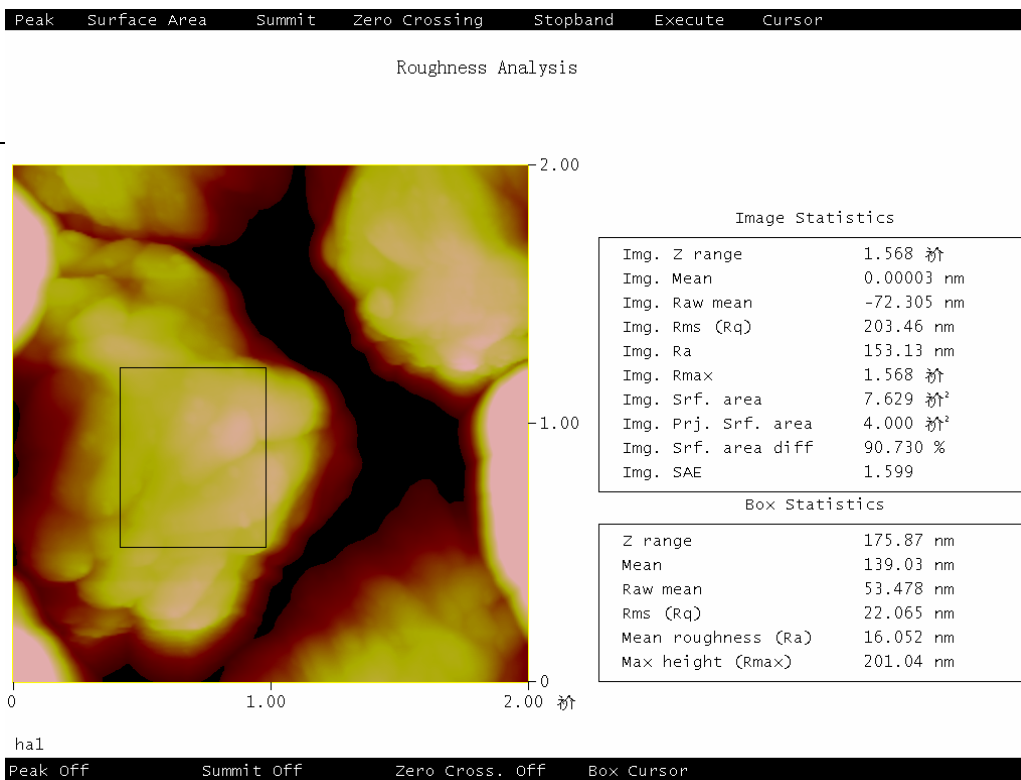


Fig. S3 The contact mode AFM image of a sub-area of the hollow silver sphere. The image size is 0.57×0.71 microns and the maximum height of a feature in the image is 201.4 nm and mean surface roughness is 16.0 nm.

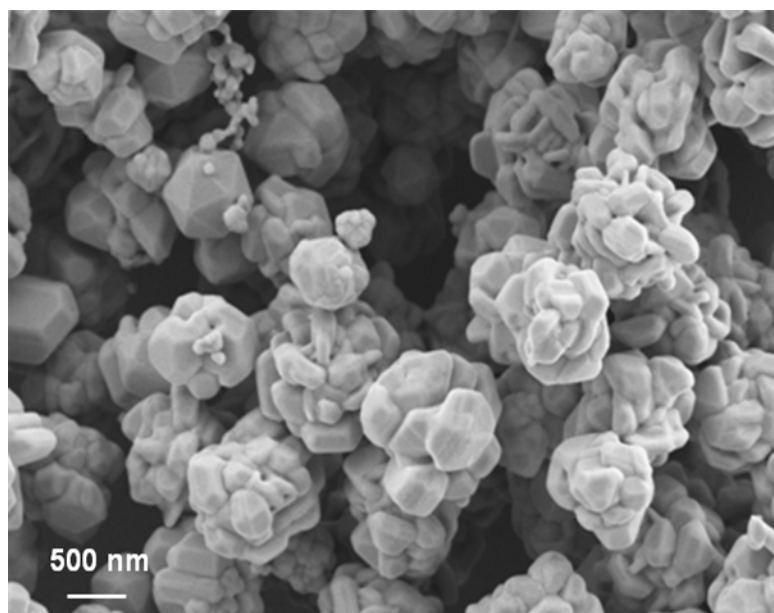


Fig. S4 SEM images of silver microspheres prepared without bacterium. From it, one can see the individual silver microsphere is made up of some aggregated large silver bulks.

Estimation of enhancement factor (EF):

We adopted E. Nalbant method¹ to estimate EF. The following expression was used to calculate the EF:

$$EF = (I_{\text{sers}}/I_{\text{bulk}})/(M_{\text{surf}}/M_{\text{bulk}})$$

Where M_{surf} and M_{bulk} are the concentration of adsorbed molecules on the Ag microspheres surface and the concentration of the molecules in the bulk sample used in the Raman measurement, respectively. The 0.1 M and 1×10^{-9} M of 2-Mpy concentrations were used for the Raman (M_{bulk}) and SERS (M_{surf}) measurements. The assumption was made that all the 2-Mpy in the SERS sample solution were adsorbed on the Ag microspheres. The I_{sers} and I_{Raman} were measured for the RB mode at 1002 cm^{-1} .

References :

1 E. N. Esenturk and A. R. H. Walker, J Raman Spectrosc, 2009, 40, 86-91.