applied sciences

MDPI

Supplementary Materials: Pt-Based Nanostructures for Observing Genuine SERS Spectra of *p*-Aminothiophenol (PATP) Molecules

Yinong Wang, Haofei Zhao, En Cao, Yinghui Sun, Huanyu Ye, Weihua Lin and Rongming Wang

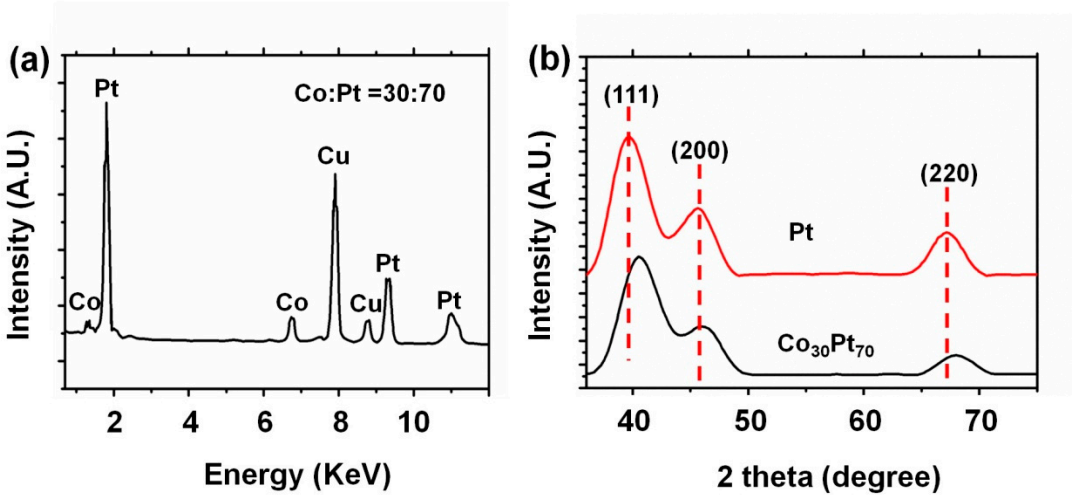

Figure S1. (**a**) EDS spectrum of the Pt-based hollow nanostructures with atomic ratio of Co to Pt of 30:70. (**b**) Powder XRD patterns with various compositions. The XRD data illustrate the sample is face-centered cubic (fcc) structure of CoPt and provide evidence of the alloy structure with peak position shift.

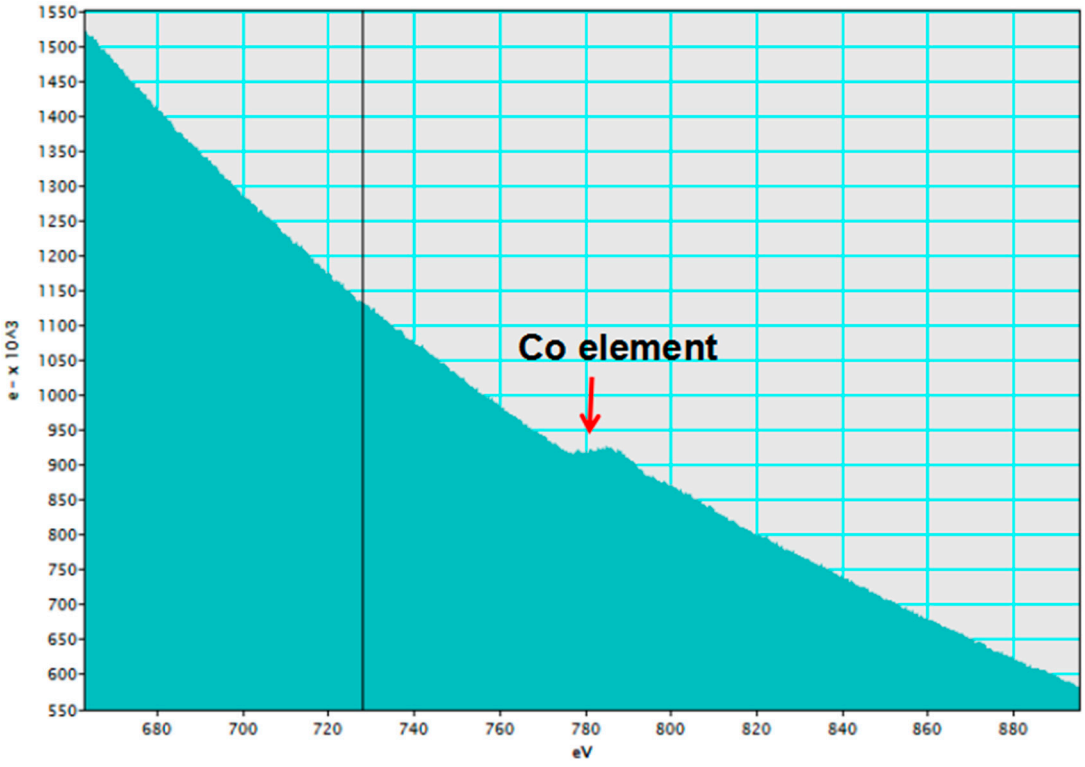

Figure S2. EELs images of the Pt-based bimetallic hollow nanostructure.

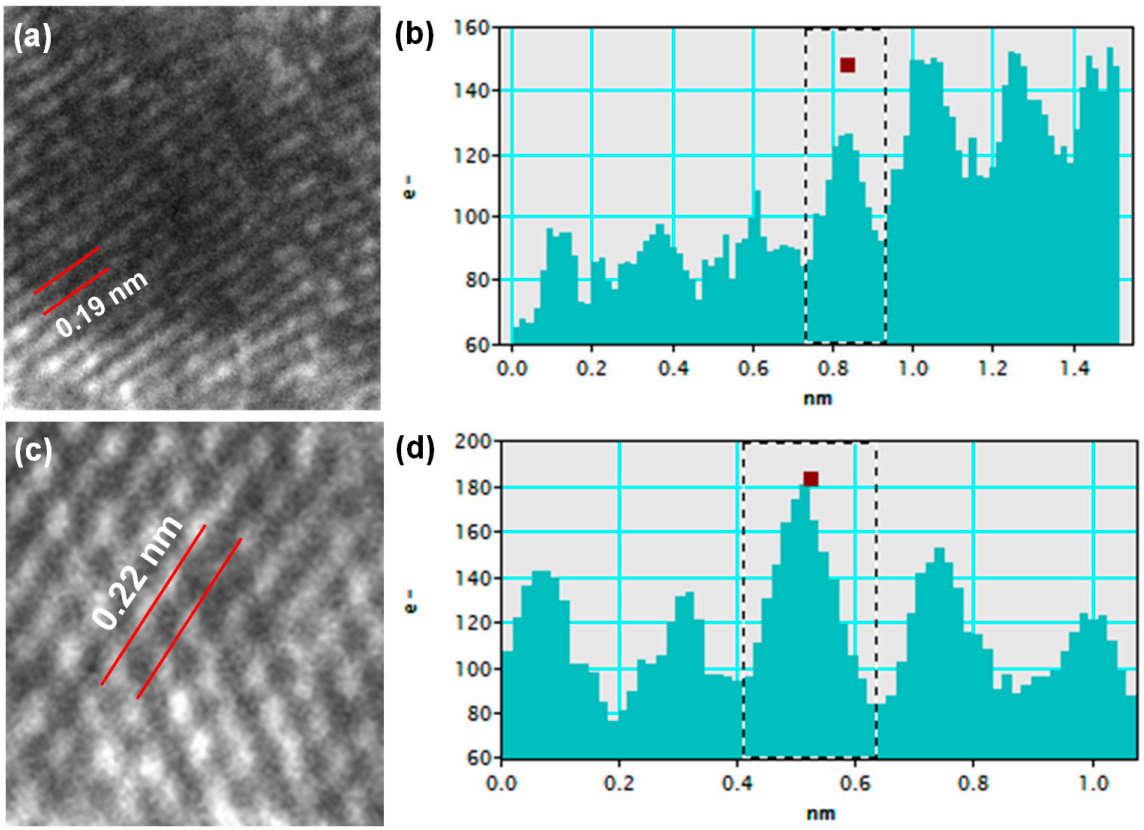

Figure S3. HR-TEM images from the area of the Pt-based hollow nanostructure shown in Figure 2a. (**a**) and (**b**) show that the lattice inter-spacing of this Pt-based hollow nanostructure is 0.19 nm, corresponding to the Co metal. (**c**) and (**d**) show that the lattice inter-spacing of this Pt-based hollow nanostructure is 0.22 nm, corresponding to the Pt metal.

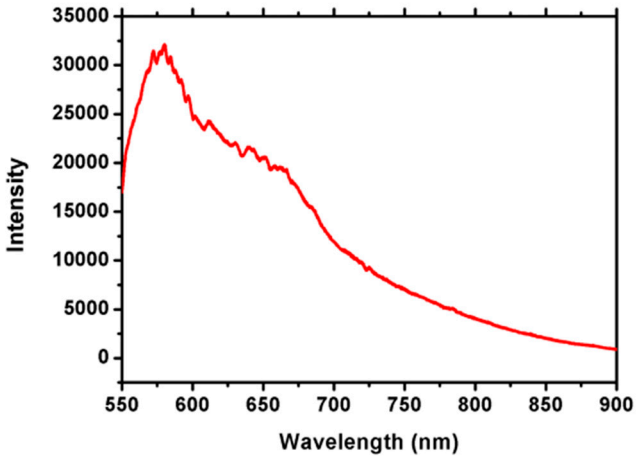

Figure S4. The emission spectrum of the Pt-based bimetallic hollow nanostructure with the laser wavelength 504 nm.

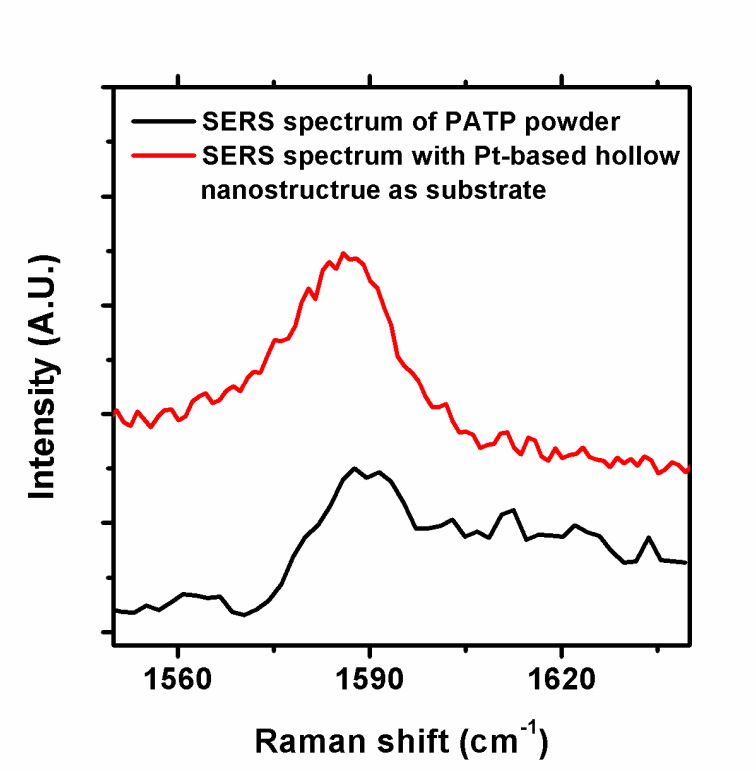

Figure S5. The SERS spectrum of PATP on the Pt-based hollow NC and Raman spectrum of solid PATP with the peak at ~1580 cm^{-1}.

$$G = (I_{SERs}/N_{SERs})/(I_{bulk}/N_{bulk}) \quad (1)$$

The number of tip molecules is represented as:

$$N_{SERs} = A \times N_{sub} \times A_{sub}/\sigma \quad (2)$$

where A is the laser irradiation area (~1.5 μm), N_{sub} is the Pt-based hollow NC number density (~1.3×10^{-7} nm^{-2}) and the diameter size (~300 nm) of NC is calculated from Figure 1, A_{sub} is the area of single Pt-based hollow NC (~7.07×10^{4} nm^2), σ is adsorbed area of the single 4-MBA molecule (~0.2 nm^2). It is assumed here that the substrate material surface is fully adsorbed with 4-MBA molecules and one layer of Pt-based hollow NC was deposited on the substrate homogeneously.

The number of tip molecules contributing Raman signal in the experiment is:

$$N_{bulk} = A \times h \times n_{bulk} = A \times h \times N_A \times \rho_{bulk}/M_{bulk} \quad (3)$$

where A is the laser irradiation area (~1.5 μm), h is the laser focusing depth (~15 μm), n_{bulk} is the number of tip molecules per unit volume, ρ_{bulk} is the density of bulk (~21.45 g/cm^3), M_{bulk} is the molecular weight of PATP molecule (~125.19 g/mol), N_A is the Avogadro constant (~6.02×10^{23}).

It can be calculated as:

$$G = (I_{SERs}/N_{SERs})/(I_{bulk}/N_{bulk}) = (I_{SERs}/I_{bulk}) \times (\sigma \times h \times \rho_{bulk} \times N_A)/(N_{sub} \times A_{sub} \times M_{bulk}) \quad (4)$$

So the EF factor G is approximately calculated as 1×10^{6}.