Electronic Supplementary Material (ESI) for Materials Chemistry Frontiers.

Supporting information：

Telluride Shell on Plasmonic Au Nanoparticles: Amorphous/Crystalline Phase and Shape Evolution Engineering via Aqueous Cation Exchange

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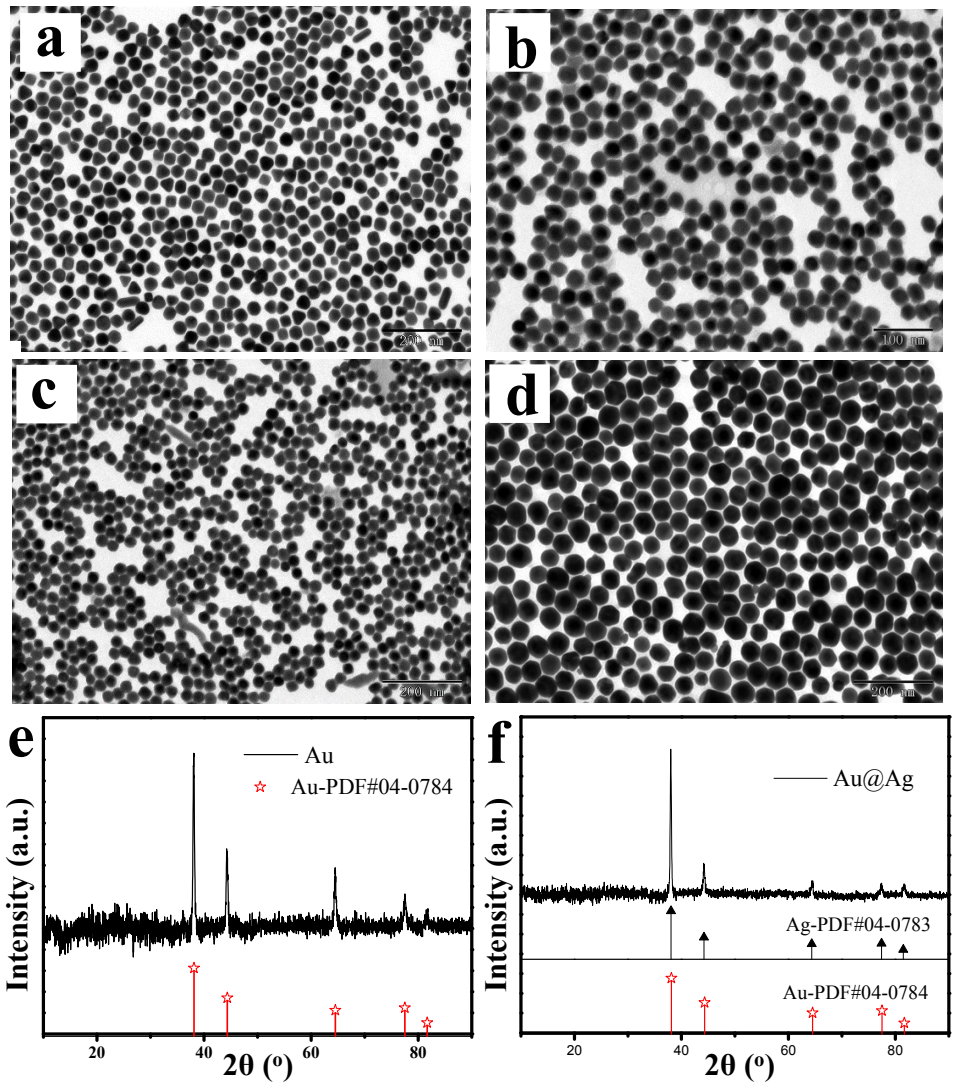


Fig. S1 TEM images of (a) Au NCs and (b) Au@Ag core-shell HNCs. X-ray diffraction patterns of (c) Au NCs and (d) Au@Ag core-shell HNCs.

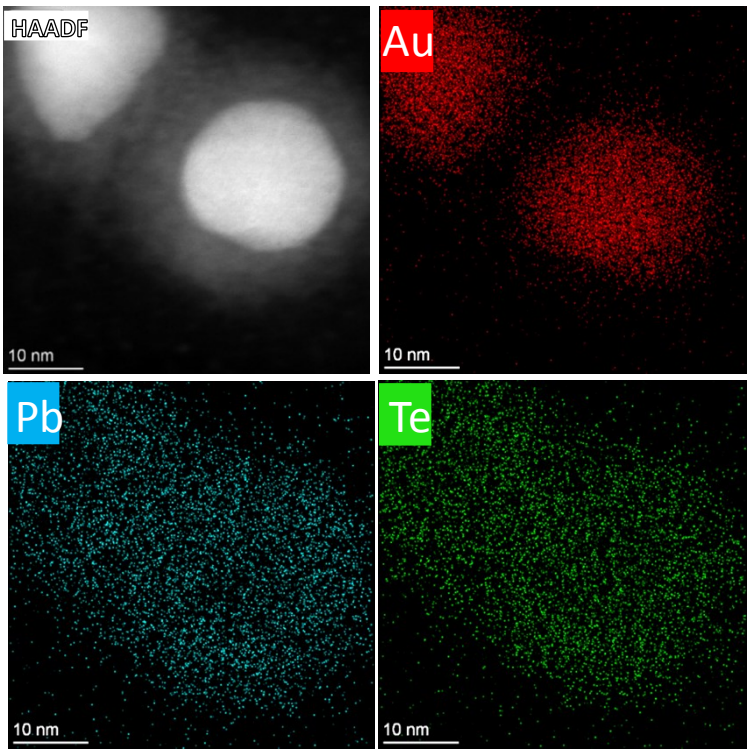
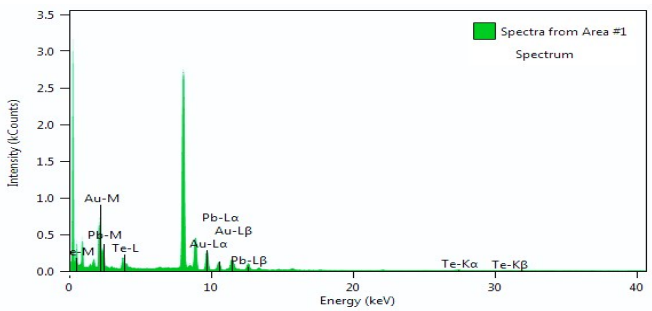


Fig. S2. Dark field STEM image, EDS STEM elemental mapping and compositional profile of Au@amorphous-PbTe core-shell HNCs.



Zaction	Element	Atomic Fraction (%)
52	Te	20.51
79	Au	52.57
82	Pb	26.93

Fig. S3. Elemental analysis spectra and Element content of as-prepared Au@a-PbTe core-shell HNCs.

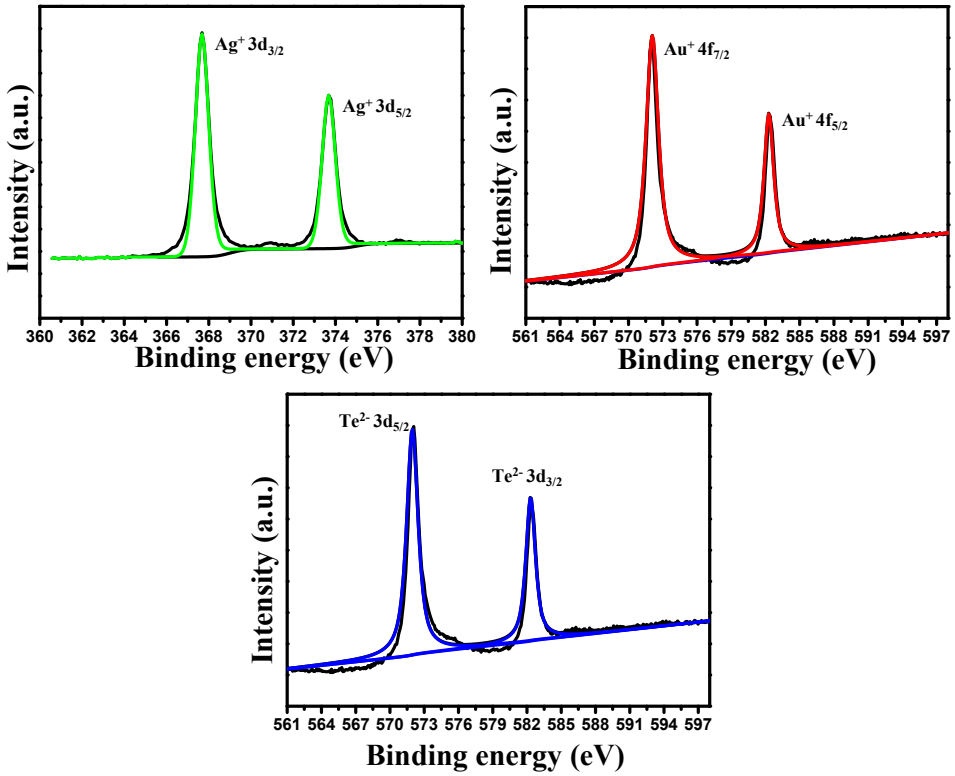


Fig. S4. XPS of as-prepared Au@Ag_3AuTe_2 core-shell NCs.

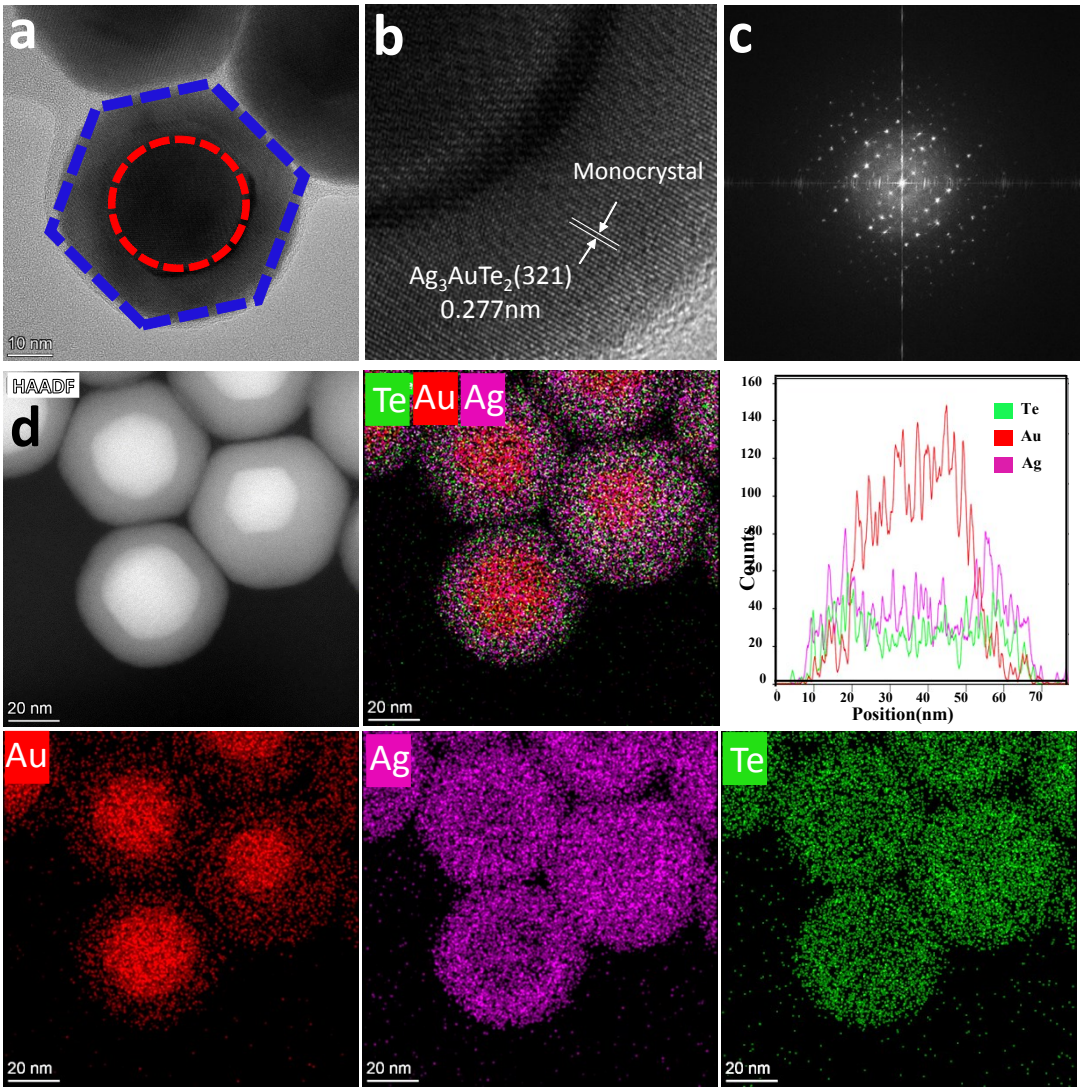
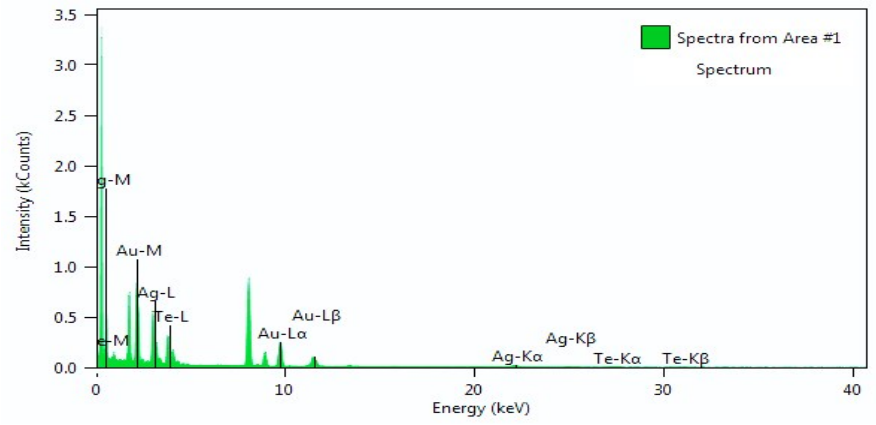


Fig. S5. HRTEM images and FFT of (a-c) Au@ Ag_3AuTe_2 core-shell NCs. (d) Dark field STEM image, EDS STEM elemental mapping and compositional profile of Au@ Ag_3AuTe_2 core-shell HNCs.



Z	Element	Family	Atomic Fraction (%)	Atomic Error (%)	Mass Fraction (%)	Mass Error (%)	Fit error (%)
47	Ag	L	42.29	4.65	32.22	2.52	0.32
52	Te	L	25.57	3.77	23.05	2.90	0.28
79	Au	L	32.14	4.75	44.73	5.63	0.19

Fig. S6. Elemental analysis spectra and Element content of as-prepared Au@Ag_3AuTe_2 core-shell HNCs.

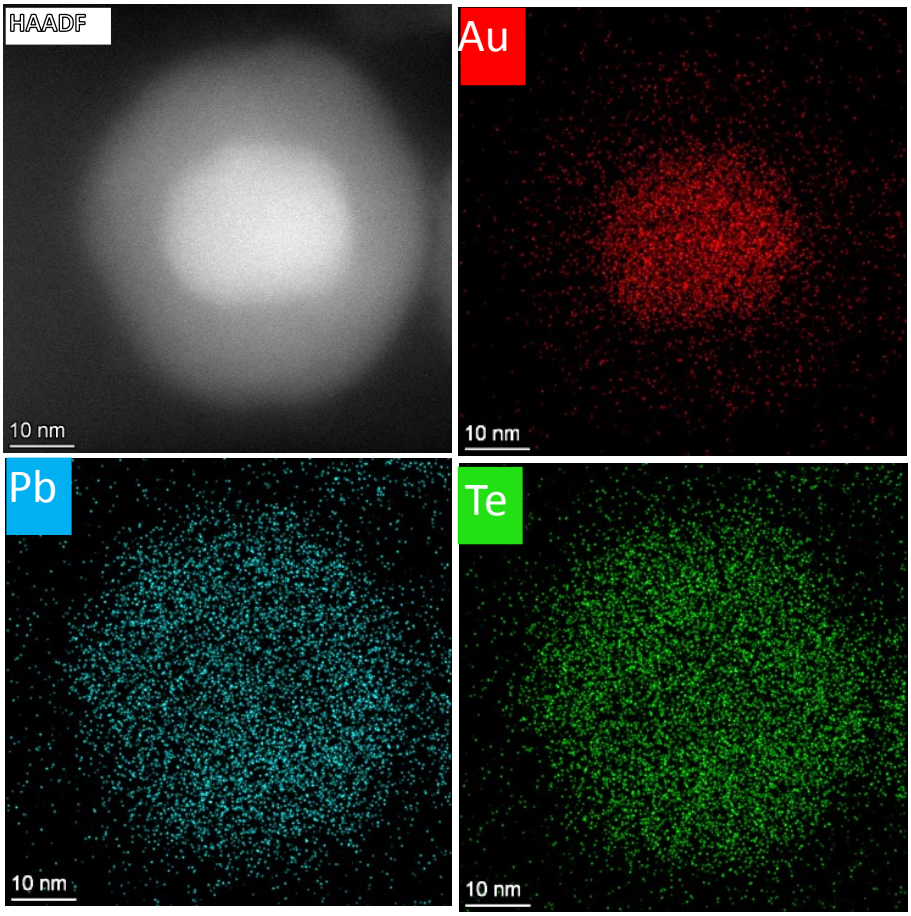
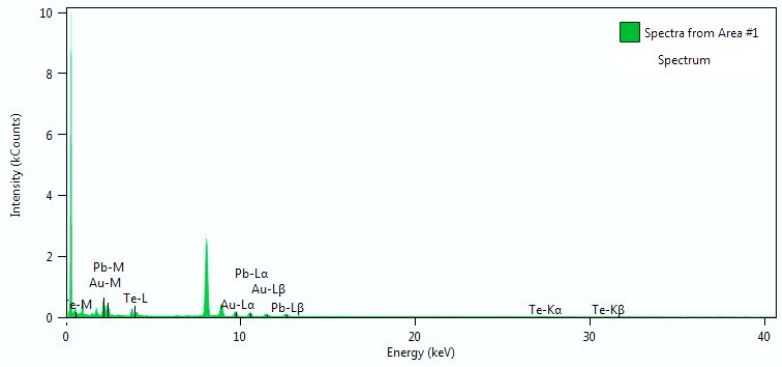


Fig. S7. Dark field STEM image, EDS STEM elemental mapping and compositional profile of Au@polycrystal-PbTe core-shell NCs.



Zaction	Element	Atomic Fraction (%)
52	Te	35.16
79	Au	34.03
82	Pb	30.80

Fig. S8. Elemental analysis spectra and Element content of as-prepared Au@p-PbTe core-shell HNCs.

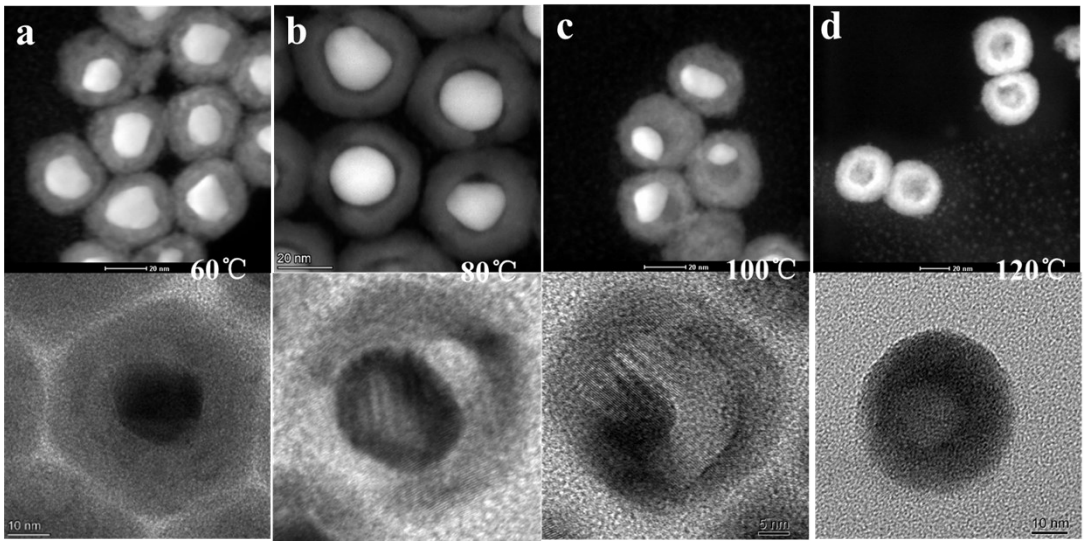


Fig. S9. Dark field STEM image and HRTEM of (a) Au@p-PbTe C-S NCs (60℃). (b) Au@p-PbTe Y-S NCs (80℃) (c) Au@p-PbTe Y-S NCs (100℃) (d) Hollow p-PbTe NCs (120℃).

Calculation of SERS enhancement factor (EF) of Au@p-PbTe NCs

Enhancement factor (EF) for Au@p-PbTe NCs was calculated according to the following equation:

$$EF = (I_1/N_1) / (I_2/N_2) \qquad (1)$$

Where I_1 and N_1 denote the vibration peaks and number of 4-MBA molecules on Au@p-PbTe NCs substrate, respectively. I_2 and N_2 denote the vibration peaks and number of 4-MBA molecules.

During the experiment, 200 μL of 4-MBA solution (0.001 M) was dropped onto the Si wafer (0.5×0.5 cm^2). N_2 was estimated by:

$$N_2 = 200\ \mu L \times 0.0001\ mol/L \times 6.02 \times 10^{23}\ mol^{-1} \times S_1 / S_2 \qquad (2)$$

Where Laser spot size S_1 is estimated by $S_1 = \pi r^2$, $r = (1.22\ \lambda/N_A)/2$, λ is incident wavelength 514.5 nm, the numerical aperture of the objective lens $N_A = 0.5$.

Moreover, N_1 is determined by the laser spot illuminating the 4-MBA-Au@p-PbTe NCs substrate and the density of 4-MBA molecule. Since the Au@p-PbTe NCs is as thin as an ideal flat surface, N_1 can be estimated as:

$$N_1 = \sigma \times S_1 \times 6.02 \times 10^{23}\ mol^{-1} \qquad (3)$$

Where σ is the density of 4-MBA molecule adsorbed onto Au@p-PbTe NCs substrate, which is estimated to ~ 0.5 nM cm^{-2} (3).

By substituting these values into Eq. (1), EF was calculated to be 1.62×10^8.

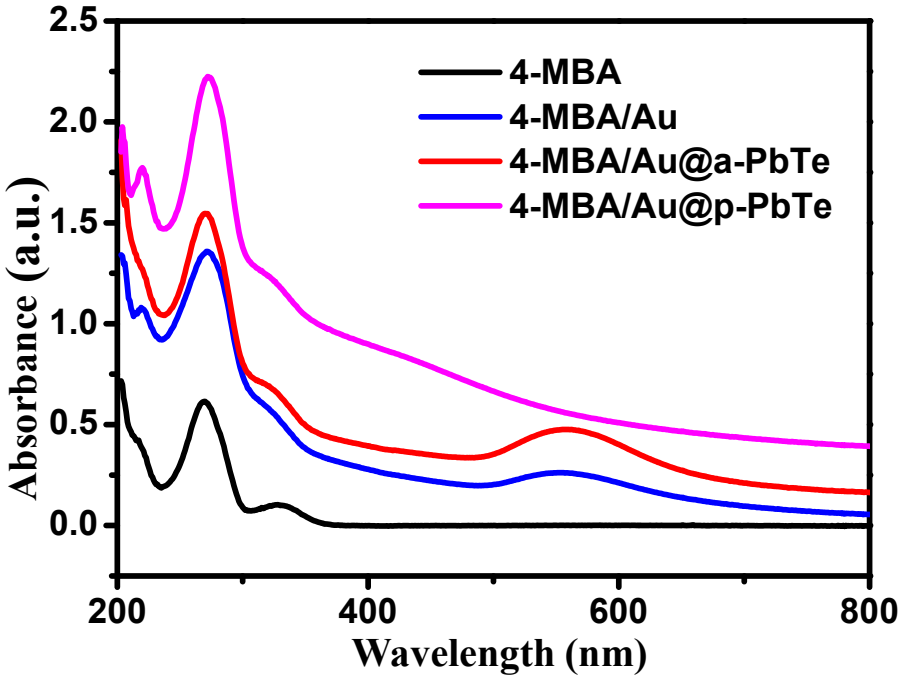


Fig. S10. UV-Vis spectra of 4-MBA, 4-MBA/Au, 4-MBA/Au@a-PbTe, 4-MBA/Au@p-PbTe.