frontiers

Supplementary Material

Selective growth of metal sulfide, metal, and metal-alloy on 2D CdS nanoplates

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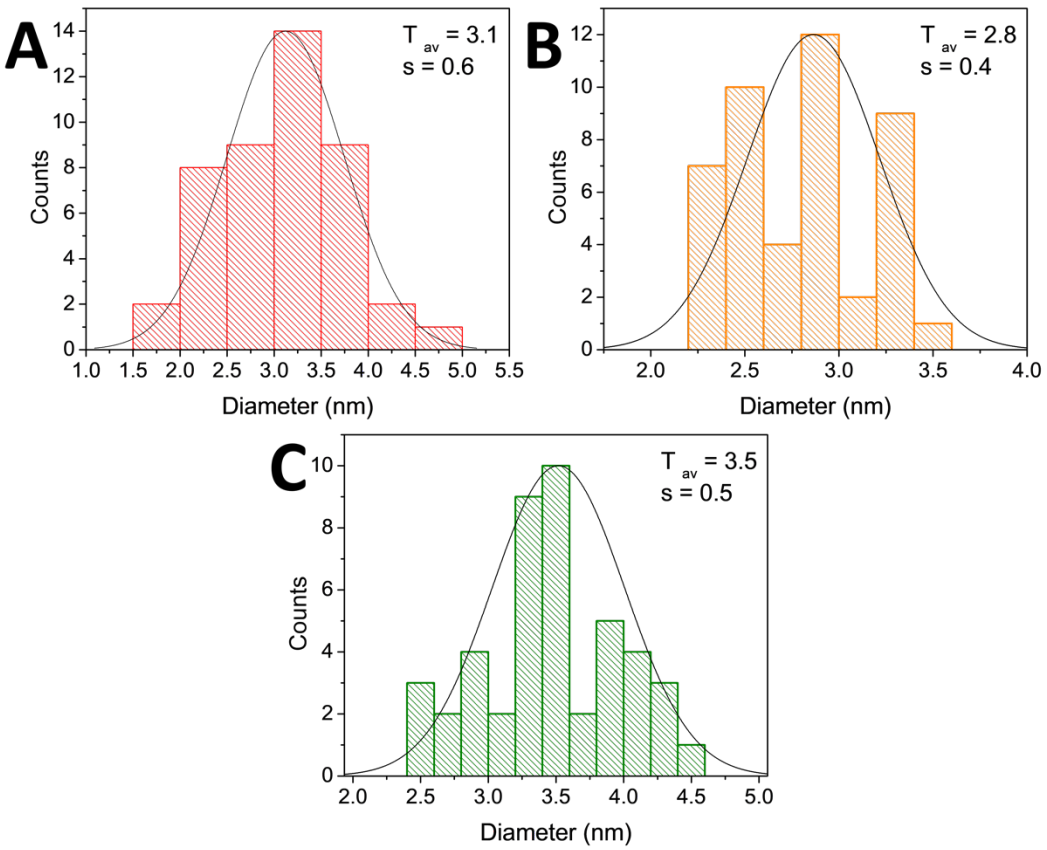
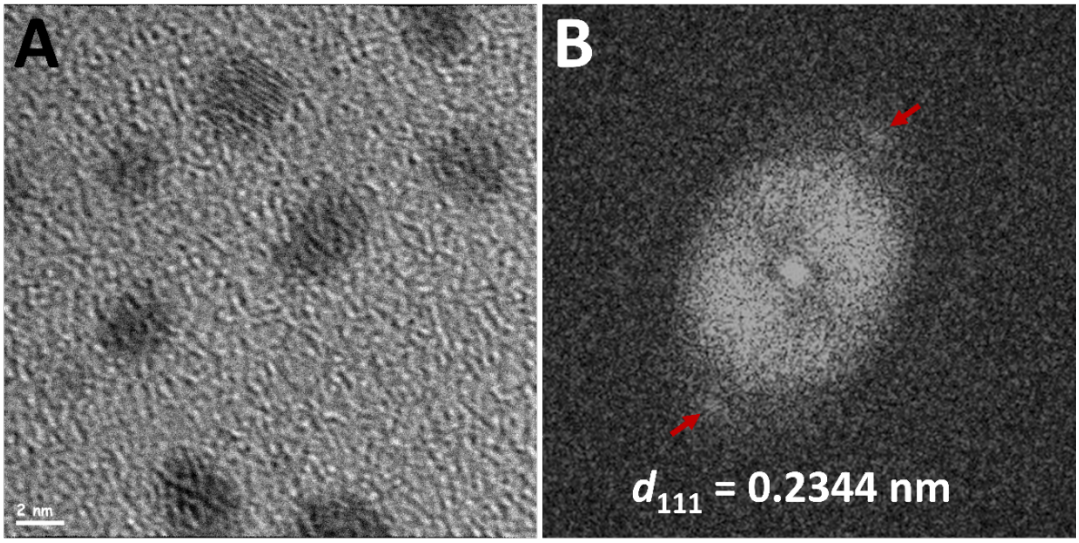
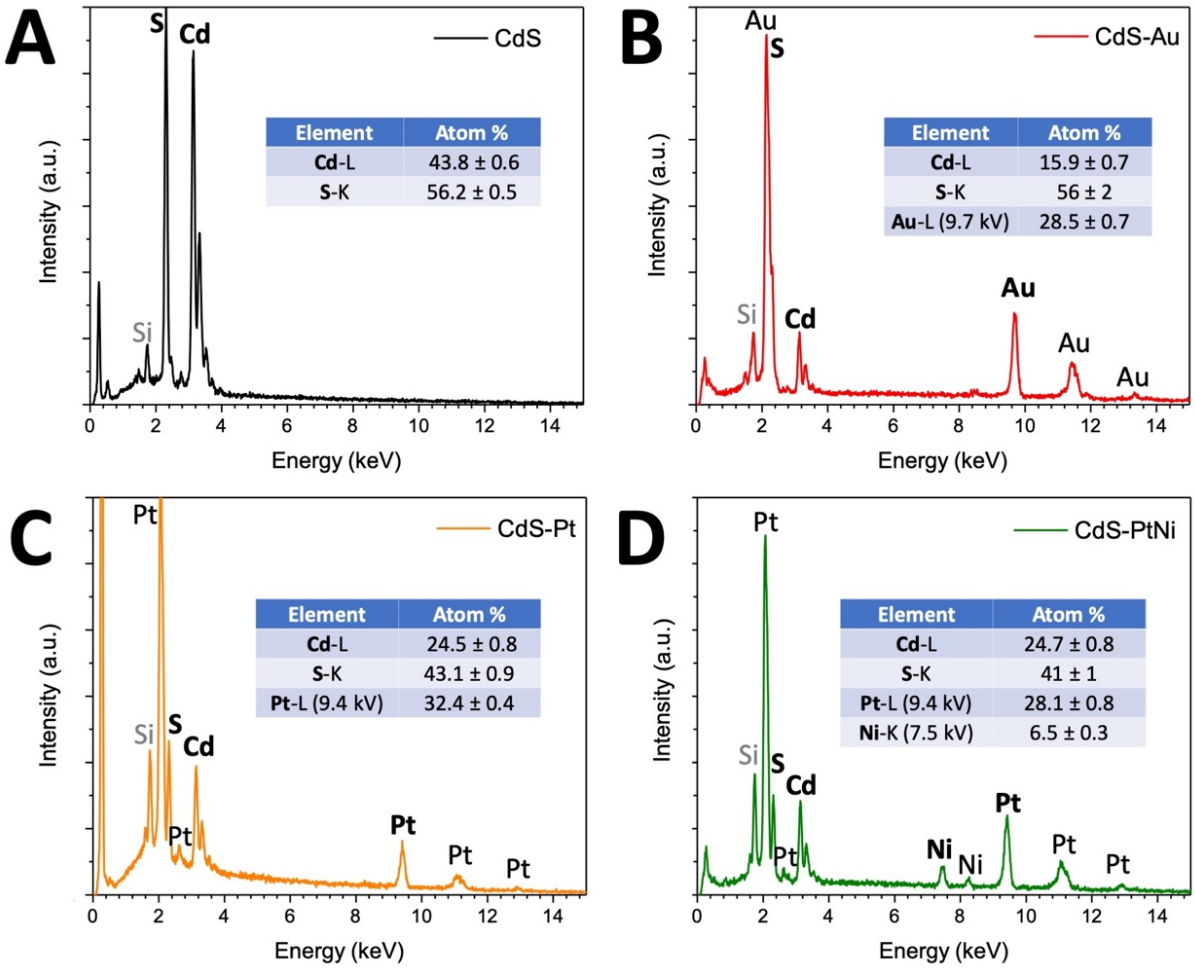


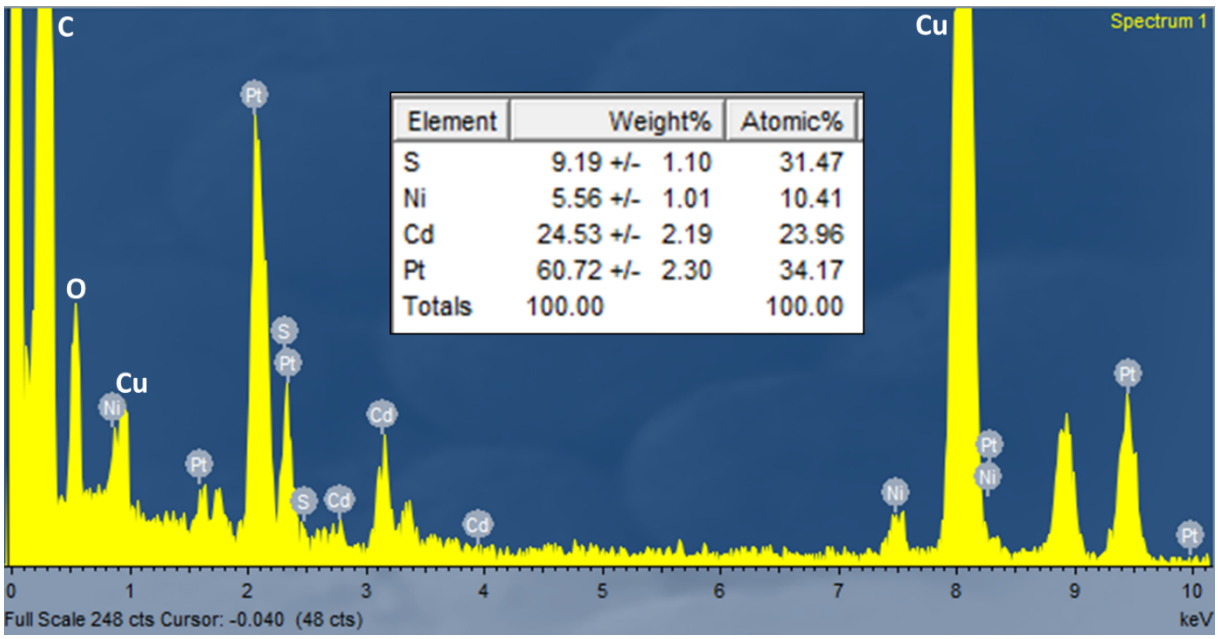
Supplementary Figure 1. Particle size distribution histograms: (A) Au, (B) Pt, and (C) PtNi metal domains, which decorate CdS nanoplates in the formed HNSs (in each sample, 45 total particles measured).



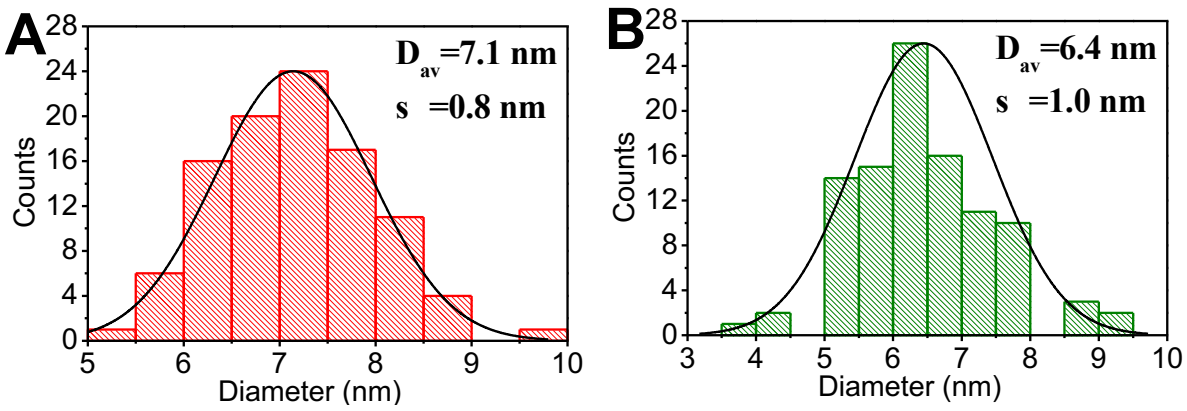
Supplementary Figure 2. High resolution TEM image of Au–CdS HNSs (A), and the corresponding FFT analysis (B), showing signal from the (111) planes of the gold domains.



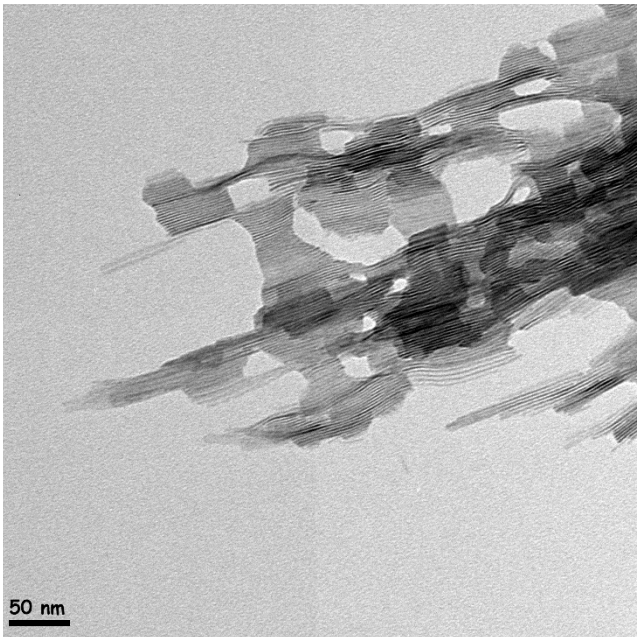
Supplementary Figure 3. EDS spectra of CdS and M–SC samples obtained using an SEM instrument over Si substrates. Quantitative analysis was performed using a Proza (rho-phi-Z) filter correction algorithm.



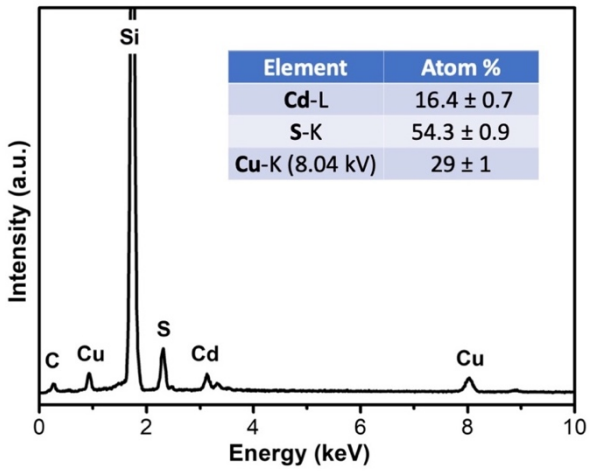
Supplementary Figure 4. EDS data of CdS–PtNi obtained from magnification on a TEM instrument.



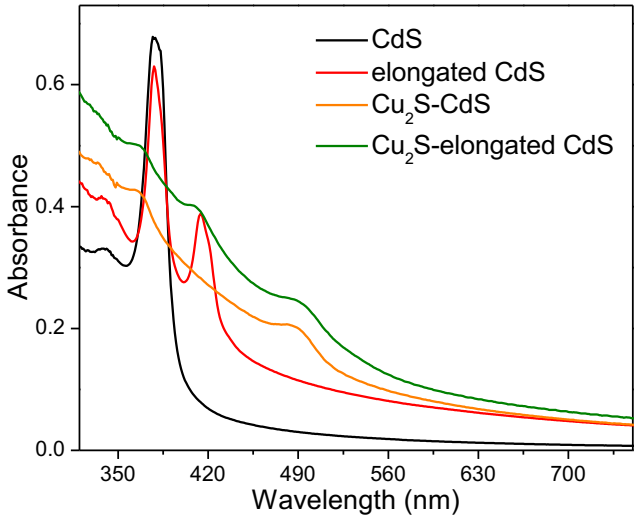
Supplementary Figure 5. Size distribution histogram of $Cu_{2-x}S$ nanoparticles decorating CdS nanoplates (A) and elongated CdS nanoplates (B) (total particles measured = 100).



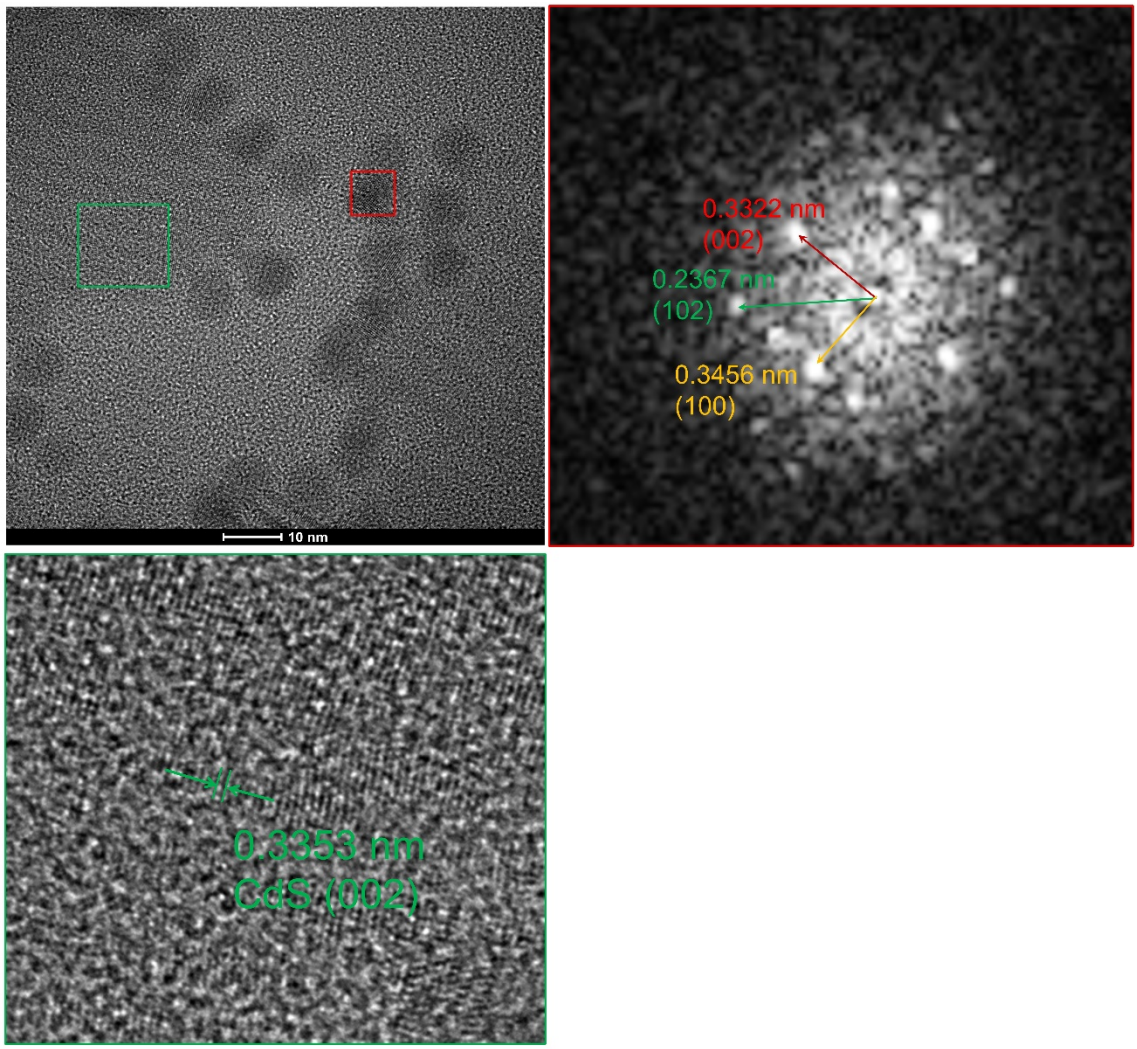
Supplementary Figure 6. TEM image of elongated CdS nanoplates.



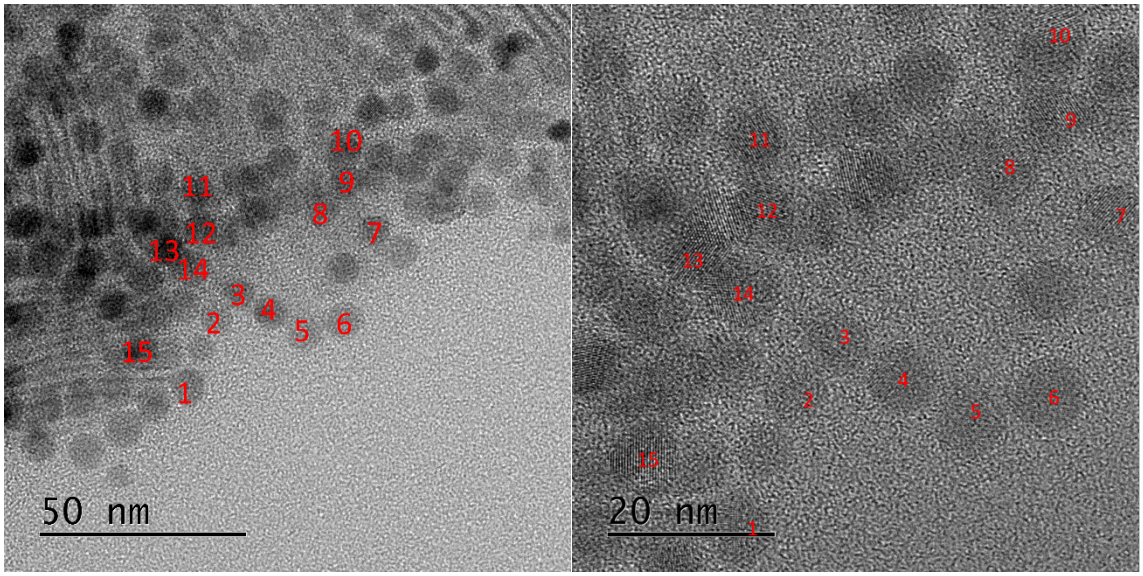
Supplementary Figure 7. EDS spectrum of $Cu_{2-x}S$–CdS obtained using an SEM instrument over a Si substrate. Quantitative analysis was performed using a Proza (rho-phi-Z) filter correction algorithm of the bulk $Cu_{2-x}S$–CdS gives a value of *x ca.* 0.6. The reasons for the inaccuracy are discussed in the results and discussion section.



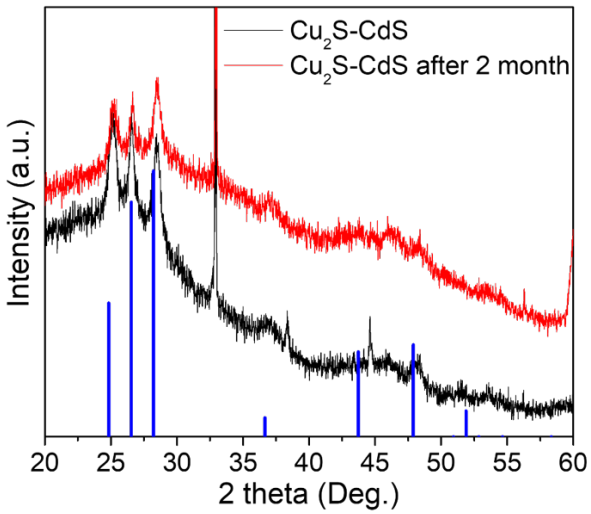
Supplementary Figure 8. UV-vis absorption spectra of CdS nanoplates and their HNSs with $Cu_{2-x}S$.



Supplementary Figure 9. HRTEM image and FFT analyses of $Cu_{2-x}S$–CdS HNSs.



Supplementary Figure 10. TEM and HRTEM images of $Cu_{2-x}S$–CdS HNSs.



Supplementary Figure 11. XRD patterns of $Cu_{2-x}S$–CdS HNSs both fresh (black pattern) and 2 months after synthesis (red pattern). The strong and narrow diffraction signal at 33° is attributed to the Si substrate.

Supplementary Table 1. The measured lattice distances of $Cu_{2-x}S$ nanoparticles in Figure S10. For each particle, the lattice distance was calculated by measuring 10 planes in the HRTEM image.

Nanoparticle number	***Measured value of lattice distance (nm)***	***Corresponding crystal plane (hkl)***	***Theoretical lattice distance (nm)***	***Mismatch (%)***
1	0.2020	110	0.2017	0.15
2	0.3045	101	0.3101	-1.81
3	0.1925	103	0.1889	1.91
4	0.3310	002	0.3370	-1.78
5	0.2425	102	0.2425	0
6	0.2417	102	0.2425	-0.33
7	0.3307	002	0.3370	-1.87
8	0.3113	101	0.3101	0.39
9	0.3123	101	0.3101	0.71
10	0.3131	101	0.3101	0.97
11	0.3123	101	0.3101	0.71
12	0.3099	101	0.3101	-0.06
13	0.3310	002	0.3370	-1.78
14	0.3311	002	0.3370	-1.75
15	0.3377	002	0.3370	0.21