

Supplementary Information

Enhancing the Activity and Tuning the Mechanism of Formic acid Oxidation at Tetrahedral Pt Nanocrystals by Au Decoration

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1. TEM characterization of Au-decorated THH Pt NCs

1.1 Identification of Miller indices of Au-decorated THH Pt NCs

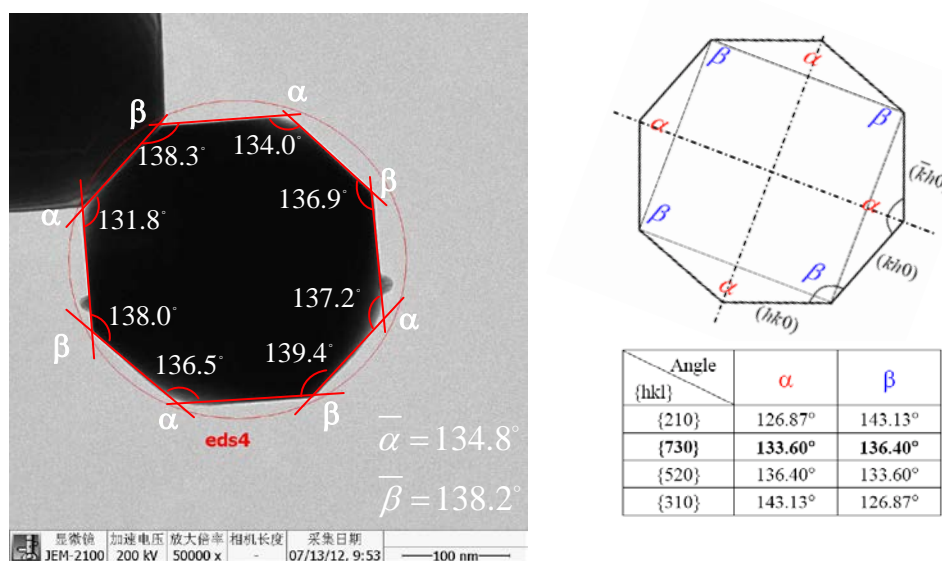


Fig. S1 Identification of Miller indices of Au-decorated THH Pt NCs ($\theta_{Au} = 0.79$).

Fig. S1 shows the TEM image of Au-decorated THH Pt NCs along [001] direction. In this orientation, eight side facets parallel to the [001] axis can be imaged edge-on and form an octagonal projection. On basis of plane angles ($\alpha=134.8^\circ$; $\beta=138.2^\circ$), the Miller indices of THH Pt NCs were also determined to be about {730} as we reported previously.^{S1}

1.2 Identification of elemental composition and Au distribution

Fig. S2-S3 show TEM images and EDS spectra of Au-decorated THH Pt NCs ($\theta_{\text{Au}} = 0.79$). Sub-monolayer Au atoms on Pt surface can not be discerned by the conventional TEM image. However, we can observe a few Au clusters on the THH Pt NC, indicating that some decorated Au exists as clusters besides Au monolayer (Fig. S3).

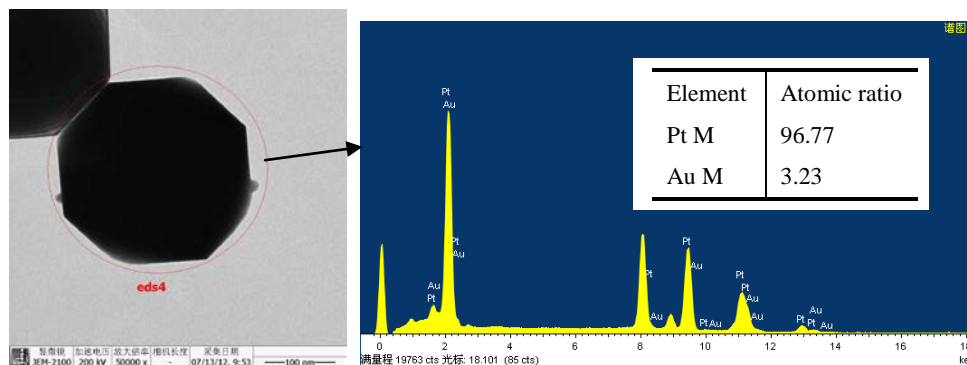


Fig. S2 TEM images and EDS spectrum and elemental composition of the Au-decorated THH Pt NCs ($\theta_{\text{Au}} = 0.79$).

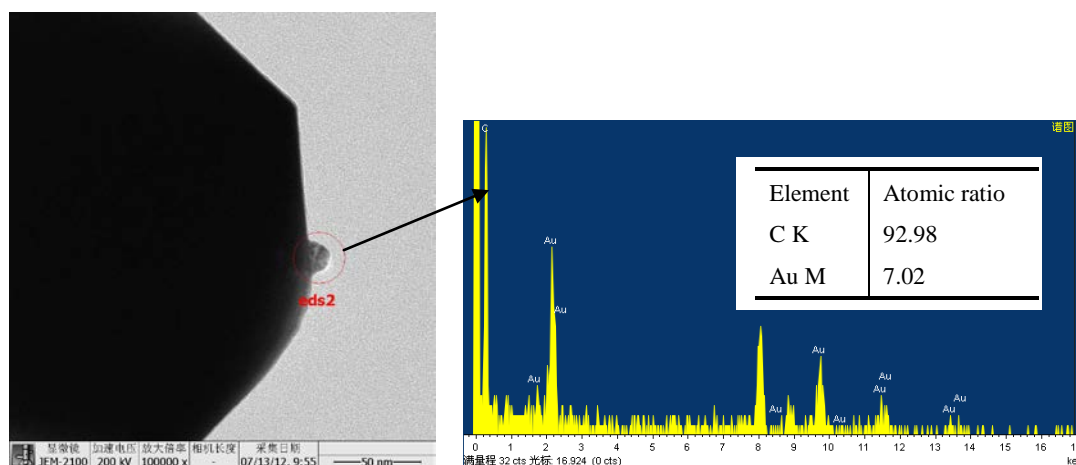


Fig. S3 TEM images and EDS spectrum and elemental composition of the Au cluster.

2. Electrochemical stability of bare and Au-decorated THH Pt NCs subjected to potential cycling

The electrochemical stability of bare and Au-decorated THH Pt NCs is fairly good. Fig.S4 shows the CV curves of bare (a) and Au-decorated (b) THH Pt NCs before (black line) and after (red line) 1000 potential cycles between 0.6 ~ 1.1 V (vs. RHE) in 0.1 M H₂SO₄ solution. The loss in electroactive surface area is less than 3% for both cases.

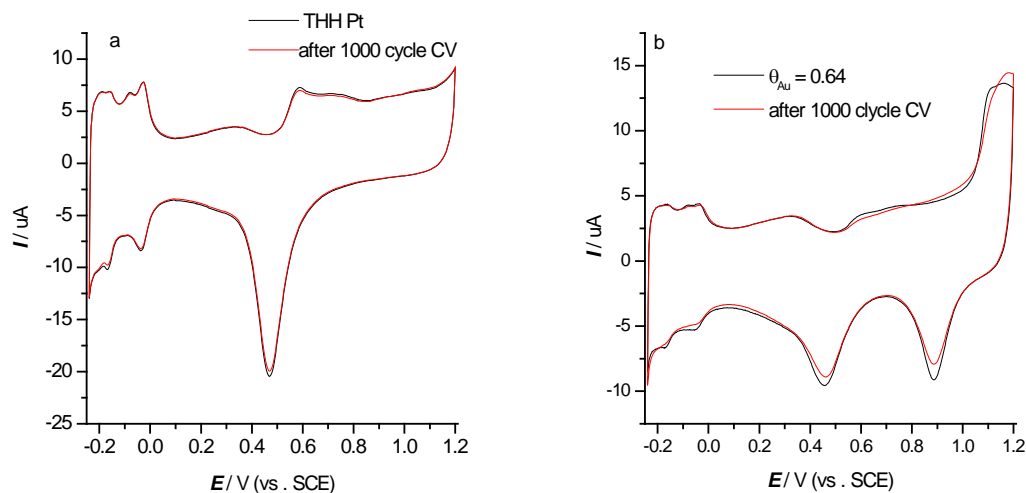


Fig. S4 The CV of the bare THH Pt NCs (a) and the Au decorated THH Pt NCs ($\theta_{\text{Au}} = 0.64$) (b) in 0.1 M H₂SO₄, and that of each electrode after 1000 cycles CV in 0.1 M H₂SO₄ solution in the potential range 0.6~1.1V (vs .RHE), in 0.1 M H₂SO₄, scan rate: 50 mVs⁻¹.

References

- (S1) N. Tian, Z.-Y. Zhou, S.-G. Sun, Y. Ding and Z. L. Wang, *Science*, 2007, **316**, 732-735.