Electronic Supplementary Material (ESI) for Journal of Materials Chemistry A.

Concave and Duck Web-like Platinum Nanopentagons with Enhanced Electrocatalytic Properties for Formic Acid Oxidation

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Table S1. Specific peak current density (J_s), mass peak current density (J_m), the residual current densities (J_{2000s}), and Normalized J_s (%) during the 2000s test for FOR on Pt black, Pt/C, Pd/C and Pt CWPNP in 0.5M H_2SO_4 and 0.5M formic acid.

	J_s/mAcm^{-2}	J_m/mAmg^{-1}	J_{2000s}/mA cm^{-2}	Normalized J_s (%)
Pt black	0.21	32	0.02	11
Pt/C	0.66	108	0.14	27
Pd/C	2.52	432	0.12	5
Pt CWPNP	5.63	739	1.62	32

Table S2. Specific activity of novel Pt CWPNP catalyst compared with others

Catalysts	J_s/mAcm^{-2}	references
Pt CWPNP	5.63	This work
Ordered Pt_3Ti	0.61	1
Pt-Cu nanocube	2.29	2
Pd/GO	5.2	3
Branched Pt	1.5	4
Sb/$Pt_{octahedral}$	2.8	5
Pd-Ni_2P/C	2.2	6
ERD $PtCu_3$	3.15	7
$Pt_7Ru_{1.5}Fe_{1.5}$ NW	2.15	8
PtCu HTBNFs	3.77	9

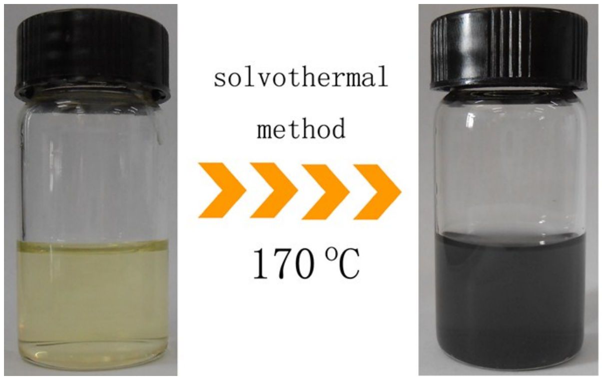

Figure S1. Image of solutions before and after the solvothermal reaction. Synthetic solution: 4 mL of oleylamine and 4 mL of tri-*n*-propylamine containing 5 mg of platinum (II) acetylacetonate.

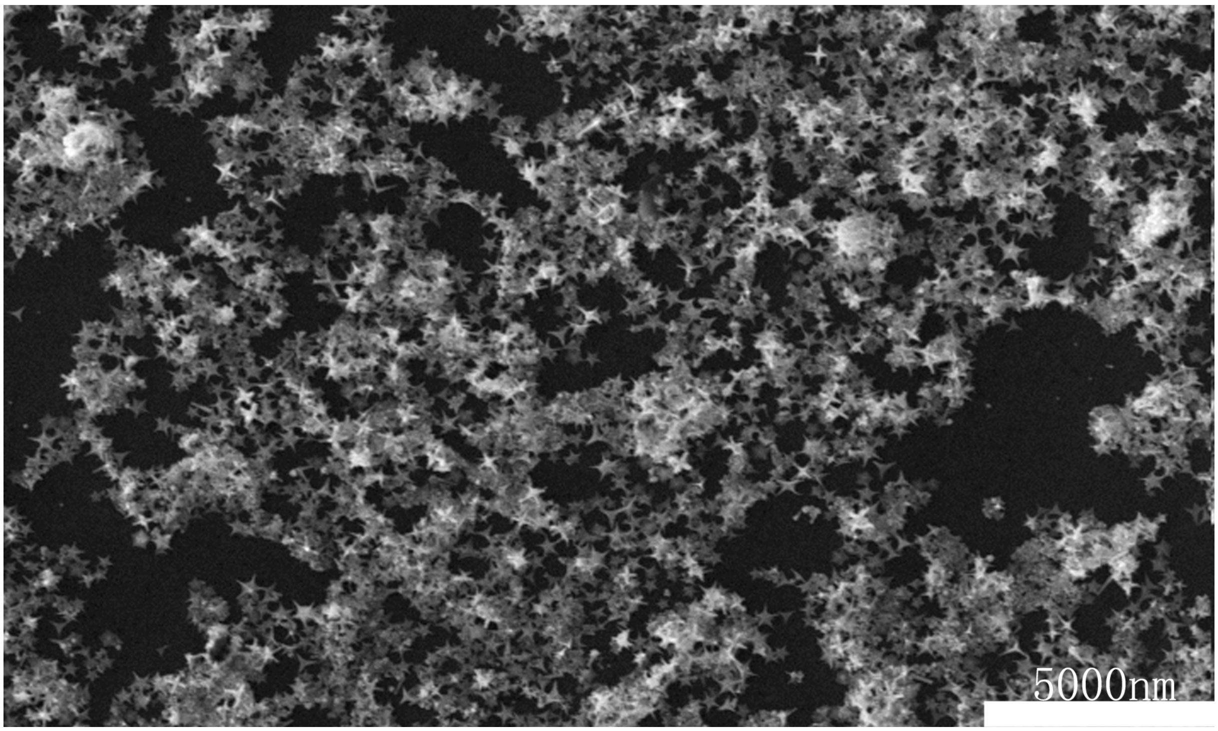

Figure S2. Large-area FESEM image of Pt CWPNP. Synthetic solution: 4 mL of oleylamine and 4 mL of tri-*n*-propylamine containing 5 mg of platinum (II) acetylacetonate.

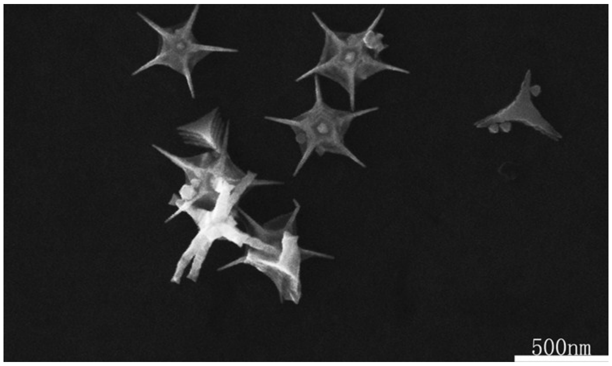

Figure S3. FESEM image of Pt CWPNP. Synthetic solution: 4 mL of oleylamine and 4 mL of tri-*n*-propylamine containing 5 mg of platinum (II) acetylacetonate.

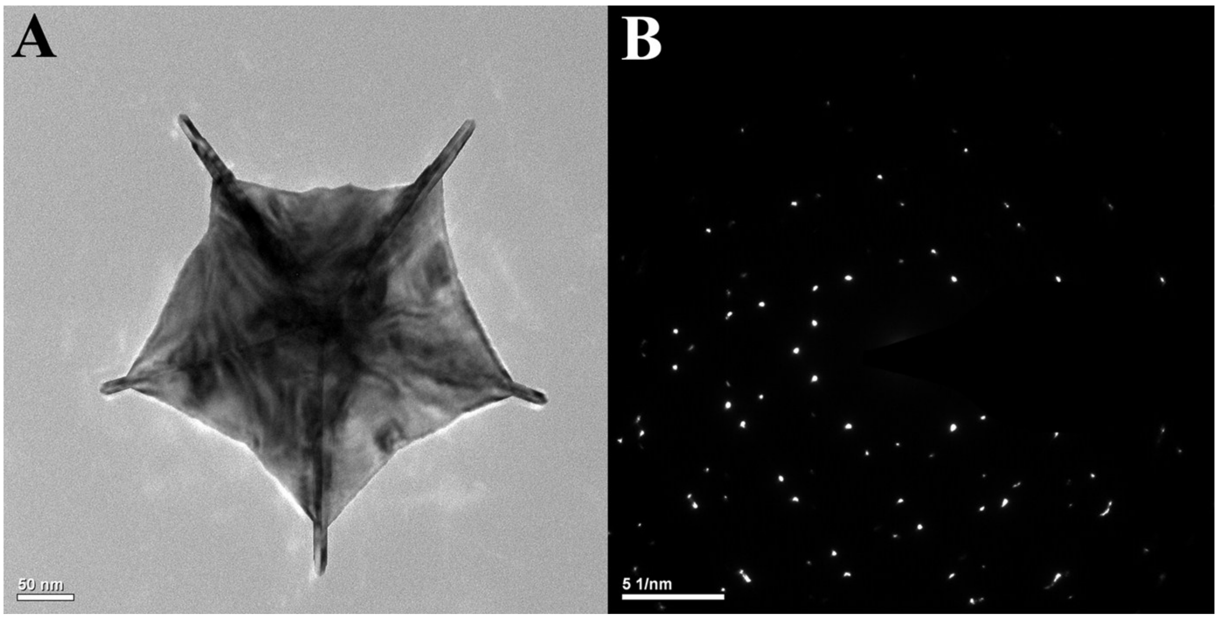

Figure S4. (A) TEM image of Pt CWPNP and (B) corresponding SAED pattern of Pt CWPNP.

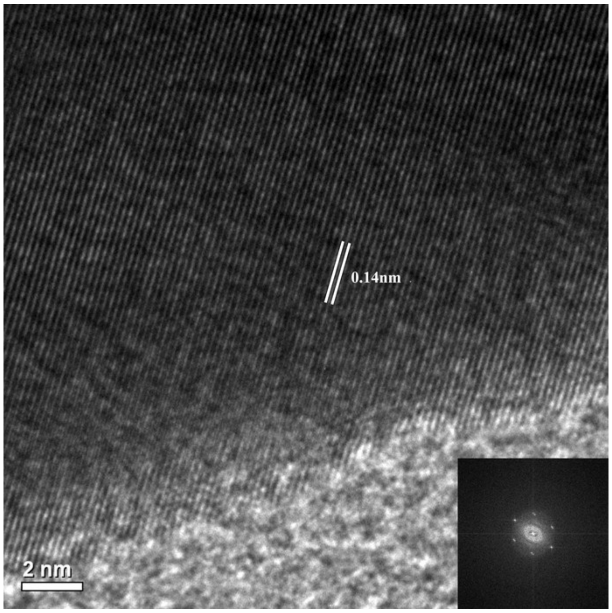

Figure S5. HRTEM images of Pt duck-web like edges. Inset: corresponding FFT pattern.

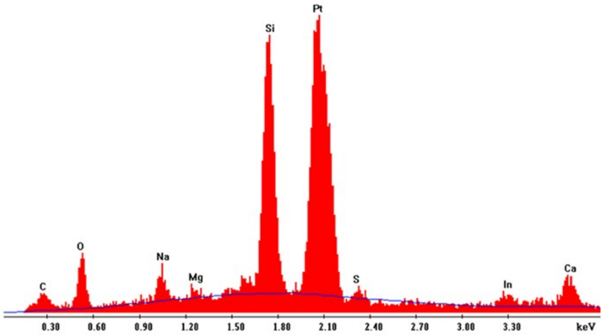

Figure S6. EDX spectrum of Pt CWPNP.

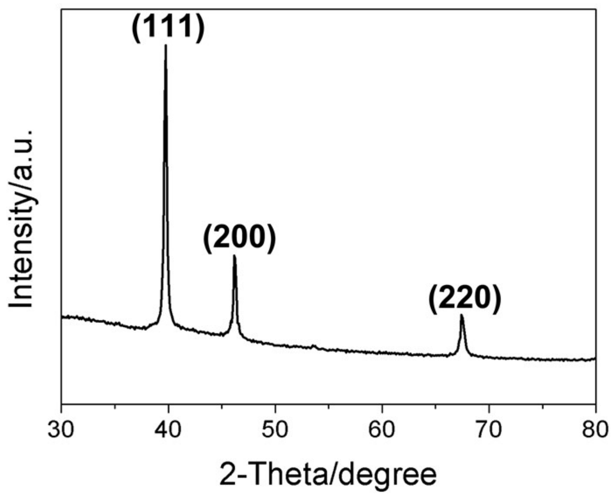

Figure S7. XRD pattern of Pt CWPNP.

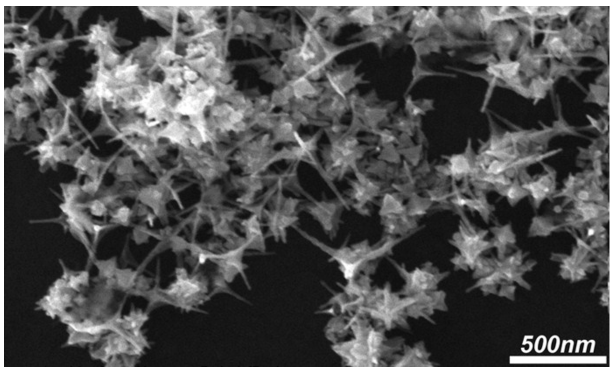

Figure S8. FESEM image of Pt nanostructures obtained in 4 mL of oleylamine and 4 mL of tri-*n*-propylamine containing 6.6 mg $H_2PtCl_6{\bullet}6H_2O$.

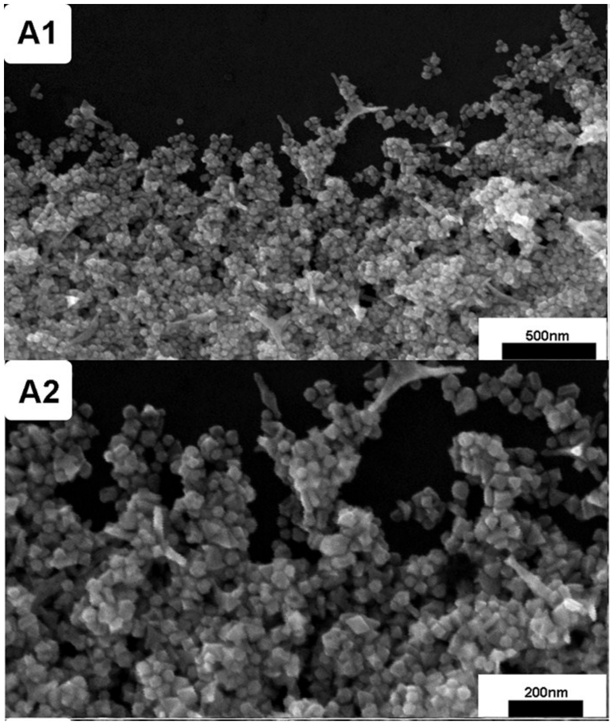

Figure S9. Large-area FESEM image (Upper) and enlarged FESEM image (Low) of Pt nanoparticles obtained in the absence of tri-*n*-propylamine (8 mL oleylamine containing 5 mg platinum (II) acetylacetonate).

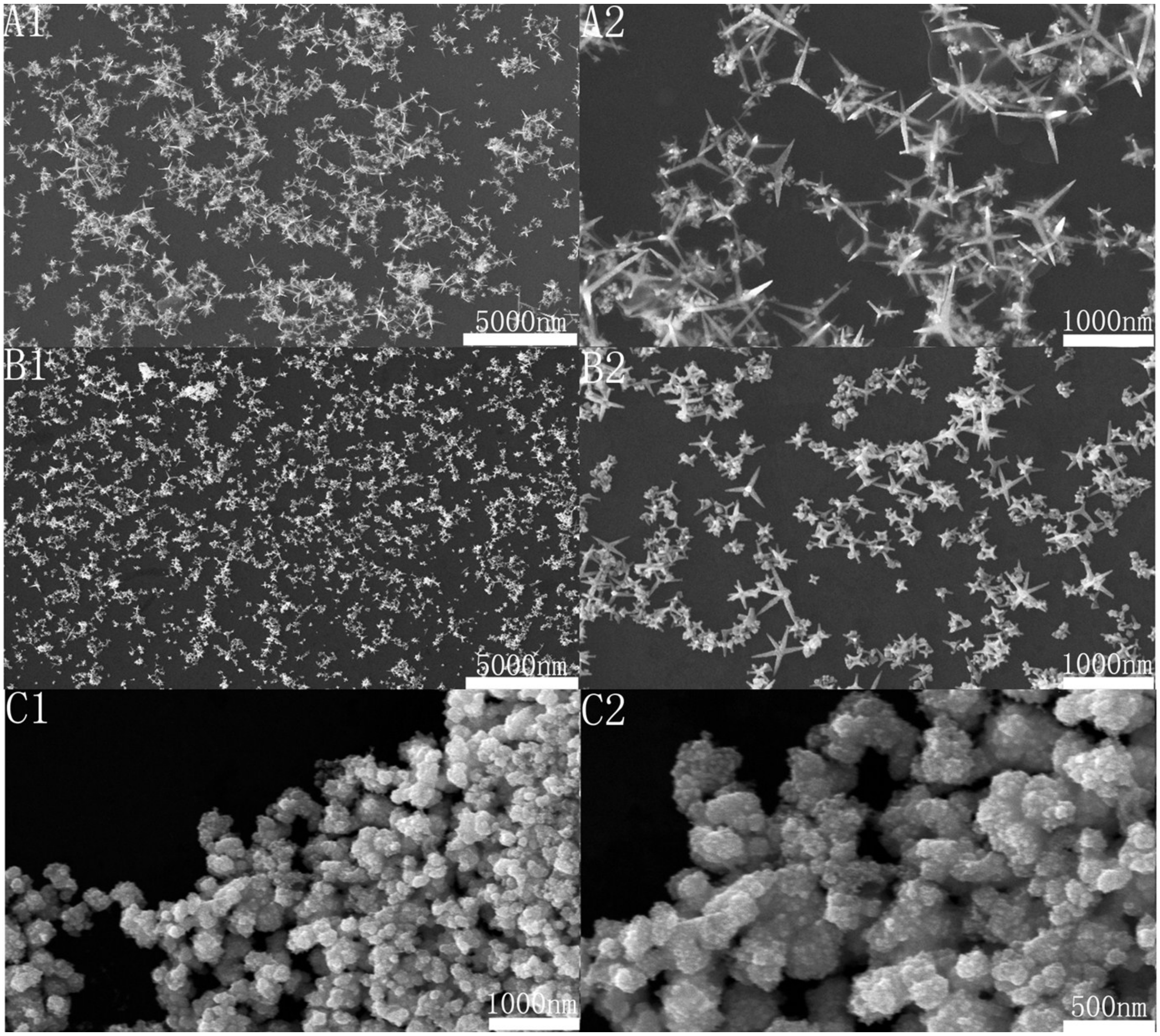

Figure S10. Large-area FESEM images (Left) and enlarged FESEM images (right) of Pt nanoparticles obtained at different tri-*n*-propylamine/oleylamine volume fractions. A) 2 mL: 6 mL, B) 6 mL: 2 mL, C) 8 mL: 0 mL.

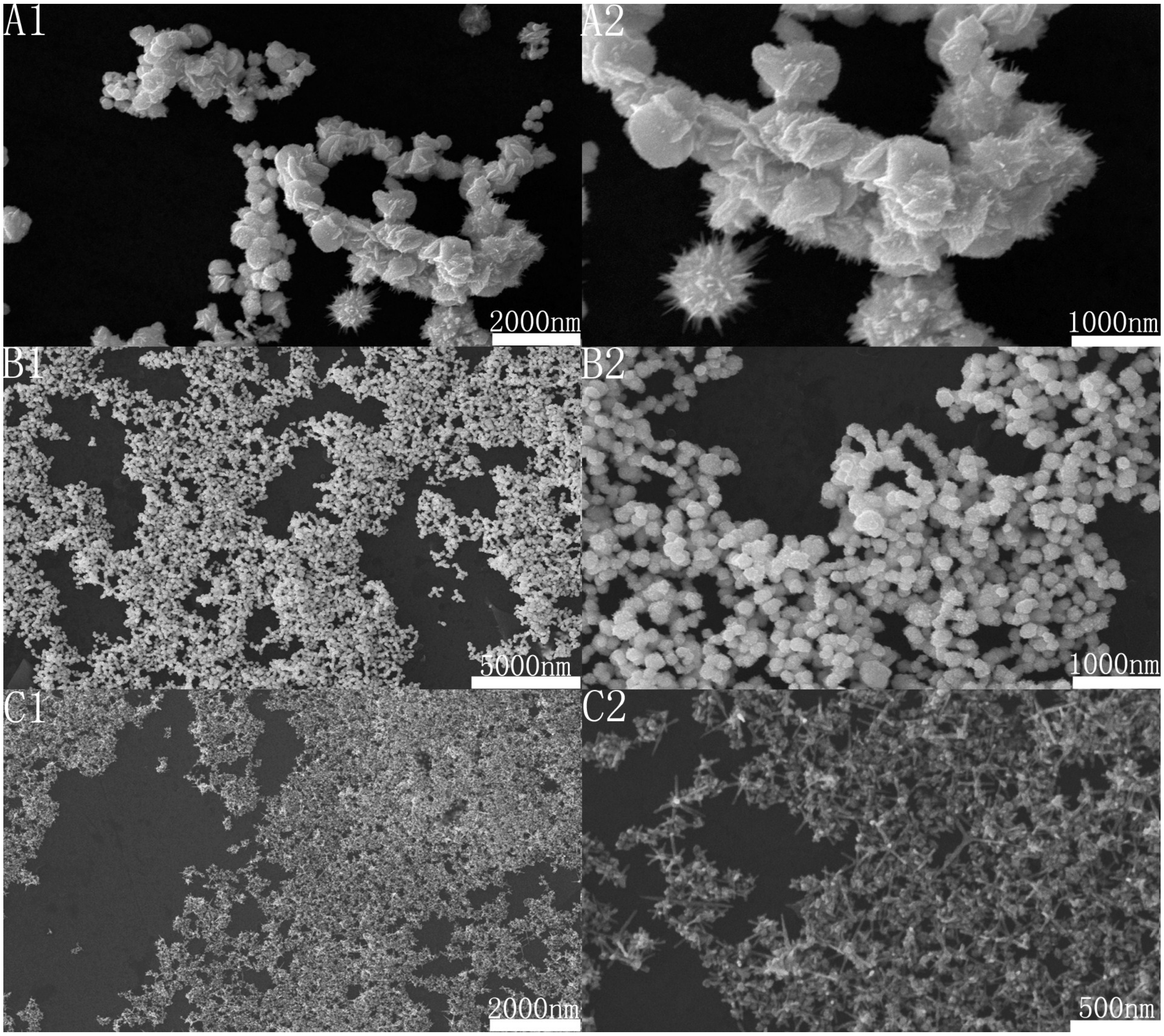

Figure S11. Large-area FESEM images (Left) and enlarged FESEM images (right) of Pt nanostructures obtained in 4 mL of oleylamine and 4 mL of A) ethylenediamine; B) *n*-Butylamine and C) tributylamine; all containing 5 mg platinum (II) acetylacetonate.

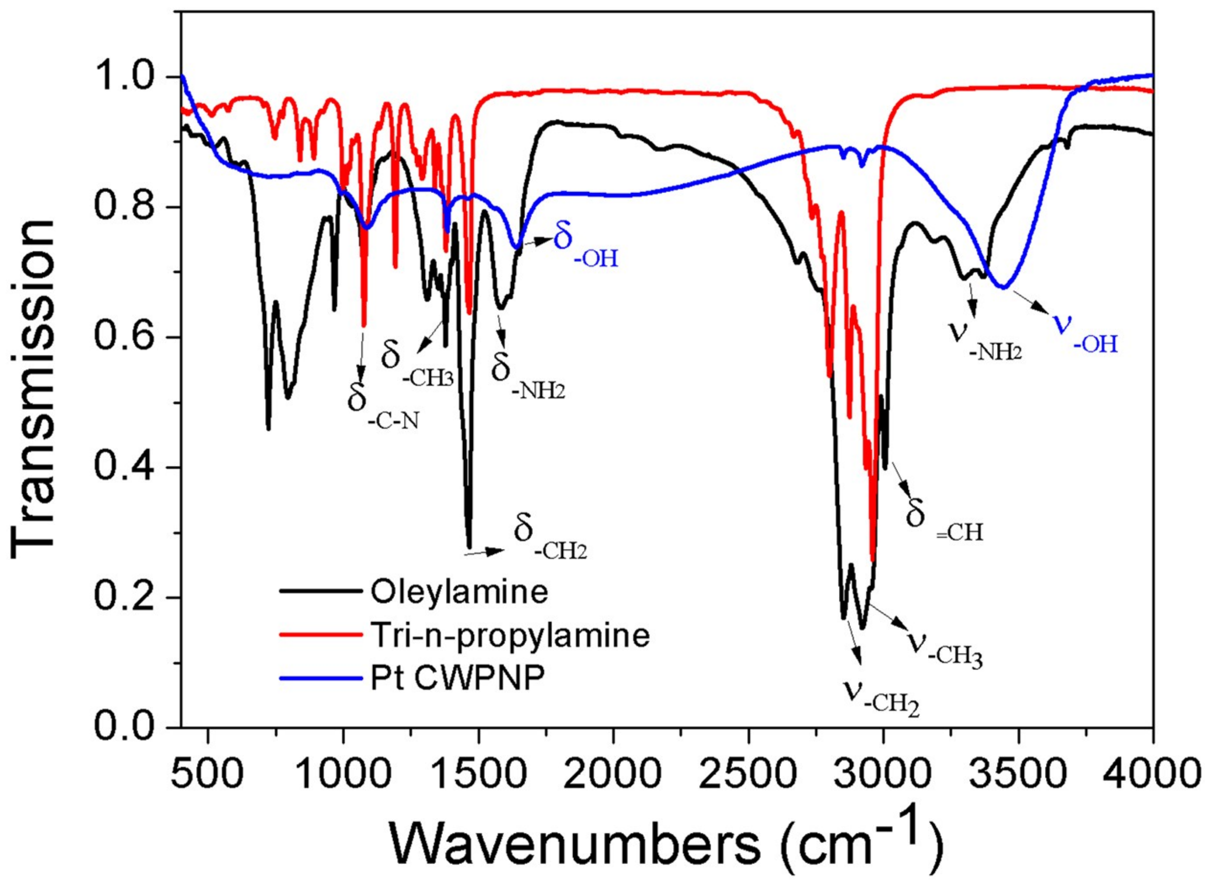

Figure S12. Fourier transforms infrared (FT-IR) spectra of pure oleylamine, tri-*n*-propylamine and the purified Pt CWPNP (product). It can be seen that some weak peaks, corresponding to ν_{-NH2}, $\delta_{=CH}$, ν_{-CH2}, ν_{-CH3}, δ_{-NH2}, δ_{-CH2}, and some strong peaks, corresponding to δ_{-CH3} and δ_{-C-N} appeared in the FT-IR spectra of the purified Pt CWPNP, suggesting the small amount of residual adsorption of oleylamine and tri-n-propylamine on the surface of Pt CWPNP.

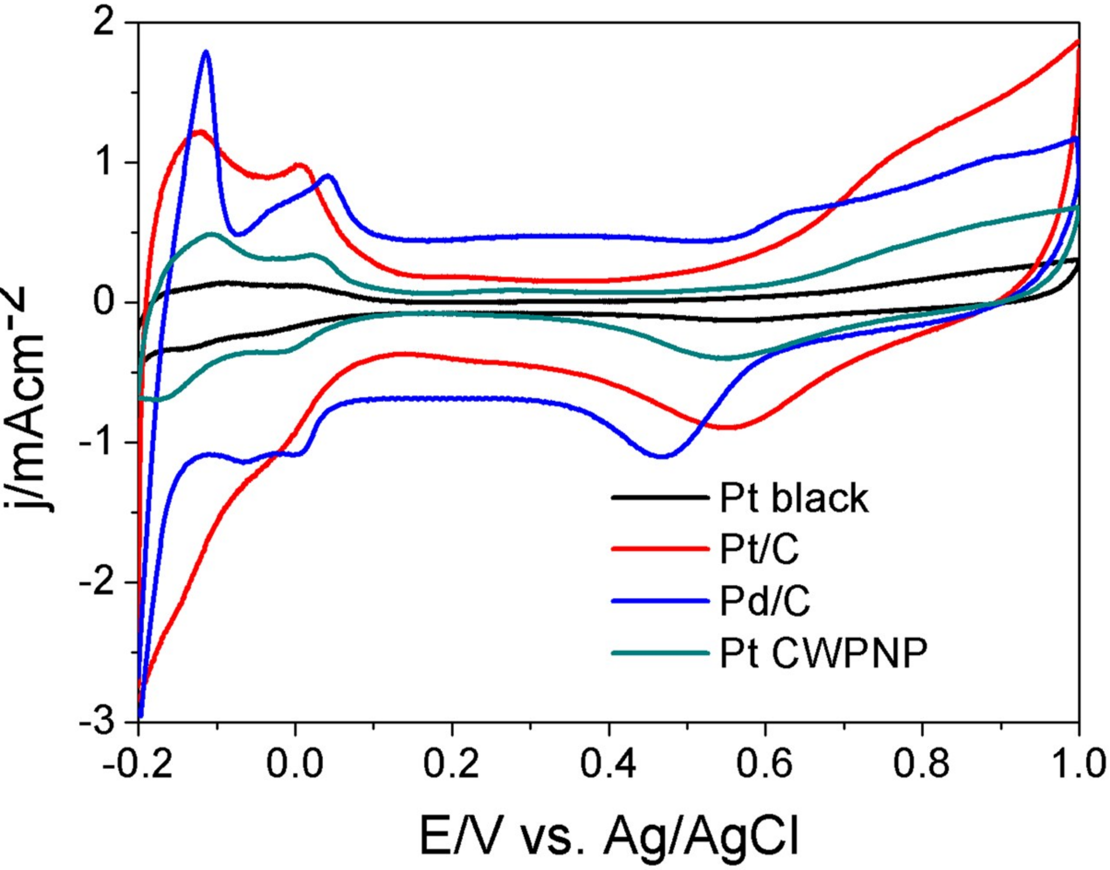

Figure S13. Cyclic voltammograms of Pt black, Pt/C, Pd/C and Pt CWPNP -modified glassy carbon electrodes in 0.5 M H_2SO_4 solution (scan rate: 50 mV/s).

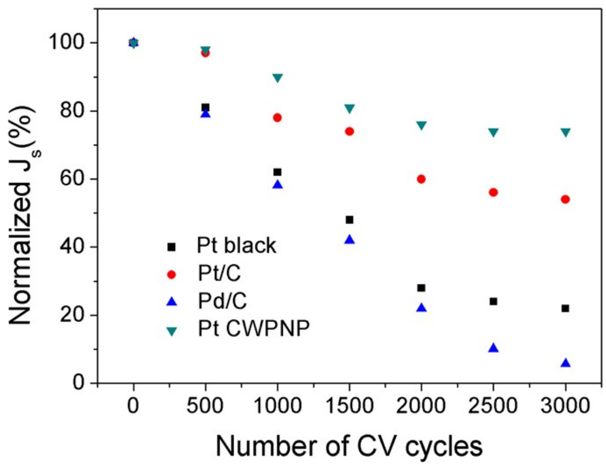

Figure S14. Normalized specific peak current density (100%)-cycling numbers curve of 0.5 M H_2SO_4 containing 0.5 M formic acid for Pt black (square), Pt/C (dot), Pd/C (triangle) and Pt CWPNP (inverted triangle)-modified glassy carbon electrode.

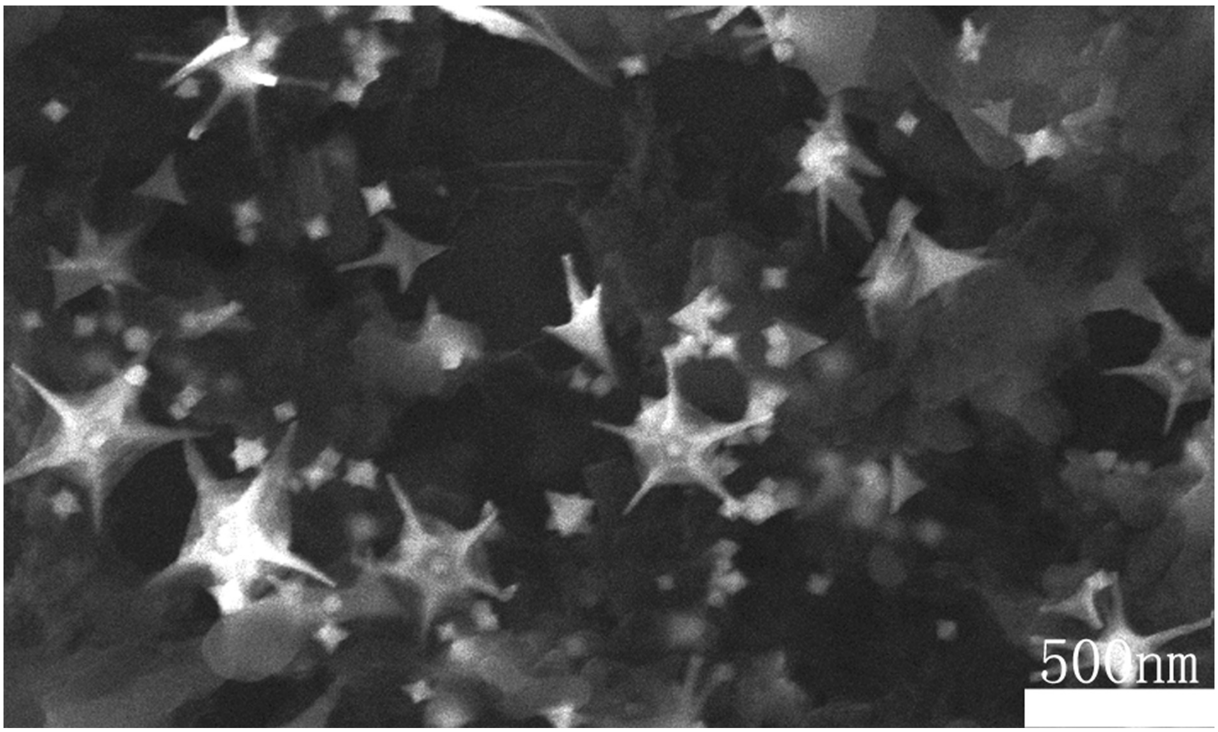

Figure S15. SEM images of Pt CWPNP after stability tests.

References

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