Electronic Supplementary Material (ESI) for Green Chemistry

Synthesis of Surfactant-Free Pt Concave Nanoparticles in a Freshly-made or Recycled Molten Salt

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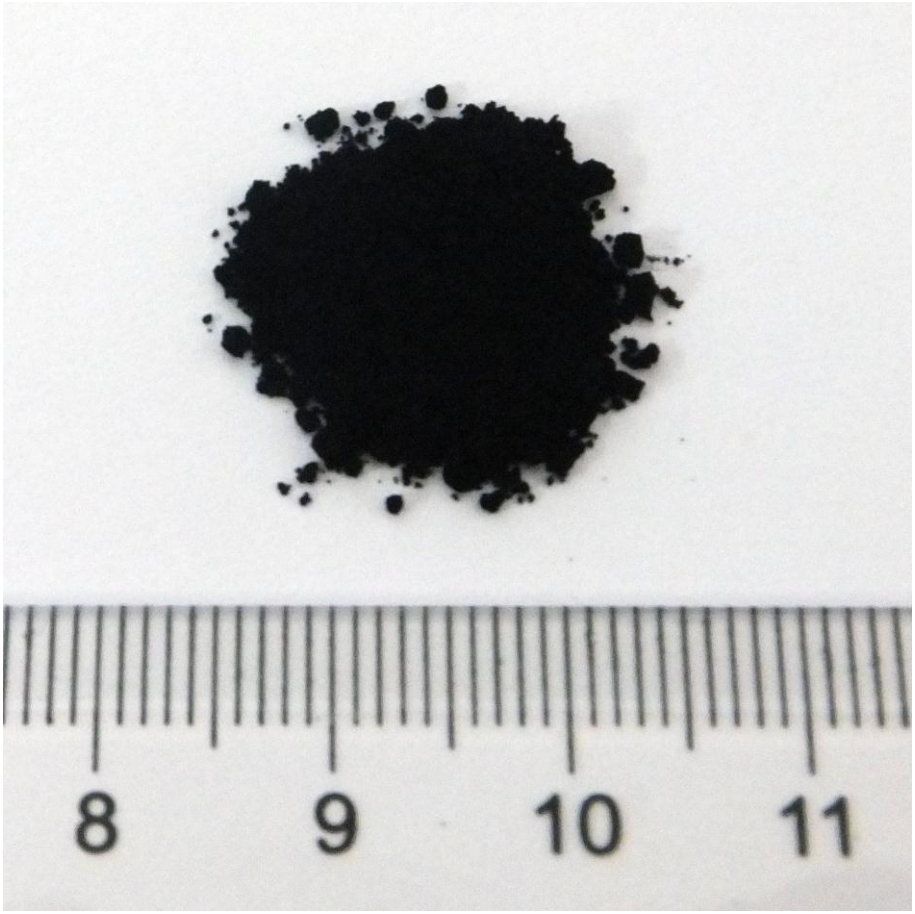

Fig. S1 A digital photo of the Pt concave NPs synthesized with 100 g of the mixture MS of KNO_3 and $LiNO_3$, 0.352 g $Pt(NH_3)_4C_2O_4$ and 0.224 g KOH at 180 ºC. Finally, about 0.2 g Pt concave NPs was obtained and the yield was higher than 99 %.

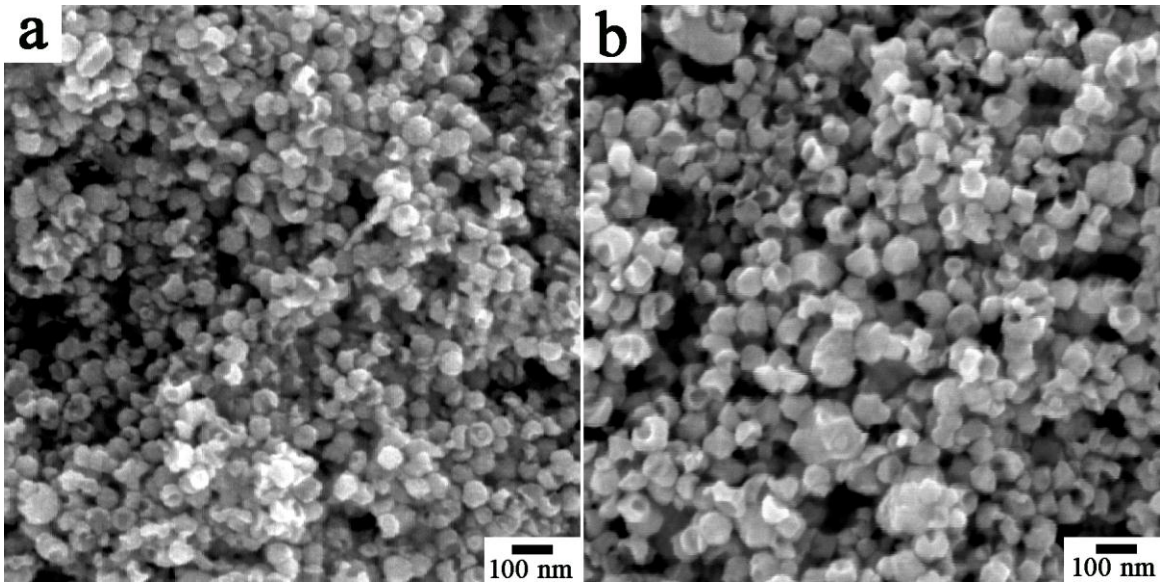

Fig. S2 SEM images of the Pt nanocave synthesized at different reaction temperature. The reaction temperature: (a) 170 ºC, and (b) 190 ºC, respectively.

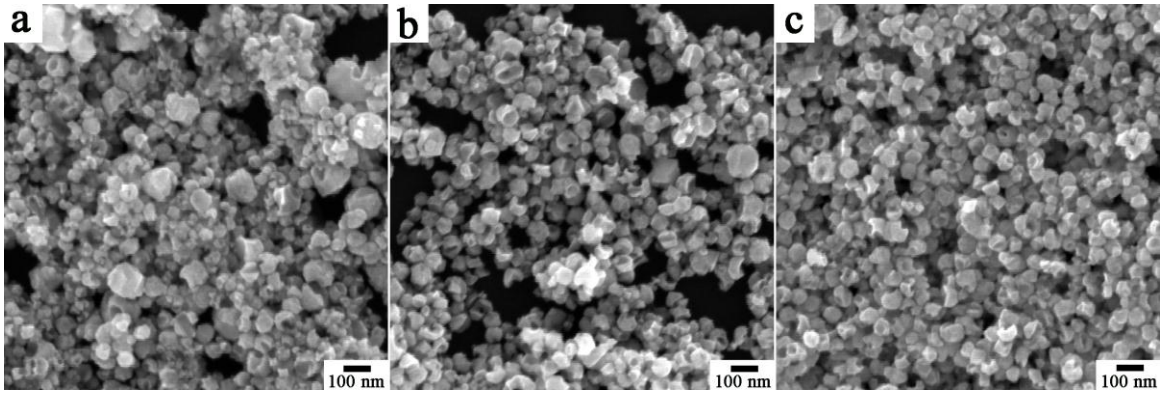

Fig. S3 SEM images of the Pt concave NPs synthesized with different concentration of the $Pt(NH_3)_4C_2O_4$. The concentrations of the $Pt(NH_3)_4C_2O_4$ were 44 mg (a), 88 mg (b), and 0.352 g $Pt(NH_3)_4C_2O_4$ in 100 g MS (c), respectively.

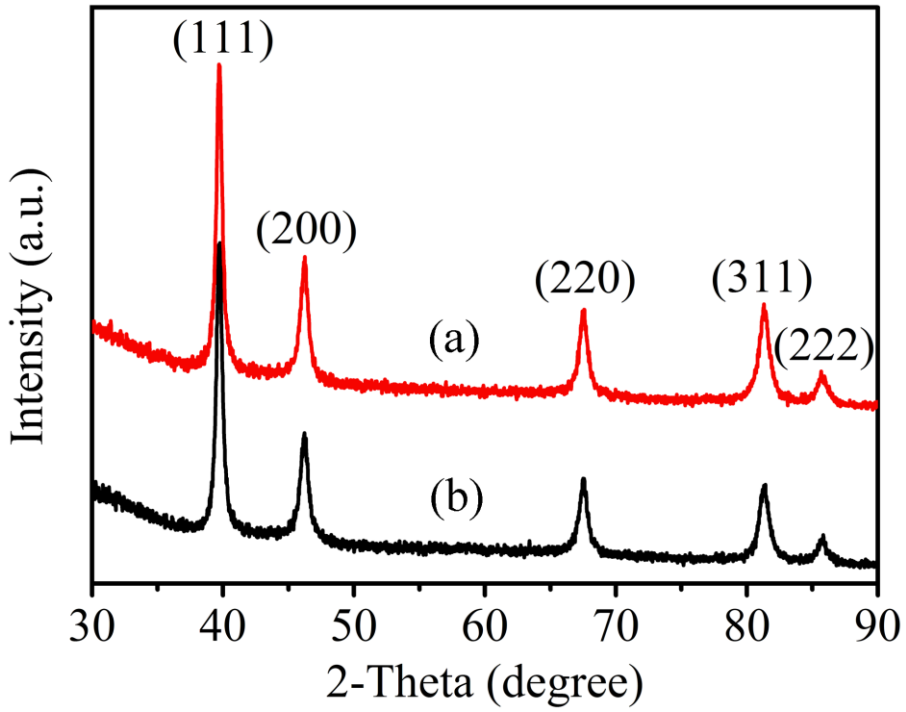

Fig. S4 The XRD patterns of the Pt concave NPs synthesized in freshly-made (a) and fourthly-recycled MSs (b) system.

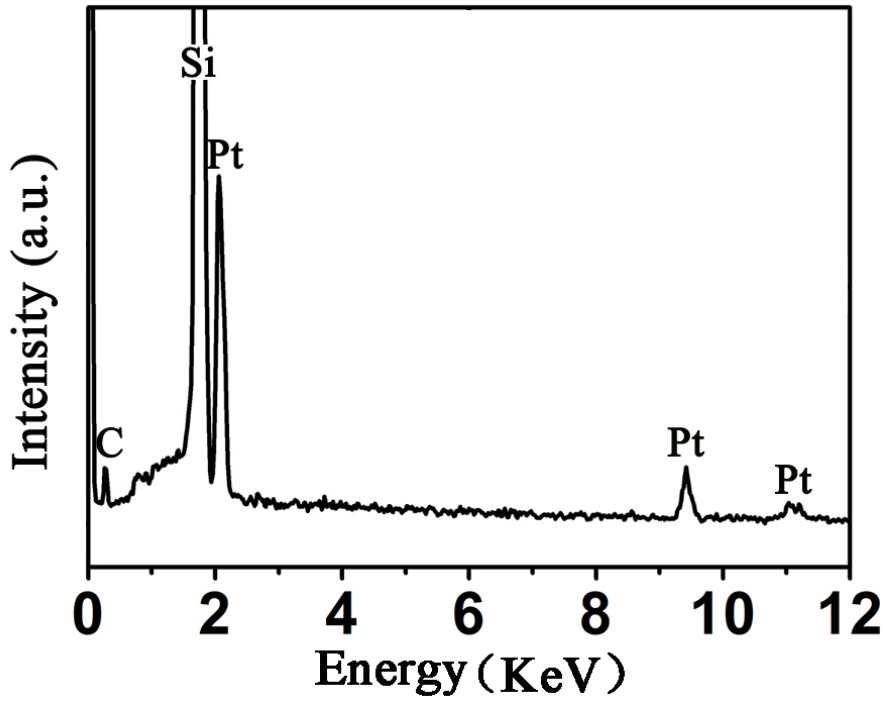

Fig. S5 The EDX spectrum of the Pt concave NPs synthesized in the fourthly-recycled MS.

Fig. S6 Photograph of the freshly-made (a) and the fourthly-recycled (b) MSs.

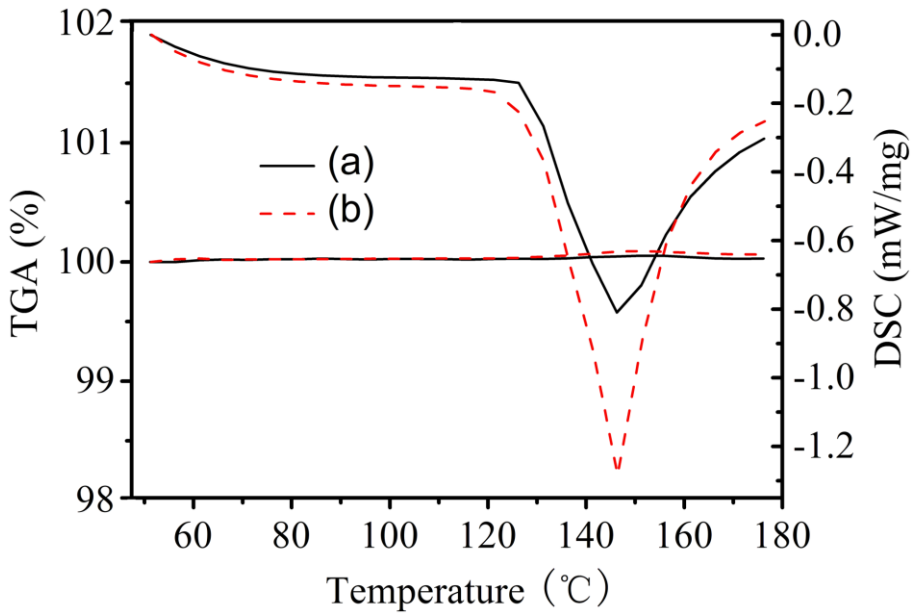

Fig. S7 The TGA and DSC patterns of the freshly-made (a) and fourthly-recycled MSs (b).

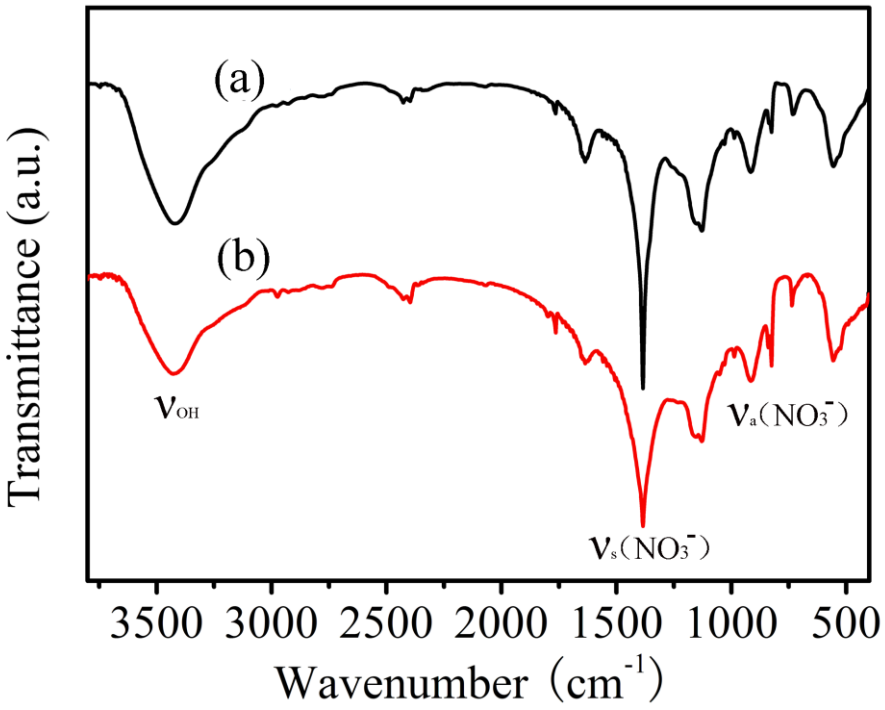

Fig. S8 The IR patterns of the freshly-made (a) and fourthly-recycled MSs (b).

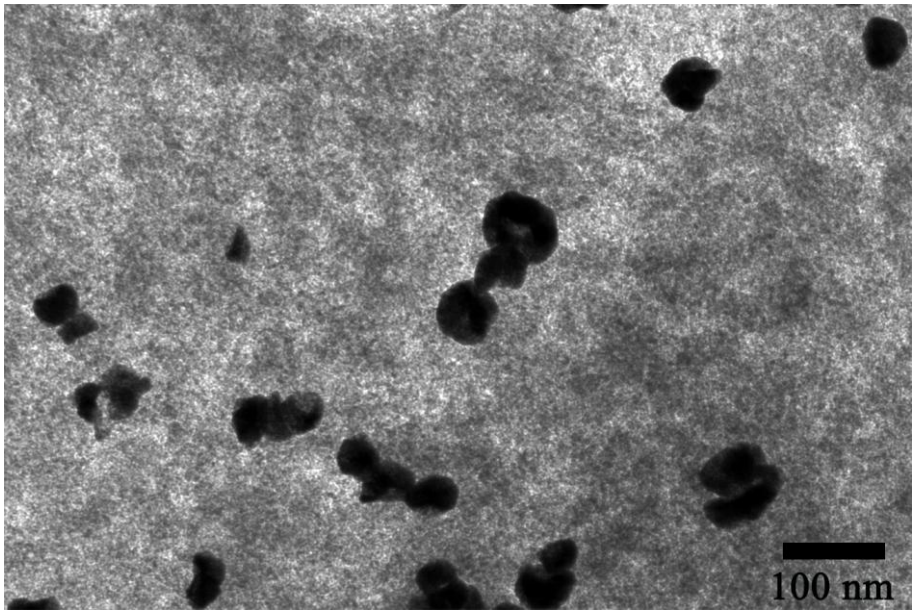

Fig. S9 TEM image of Pt concave NPs loaded on carbon black.

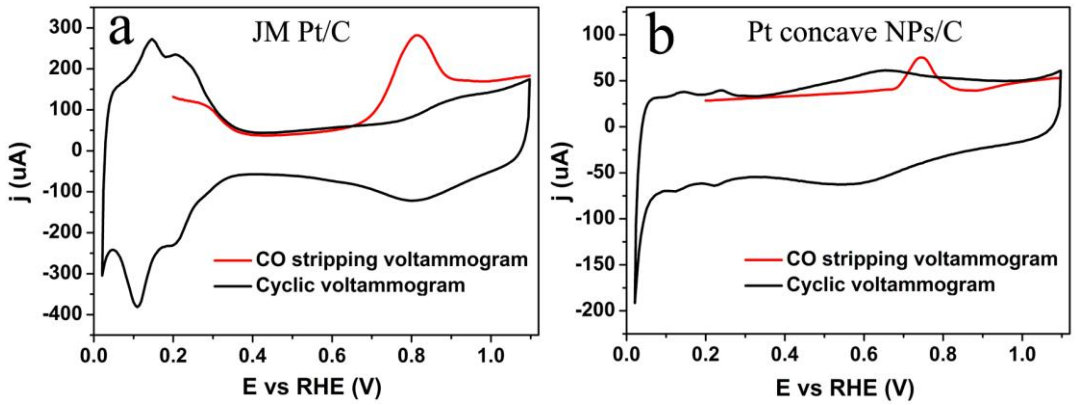

Fig. S10 Cyclic voltammograms (CVs) and CO stripping voltammograms of Pt/C (JM, 40 wt%) (a) and Pt concave NPs/C catalysts (b) in 0.1 M $HClO_4$ at a scan rate of 50 mVs^{-1}. The CO adlayers were formed by exposing the Pt/C and Pt concave NPs/C electrode to CO-saturated 0.1 M $HClO_4$ solution for 3 min at a potential of 0.1 V (vs. RHE). Then, the electrode was taken out and immediately immersed in the oxygen-free (purged with nitrogen for 30 min) 0.1 M $HClO_4$ solution for measuring the CO stripping voltammograms. The CO stripping peak potentials were 0.74 V for Pt concave NPs/C and 0.81 V for Pt/C.

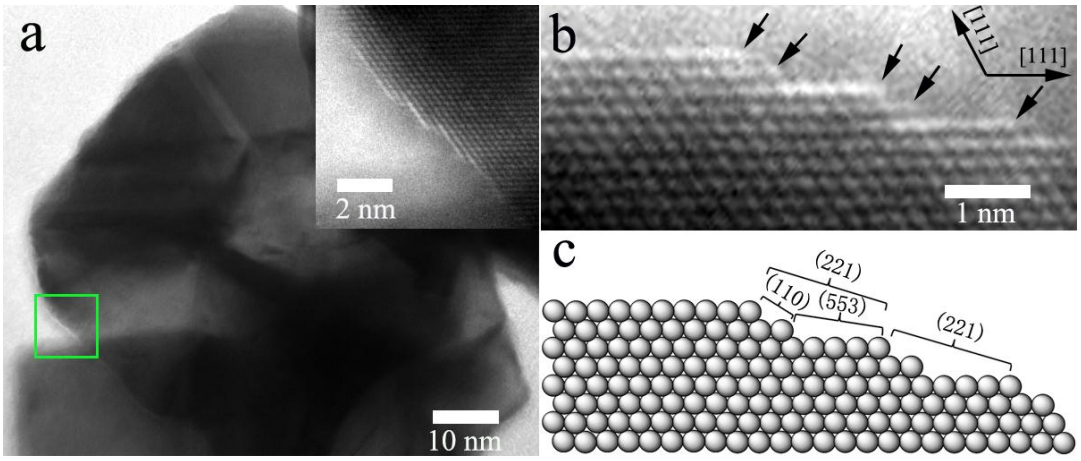

Fig. S11 (a) TEM image of the Pt concave NP, and the inset image of (a) was the HRTEM image of one surface facet that was marked in Fig. a by the square region, (b) enlarged HRTEM image of the surface facet that was shown in the inset image. The surface steps existed on the edge of the NPs, indicating the presence of high index facets. (c) Schematic of high-index planes observed on Pt concave NPs, and the step configurations of (110), (553), (221) and the real surfaces received from (b).

Table S1 List of the high index facets existed on the edge of the Pt concave that obtained from the method of microfacet notation, and these high index facets corresponding to those in Fig. S11.

Number of atoms across a terrace (n)	Step notation	Microfacet notation	Surface facets (hkl)
n	(n+1) (111) ×(111)	$n_n(111)+1_1(11\bar{1})$	(n+1, n+1, n-1)
n=1	2 (111) × (111)	$(1/2)_n(111)+(1/2)_1(11\bar{1})$	(110)
n=4	5 (111) × (111)	$4_4(111)+1_1(11\bar{1})$	(553)