

Electronic Supplementary Information

Platinum nanoparticles supported on N-doped carbon nanotubes for the selective oxidation of glycerol to glyceric acid in a base-free aqueous solution

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Table S1 Physical properties of the catalyst supports with different N contents.

Samples	S_{BET} /m ² g ⁻¹	$V_{\text{pore}}^{\text{a}}$ /cm ³ g ⁻¹	D_{pore} /nm
CNTs-353	112.4	0.29	10.2
N-CNTs(1.57)	93.6	0.30	12.0
N-CNTs(3.32)	81.3	0.24	11.3
N-CNTs(5.74)	74.6	0.19	11.1
N-CNTs(9.44)	61.6	0.22	14.0
N-CNTs(22.85)	34.6	0.13	14.2
C ₃ N ₄ (22.85)	10.0	0.03	7.7

^a Obtained from $P/P_0 = 0.99$.

Table S2 Catalytic performance of catalysts with different supporting materials in base-free condition.^a

Catalyst	Conversion /%	Selectivity /%		
		GLYA	GLYDE	DHA
1% Pt/SBA-15-NH ₂	1.0	–	100	–
1% Pt/SiO ₂	30.7	22.1	53.6	17.8
1% Pt/Al ₂ O ₃	28.4	42.3	18.5	28.8
1% Pt/TiO ₂	49.4	42.5	28.8	20.7
1% Pt/C ₃ N ₄	2.5	20.9	55.1	24.0
1% Pt/AC ^b	38.6	48.0	17.5	29.1
1% Pt/CMK ^c	55.4	49.4	14.4	29.6
1% Pt/graphite	52.5	46.1	28.2	18.6
1% Pt/graphene	55.8	44.3	29.8	19.8
1% Pt/CNTs-353	51.5	43.2	26.4	23.2

^a Reaction conditions: 10 mL glycerol aqueous solution (0.1 mol/L), 0.039 g catalyst, glycerol/Pt = 500 (molar ratio), T = 333 K, P (O₂) atmospheric pressure, O₂ 10 mL/min, reaction time = 4 h. ^b Activated carbon. ^c Mesoporous carbon.

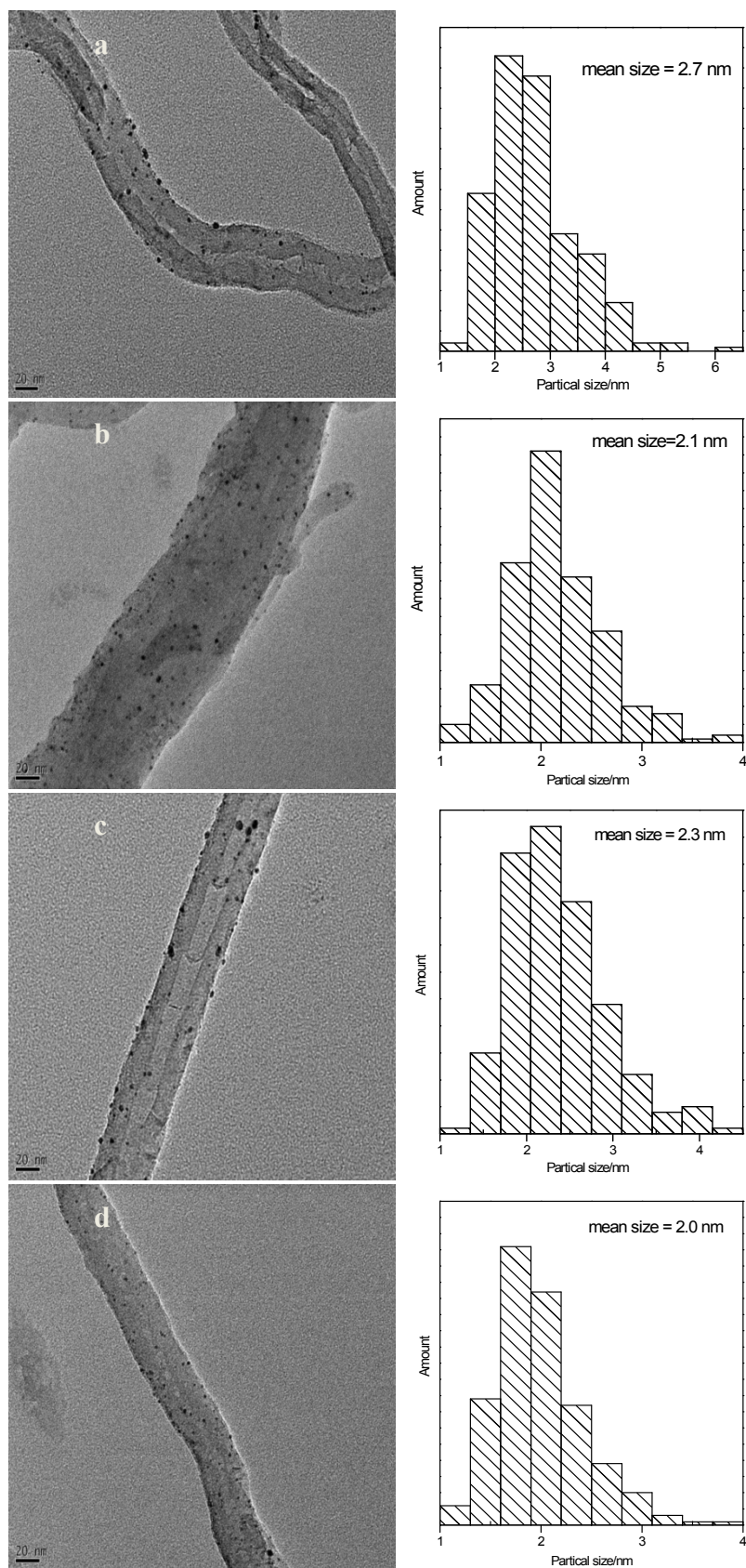


Fig. S1 TEM images of catalysts with and without N doped: (a) 1%Pt/CNTs-353, (b) 1%Pt/N-CNTs(3.32), (c) 1%Pt/N-CNTs(5.74), (d) 1%Pt/N-CNTs(9.44).

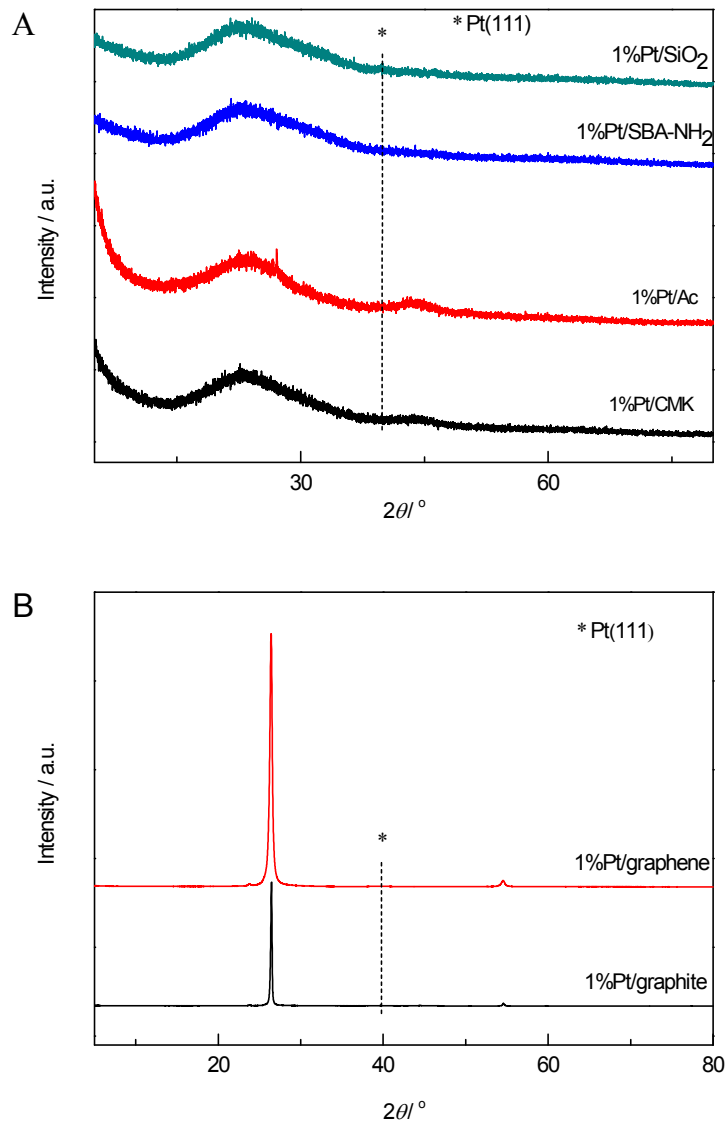


Fig. S2 XRD patterns of the catalysts with different support materials.

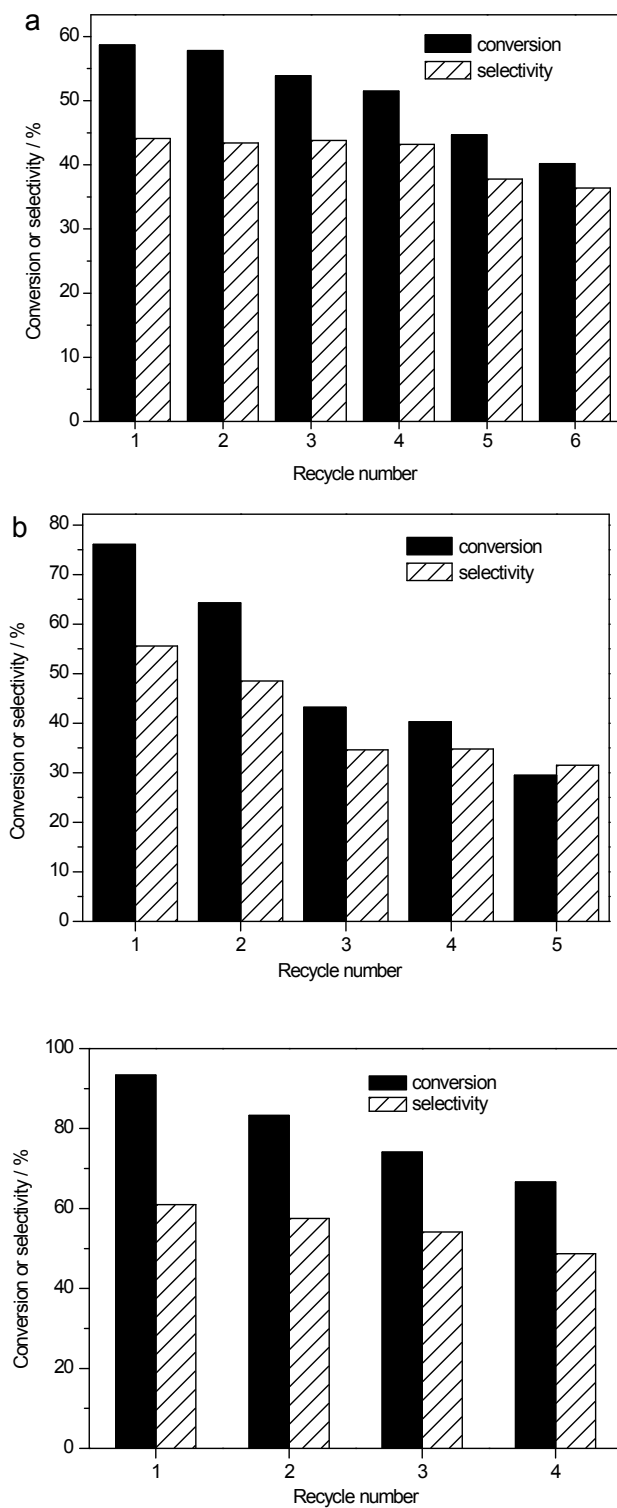


Fig. S3 The conversion of glycerol and the selectivity of glyceric acid during the successive reaction: (a) 1%Pt/CNTs-353, reaction time 4 h, (b) 1%Pt/N-CNTs(5.74), reaction time 4 h, (c) 1%Pt/CNTs-353, reaction time 12 h, reactions are conducted in the same conditions.

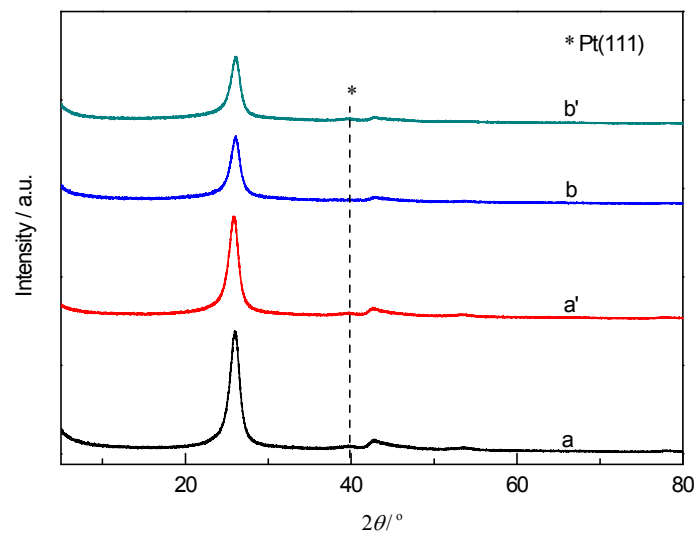


Fig. S4 XRD patterns of the fresh and recycled catalysts: (a) 1%Pt/CNTs-353, (a') 1%Pt/CNTs-353 after 5 runs of reaction, (b) 1%Pt/N-CNTs(5.74), (b') 1%Pt/N-CNTs(5.74) after 5 runs of reaction.

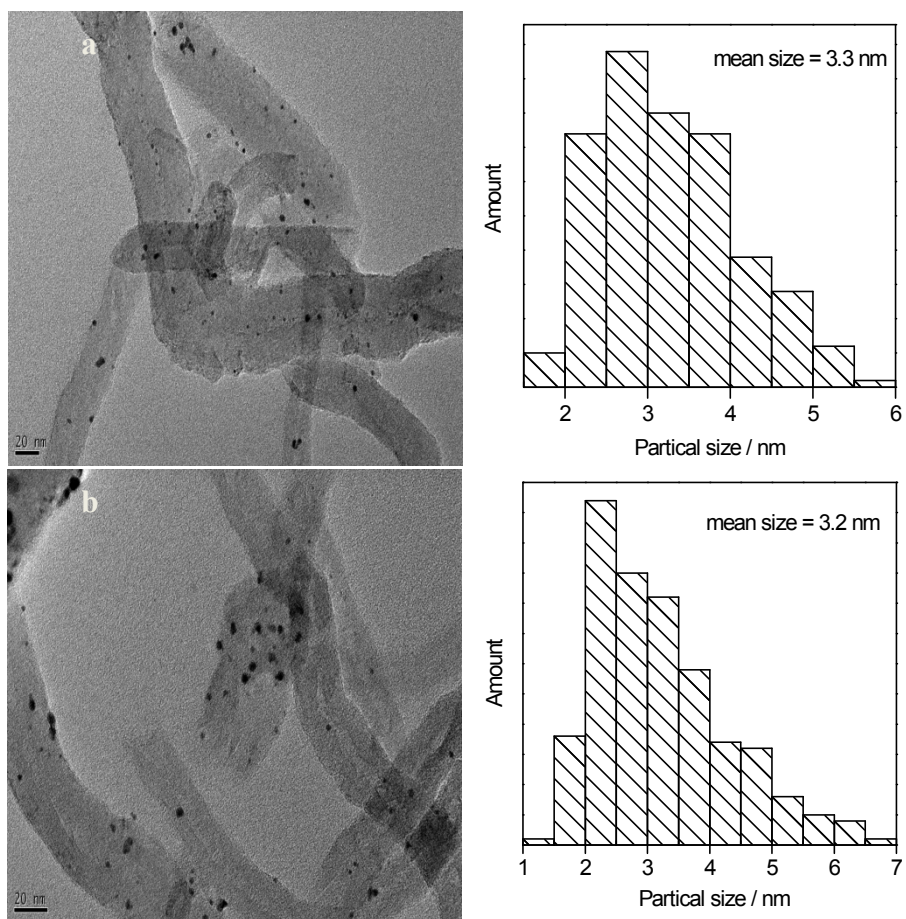


Fig. S5 TEM images of (a) 1%Pt/CNTs-353 and (b) 1%Pt/N-CNTs(5.74) catalysts after 5 runs of reactions.

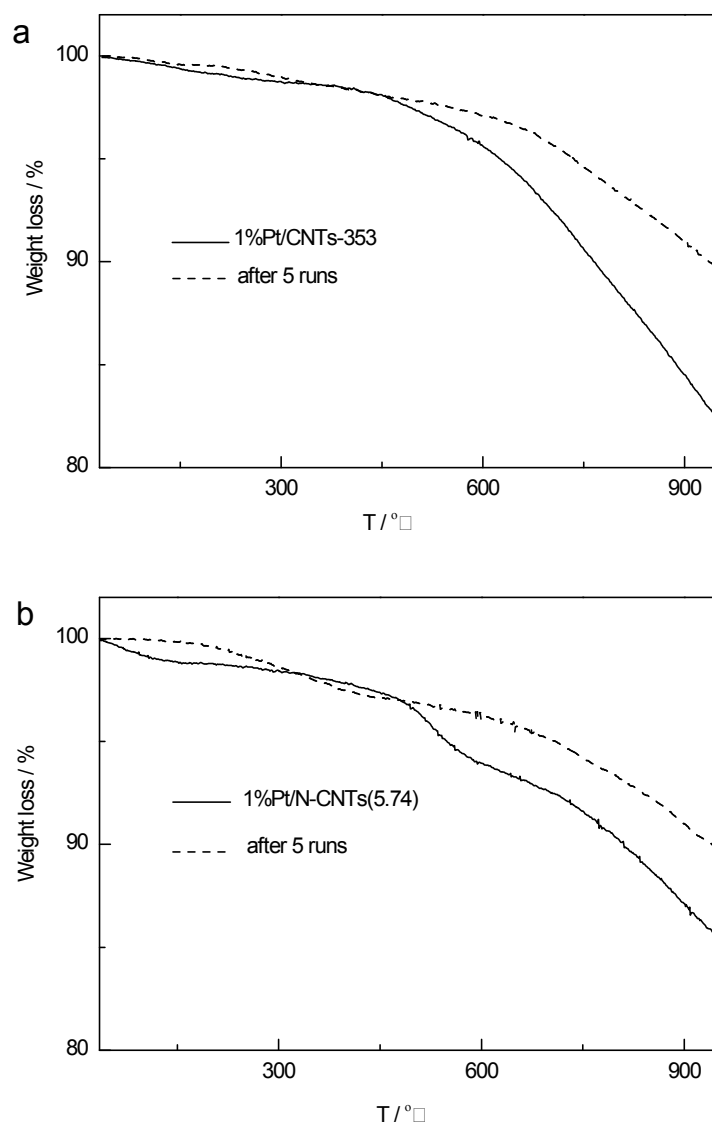


Fig. S6 TGA curves of catalysts before and after 5 runs reactions: (a) 1%Pt/CNTs-353, (b) 1%Pt/N-CNTs(5.74).