Electronic Supporting Information

Size effects of Pt nanoparticles supported on carbon nanotubes for selective oxidation of glycerol in a base-free condition

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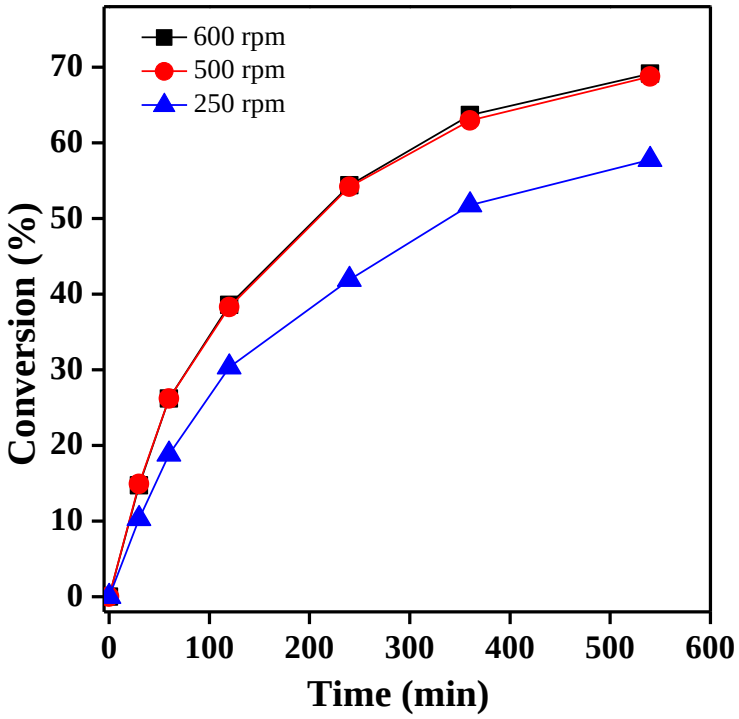

Figure S1 Influence of agitation speed on the catalytic activity of 5.0 wt% Pt/CNTs. Reaction conditions: 30 mL glycerol aqueous solution (0.1 $g \cdot mL^{-1}$), glycerol/Pt molar ratio 890, T=60 ^{o}C, F_{O2}=150 $mL \cdot min^{-1}$.

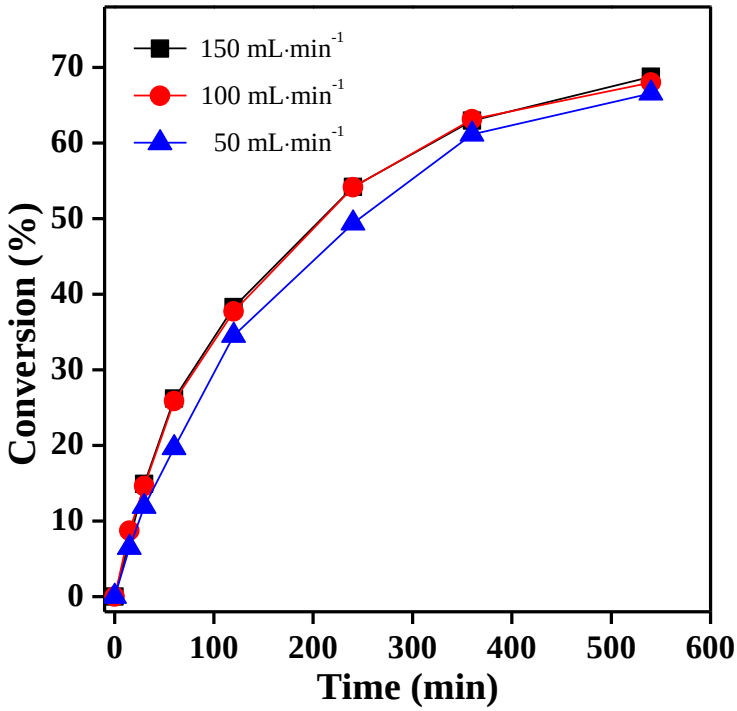

Figure S2 Influence of oxygen flow rate on the catalytic activity of 5.0 wt% Pt/CNTs. Reaction conditions: 30 mL glycerol aqueous solution (0.1 g·mL^{-1}), glycerol/Pt molar ratio 890, T=60 ^{o}C, 500 rpm.

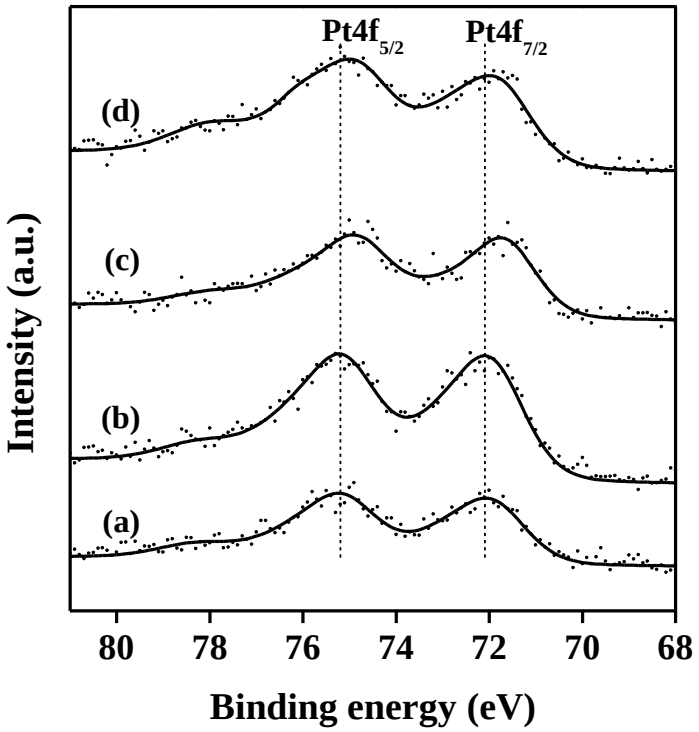

Figure S3 XPS spectra for the Pt 4f regions of Pt catalysts: (a) 3.0 wt% Pt/CNTs, (b) 5.0 wt% Pt/CNTs, (c) 3.0 wt% Pt/CNTs after reaction for 9 h, (d) 5.0 wt% Pt/CNTs after reaction for 9 h. The dotted profile represents the original XPS spectra while the bold black line represents the fitted Pt spectra.

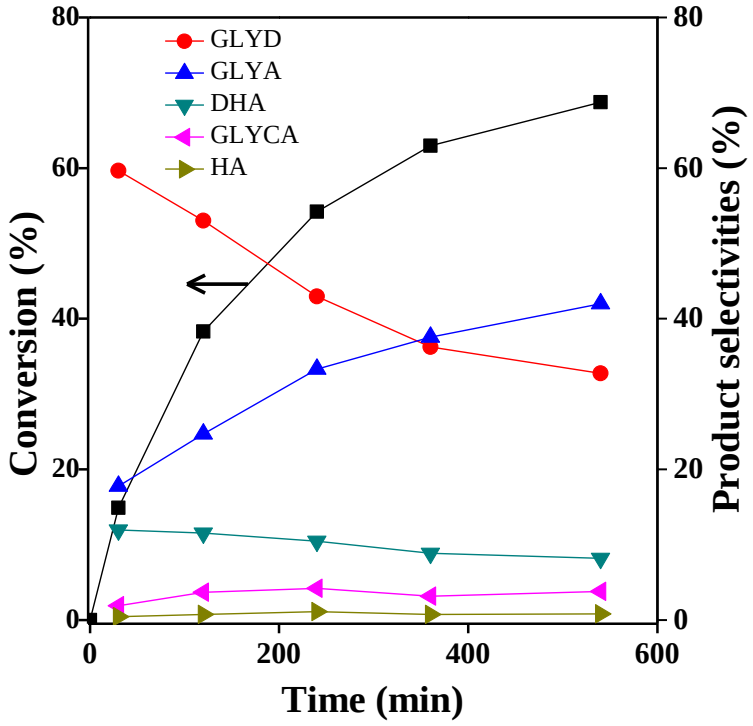

Figure S4 Glycerol oxidation over 5.0 wt% Pt/CNTs catalyst. Reaction conditions: 30 mL glycerol aqueous solution (0.1 g·mL^{-1}), glycerol/Pt molar ratio 890, T=60 ^{o}C, F_{O2}=150 mL·min^{-1}, 500 rpm.

Table S1 Binding energies of Pt catalysts

catalyst	Pt 4f (eV)	
	$4f_{7/2}$	$4f_{5/2}$
3.0 wt% Pt/CNTs	72.1	75.2
5.0 wt% Pt/CNTs	72.1	75.2
used 3.0 wt% Pt/CNTs	71.7	74.9
used 5.0 wt% Pt/CNTs	71.9	75.1

Table S2 Comparison of activities and selectivities after 6 h reaction for glycerol oxidation over different Pt/CNTs catalysts in a base-free condition

Pt catalyst	glycerol/Pt molar ratio	P_{O2} (bar)	specific rate [a] ($mol \cdot h^{-1} \cdot mol^{-1}$ Pt)	product selectivity[b] (%)					Ref.
				GLYA	GLYD	DHA	GLYCA	HA	
5.0 wt% Pt/CNTs	890	1	90.4	37.6	36.2	8.8	2.5	0.7	This work
5.0 wt% Pt/CNTs	445	1	55.3	48.1	9.8	8.9	3.8	2.2	This work
5Pt/MWNTs	445	1	35.7[c]	65.9	3.7	2.8	1.4	7.1	[1]
5Pt/H_2O_2-MWNTs	445	1	52.0[c]	69.8	3.0	2.8	2.2	0	[2]
5Pt/S-MWNTs	445	1	67.2[c]	68.3	1.3	13.3	5.9	0	[1]
Ptc/MWNTs	1250	3	122	34.0[d]	42.0[d]	11.0[d]	2.0[d]	-	[3]

[a] Calculated as: (mol of converted glycerol)/(mol of total Pt added)/(reaction time, h). [b] Calculated as: (mol of product in reaction mixture)*(the number of carbon atom in the product)/(mol of glycerol converted*3)*100%. [c] Recalculated according to the reported data. [d] Product selectivities at 40% glycerol conversion.

REFERENCES

(1) Liang, D.; Gao, J.; Wang, J. H.; Chen, P.; Hou, Z. Y.; Zheng, X. M. Selective Oxidation of Glycerol with Oxygen in a Base-Free Aqueous Solution over MWNTs Supported Pt Catalysts. *Appl. Catal. B: Environ*. **2011**, *106*, 423.

(2) Gao, J.; Liang, D.; Chen, P.; Hou, Z. Y. ; Zheng, X. M. Oxidation of Glycerol with Oxygen in a Base-Free Aqueous Solution over Pt/AC and Pt/MWNTs Catalysts. *Catal. Lett*. **2009**, *130*, 185.

(3) Rodrigues, E. G.; Pereira, M. F.; Chen, X. W. ; Delgado, J. J.; Órfão, J. J. M. Selective Oxidation of Glycerol over Platinum-Based Catalysts Supported on Carbon Nanotubes. *Ind. Eng. Chem. Res*. **2013**, *52*, 17390.