

Supporting information

Pt nanoparticles on multi-walled carbon nanotubes with High CO

Tolerance for methanol electrooxidation

PingPing Yang¹², Shiming Dong¹, YouShu^{1*}, Xuejiao Wei^{3*}

¹College of Chemistry and Materials Engineering, Huaihua university, Huaihua, 418000, China

²College of Life Science and Chemistry, Hunan University of Technology, Zhuzhou, 412007, China

³ Hutian middle school, Huaihua 418000, China

*Corresponding author: * YouShu¹, E-mail: sy@hhtc.edu.cn;

*XueJiao Wei, E-mail: wei1348137@163.com

Table of Contents:

1. Supplementary Figures

Figure S1. TEM and HRTEM images of Pt/CNTs-W.

Figure S2. Nodes of the Pt/CNTs-EG-DES catalyst.

Figure S3. XPS survey spectra of the Pt/CNTs-W catalyst.

Figure S4 Raman spectra of Pt/CNTs-EG-DES (red) and Pt/CNTs-W (black).

Table S1 a recent literatures survey of the activity of MOR electrocatalysts.

2. Supplementary References

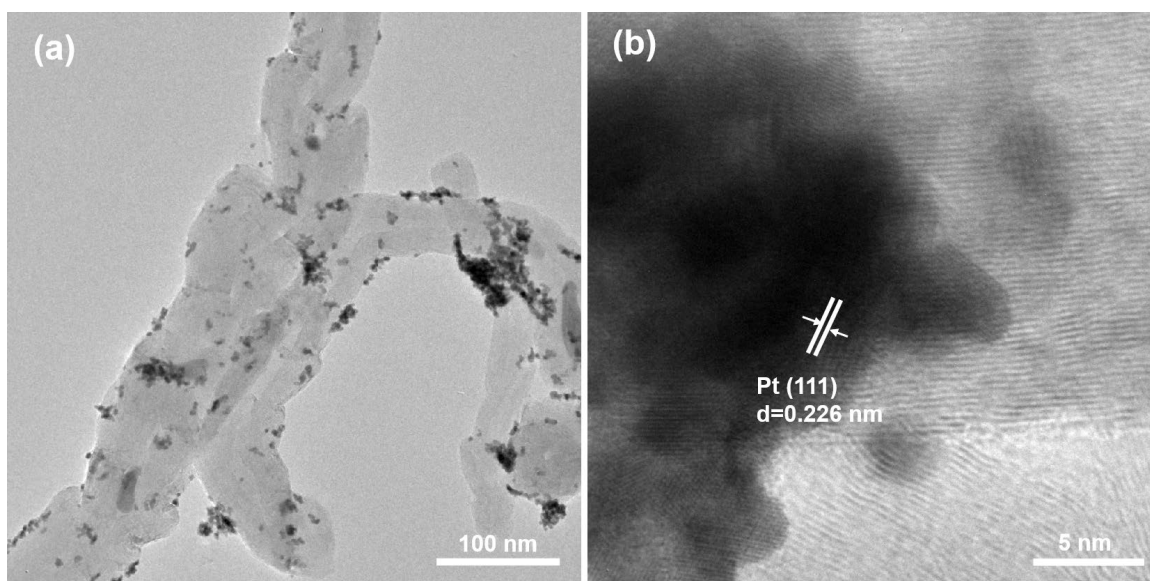


Figure S1. TEM and HRTEM images of Pt/CNTs-W catalyst.

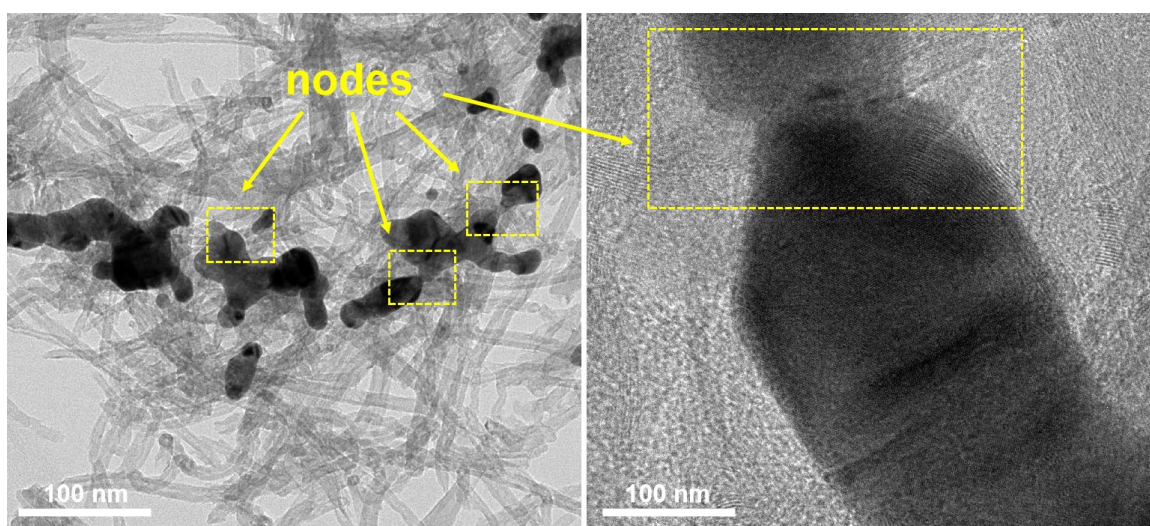


Figure S2. Nodes of the Pt/CNTs-EG-DES catalyst.

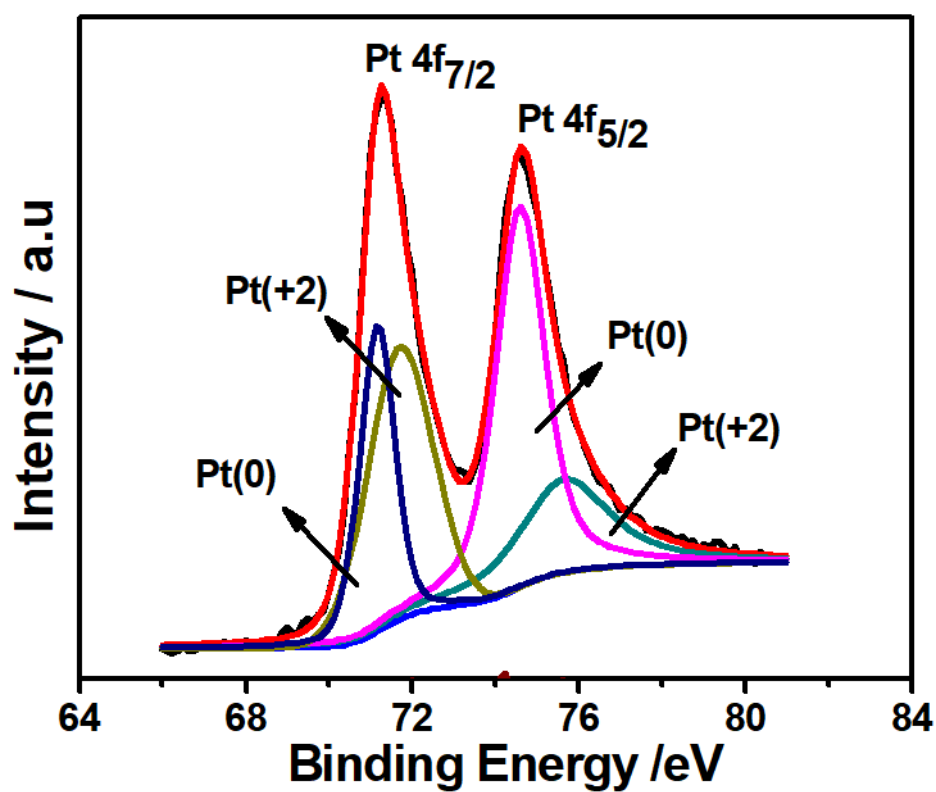


Figure S3. XPS survey spectra of the Pt/CNTs-W catalyst.

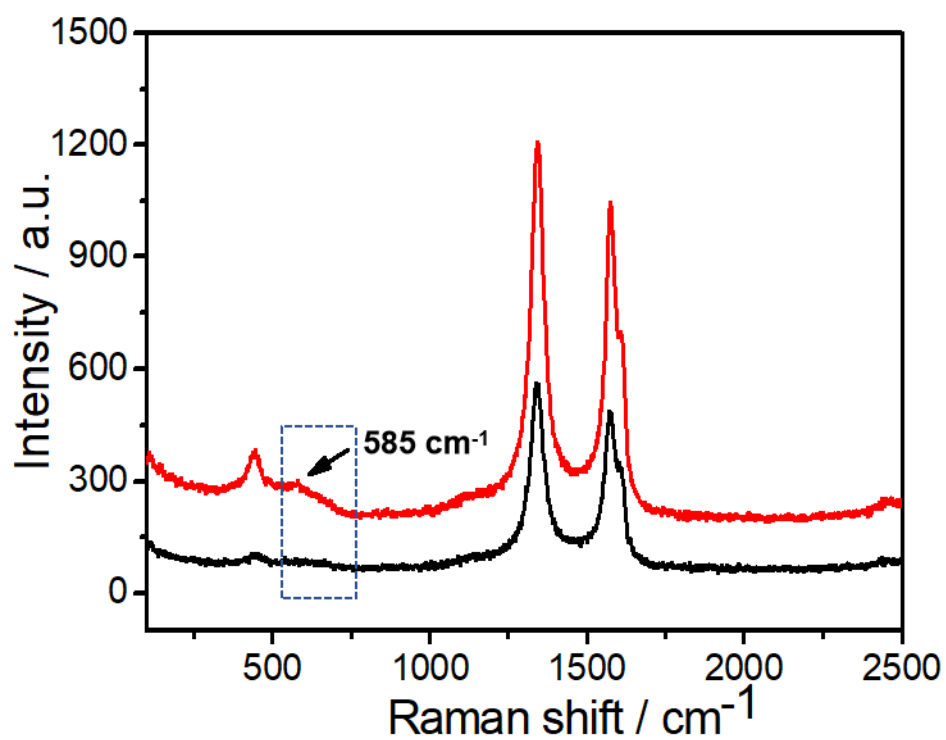


Figure S4 Raman spectra of Pt/CNTs-EG-DES (red) and Pt/CNTs-W (black).

Table S1 a recent literatures survey of the activity of MOR electrocatalysts.

Catalysts	Mass activity (mA mg ⁻¹ Pt)	References
Pt/CNTs-EG-DES	1101.2	This work
Pt ₃ Sn ₁ -SnO ₂ /CNTs-D	361.2	[1]
Au@Pt _{1.2} Cu	180	[2]
PtRu/1-AP-MWCNTs	295	[3]
Pt Ru/APZ-MWCNTs	278.8	[4]
PtRu icosahedra	74.4	[5]
NP-Pt ₇₀ Ru ₃₀	150	[6]
Commercial Pt/C	114.2	[7]
CB/PBI/PtRu	150	[8]
Pt/YBCPE	131	[9]
Pt-SnO ₂ (HS)	230.3	[10]

References

1. Yang, P, et al. One-step synthesis in deep eutectic solvents of Pt₃Sn₁-SnO₂ alloy nanopore on carbon nanotubes for boosting electro-catalytic methanol oxidation. *J Electroanal Chem* **2021**, 887, 115164.
2. Bian, T et al. Seed-mediated synthesis of Au@PtCu nanostars with rich twin defects as efficient and stable electrocatalysts for methanol oxidation reaction. *RSC Adv* **2019**, 9, (61), 35887-35894.
3. S Y Wang, et al. PtRu Nanoparticles Supported on 1-Aminopyrene-Functionalized Multiwalled Carbon Nanotubes and Their Electrocatalytic Activity for Methanol Oxidation. *Langmuir* 2008, 24, 18, 10505–10512.
4. Zhao, Y et al. Electrocatalytic oxidation of methanol at 2-aminophenoxazin-3-one-functionalized multiwalled carbon nanotubes supported PtRu nanoparticles. *Electrochim Acta* **2009**, 54, (27), 7114-7120.
5. Lin, Z et al. Facile synthesis of Ru-decorated Pt cubes and icosahedra as highly active electrocatalysts for methanol oxidation. *Nanoscale* **2016**, 8, (25), 12812-8.

6. Xu, C et al. Nanoporous PtRu alloys for electrocatalysis. *Langmuir* **2010**, 26, (10), 7437-43.
7. Guo, M et al. Hollow Pt skim-sandwiched Cu spheres supported on reduced graphene oxide-carbon nanotube architecture for efficient methanol electrooxidation. *Inter J Hydrogen Energ* **2019**, 44, (13), 6886-6895.
8. Zhao, L et al. Supramolecular assembly promoted synthesis of three-dimensional nitrogen doped graphene frameworks as efficient electrocatalyst for oxygen reduction reaction and methanol electrooxidation. *Appl Catal B: Environ* **2018**, 231, 224-233.
9. Zhang, J et al. PdPt bimetallic nanoparticles enabled by shape control with halide ions and their enhanced catalytic activities. *Nanoscale* **2016**, 8, (7), 3962-72.
10. Fan, Y et al. Hierarchical structure SnO₂ supported Pt nanoparticles as enhanced electrocatalyst for methanol oxidation. *Electrochim Acta* **2012**, 76, 475-479.