

Supporting Information

Polyethyleneimine Stabilized Platinum Nanoparticles as Peroxidase Mimic for Colorimetric Detection of Glucose

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1.1 Materials

Polyethyleneimine (PEI) solution ($M_w = 70$ kDa, 50 wt.%), H_2O_2 solution (30 wt.%), potassium tetrachloroplatinate (I) (K_2PtCl_4), sodium borohydride ($NaBH_4$), and 3,3',5,5'-tetramethylbenzidine (TMB) were purchased from Aladdin. Glucose, maltose, fructose, lactose, sodium carbonate, sodium bicarbonate, sodium acetate, acetic acid and hydrochloric acid were purchased from Sinopharm Chemical Reagent Beijing Co. Ltd. Glucose oxidase (GOD) was purchased from Sangon Biotech (Shanghai) Co., Ltd. Dialysis bags ($MWCO = 10$ kDa) were purchased from Spectrum Laboratories INC.

1.2 Characterization

UV-Vis spectra were measured using UV-TU1810PC spectrophotometer (with 10 mm quartz cells). The sizes of platinum nanoparticles were characterized by using transmission electron microscopy (TEM, JEM-1230EX). The hydrodynamic size and

zeta potential of Pt_n-PEI NPs were characterized by dynamic light scattering (DLS) technology.

1.3 Peroxidase-like activity assays

100 μ L of Pt₅₀-PEI (6 μ M), 300 μ L of HAc-NaAc buffer (pH = 4.0, 0.2 M) and 900 μ L of TMB (0.6 mM) were incubated for 10 min. Then, 100 μ L of H₂O₂ (0.3 M) was added and incubated for 5 min. Finally, the absorbance was obtained by a spectrophotometer. The control group was also measured.

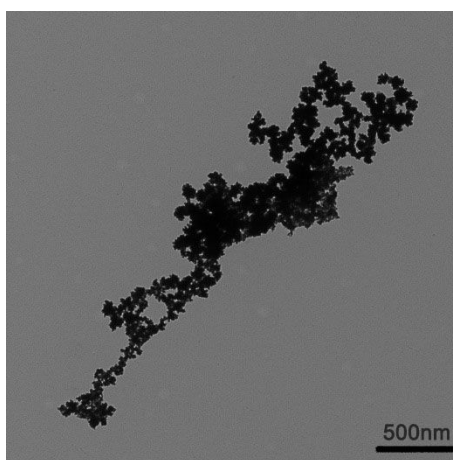


Figure S1 TEM images of Pt NPs without PEI

Some molecules are used to tune size of Pt NPs or increase the stability of Pt NPs in Table S1.

Table S1. Comparison of Pt_n-PEI NPs and other particles

Catalyst	Size (nm)	Molecules	Reference
Pt _n -PEI	3.21-3.70	PEI (70000)	This work
EY-PAAS1@Pt	50	sodium polyacrylate	1
Pt NPs	12.9-70.7	PEI (300,1200,70000)	2
BSA-PtNPs	4	bovine serum albumin	3
Hb-Pt NPs	8.7	hemoglobin	4
Pt ₅₅ -G5MC	1.64	G5MC	5

REFERENCES

(1) Kong, C.; Han, Y.-x.; Hou, L.-j.; Li, Y.-y., Gathered sensitizer on the surface of catalyst by sodium polyacrylate for highly efficient photocatalytic hydrogen evolution. *J. Photoch. Photobio. A* **2017**, *345*, 92-97.

(2) Nagao, H.; Ichiji, M.; Hirasawa, I., Synthesis of platinum nanoparticles by reductive crystallization using polyethyleneimine. *Chem. Eng. Technol.* **2017**, *40* (7), 1242-1246.

(3) He, S. B.; Deng, H. H.; Liu, A. L.; Li, G. W.; Lin, X. H.; Chen, W.; Xia, X. H., Synthesis and peroxidase-like activity of salt-resistant platinum nanoparticles by using bovine serum albumin as the scaffold. *ChemCatChem* **2014**, *6* (6), 1543-1548.

(4) Molaabasi, F.; Sarparast, M.; Shamsipur, M.; Irannejad, L.; Moosavi-Movahedi, A. A.; Ravandi, A.; Hajipour Verdom, B.; Ghazfar, R., Shape-controlled synthesis of luminescent hemoglobin capped hollow porous platinum nanoclusters and their application to catalytic oxygen reduction and cancer imaging. *Sci. Rep.-UK* **2018**, *8* (1), 14507.

(5) Cui, Y.; Zhang, J.; Yu, Q.; Guo, X.; Chen, S.; Sun, H.; Liu, S.; Wang, L.; Lai, X.; Gao, D., Highly biocompatible zwitterionic dendrimer-encapsulated platinum nanoparticles for sensitive detection of glucose in complex medium. *New. J. Chem.* **2019**, *43* (23), 9076-9083.