Supplementary Materials

Polyacrylonitrile Copolymer-Silica Template to Three-Dimensional Hierarchical Porous Carbon as a Pt Catalyst Support for Oxygen Reduction Reaction

Minmin Liu^a, Jian Li^a, Chao Cai^a, Ziwei Zhou^a, Yun Ling^b and Rui Liu^{*a}

(*aKey Laboratory of Advanced Civil Engineering Materials of Ministry of Education, School of Materials Science and Engineering, and Institute for Advanced Study, Tongji University, Shanghai, 201804, China, E-mail: ruiliu@tongji.edu.cn*

^bShanghai Key Laboratory of Molecular Catalysis and Innovative Materials, Department of Chemistry, Fudan University, Shanghai, 200433, China)



of(A)3DC and (B)Pt/3DC; (C) EDX analysis collected in the selected area in (B).



Fig. S3 (A) The deconvoluted high resolution XPS spectrum of Pt 4d and (B) the powder X-ray diffraction (XRD) pattern of the obtained 3DC and Pt/3DC.



Fig. S4 (A) CV curves of 3DC in N_2 - and O_2 -saturated 0.1 M KOH solution with scanning rate of 20 mV/s and (B) LSV curves in 0.1 M KOH solution at different rotating rates from 225 to 1600 rpm.



Fig. S5 (A)CV curves of Pt/3DC in N₂-saturaed 0.1 M KOH solution at different potential scan rates from 20 to 100mV/s; (B) ring current density curves of Pt/3DC collected on the RRDE in O_2 -saturaed 0.1 M KOH solution with the rotating rate from 225 to 1600 rpm.



Fig. S6 CV curves of the commercial 20% Pt/C catalyst (A) in N_2 -saturated 0.1 M KOH solution at different scanning rates and (B) in N_2 and O_2 -saturated 0.1 M KOH solution with scanning rate of 50 mV/s.



Fig. S7 (A) Electron transferred *n* numbers of Pt/3DC and commercial 20% Pt/C catalyst. (B)Linear sweep voltammetry (LSV) curves of oxygen reduction on commercial 20% Pt/C catalyst in O₂-saturated 0.1 M KOH solution with different rotating rates from 225 to 1600 rpm. The inset shows the corresponding Koutecky-Levich plots ($J^1 vs \ \omega^{1/2}$) at different potentials.



Fig. S8 The CV curves of Pt/3DC (A) and the commercial 20% Pt/C (C) in the $\rm N_2\text{-}$ and $\rm O_2$ -

saturated 0.1 M HClO₄ solution with the potential scanning rate of 50 mV/s. The LSV curves of Pt/3DC (B) and the commercial20% Pt/C (D) in the O₂ -saturated 0.1 M HClO₄ solution under the rotating rate from 1600 to 225 rpm with the same potential scanning rate of 5 mV/s. The insets of B and D are the corresponding Koutecky-Levich plots ($J^{-1} vs \sigma^{-1/2}$) at different potentials, respectively.



Fig. S9 The LSV curves of Pt/3DC in O_2 -saturated 0.1 M KOH (A) and 0.1 M HClO₄(B) solution with different potential scanning rate from 20 to 5 mV/s. (C)The LSV curves of Pt/3DC in the O_2 saturated 0.1 MKOH under the rotating rate from 1600 to 225 rpm with the same potential

scanning rate of 5 mV/s. (D) The corresponding Koutecky-Levich plots ($J^{-1} v s \omega^{1/2}$) at different potentials, respectively.