

Supporting Information

Anchoring ultrafine Pt nanoparticles on 3D hierarchical self-assembly of graphene/functionalized carbon black as a highly efficient oxygen reduction catalyst

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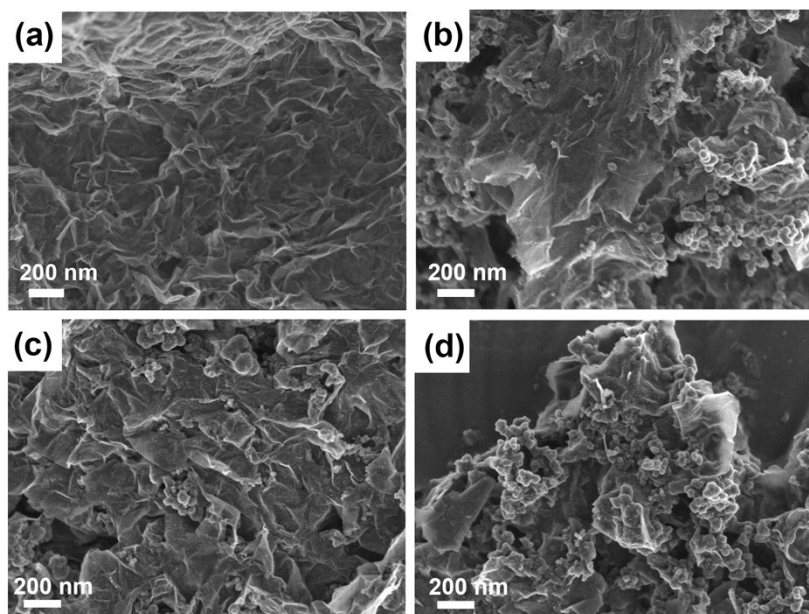


Fig. S1. (a-d) Representative FE-SEM images of (a) Pt/rGO, (b) Pt/rGO₁-CB₂, (c) Pt/rGO₁-FCB₁ and (d) Pt/rGO₁-FCB₄.

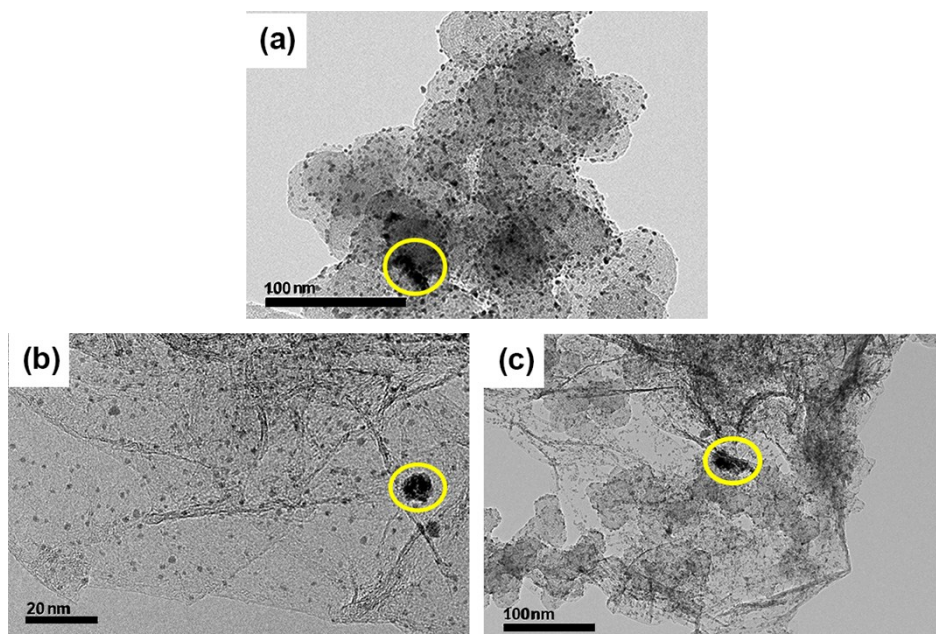


Fig. S2. (a-c) TEM images of (a) Pt/C, (b) Pt/rGO and (c) Pt/rGO₁-CB₂.

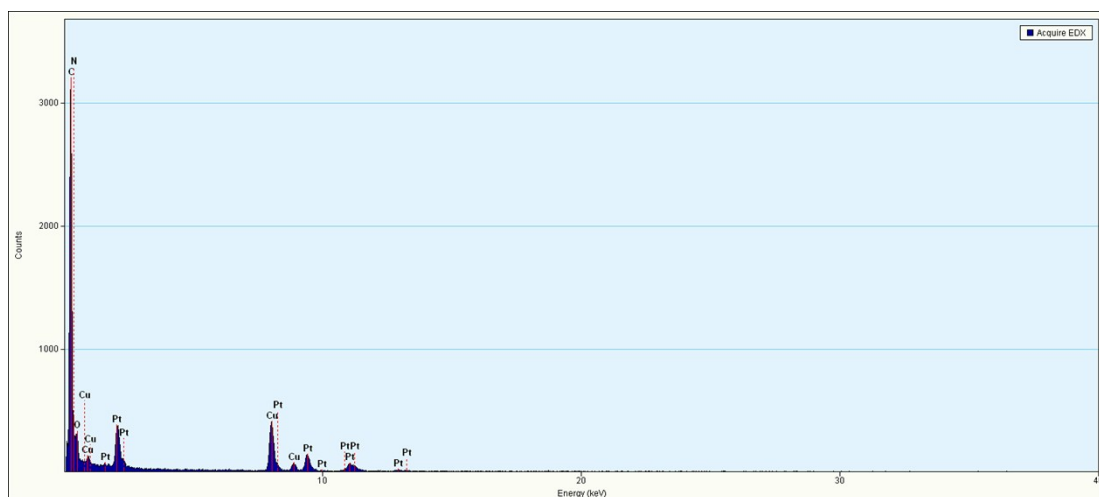


Fig. S3. EDX spectra of Pt/rGO₁-FCB₂.

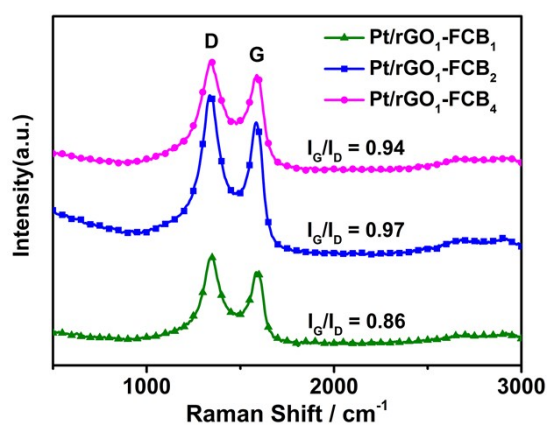


Fig. S4. Raman spectra of Pt/rGO-FCB architectures.

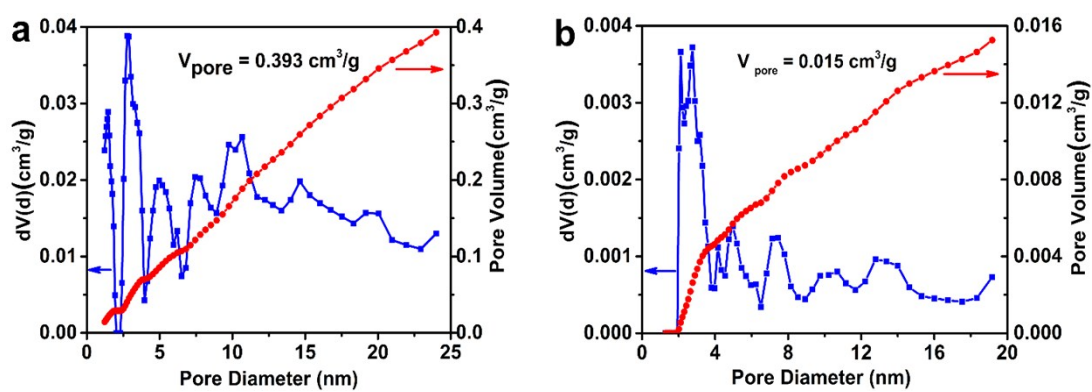


Fig. S5. Porous structure analysis of (a) Pt/rGO₁-CB₂ and (b) Pt/rGO.

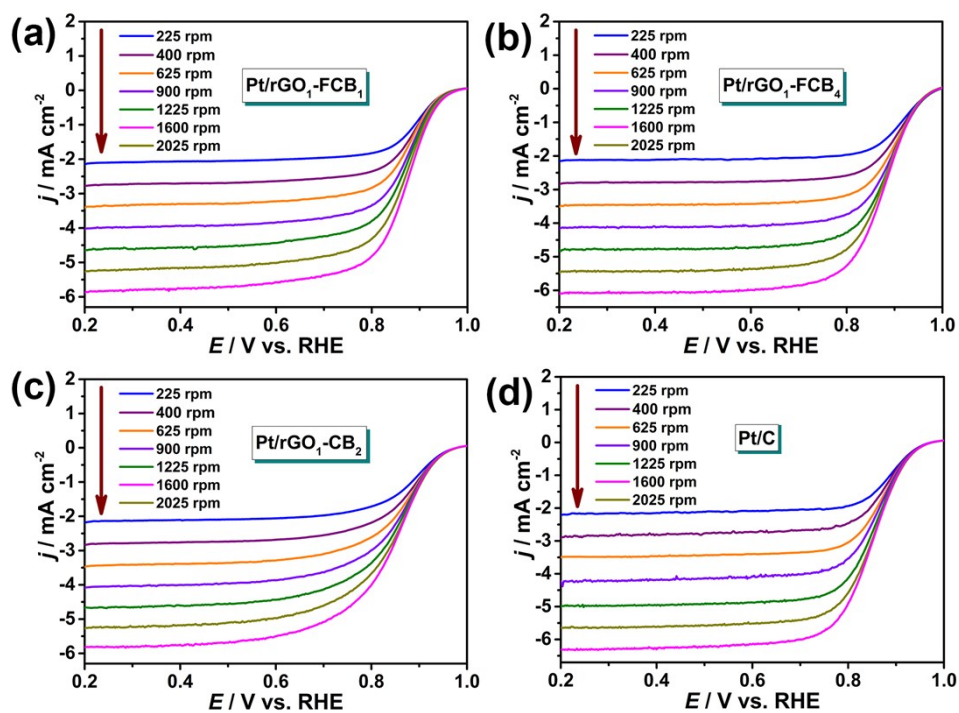


Fig. S6. LSV curves of (a) Pt/rGO₁-FCB₁, (b) Pt/rGO₁-FCB₄, (c) Pt/rGO₁-CB₂ and (d) Pt/C obtained from different rotation speeds.

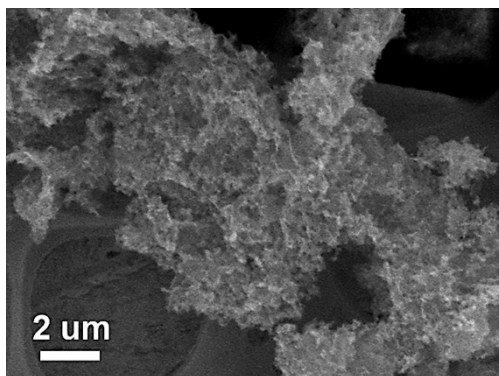


Fig. S7. SEM image of the Pt/rGO₁-FCB₂ catalyst after ADT.

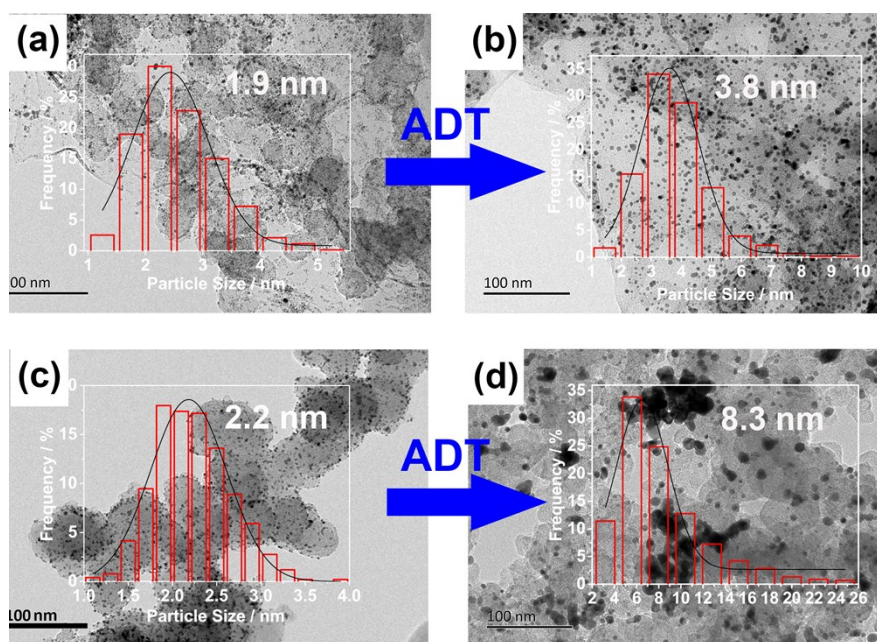


Fig. S8. TEM images of (a) fresh Pt/rGO1-FCB2 catalyst, (b) Pt/rGO1-FCB2 catalyst after ADT, (c) fresh Pt/C catalyst, and (d) Pt/C catalyst after ADT.

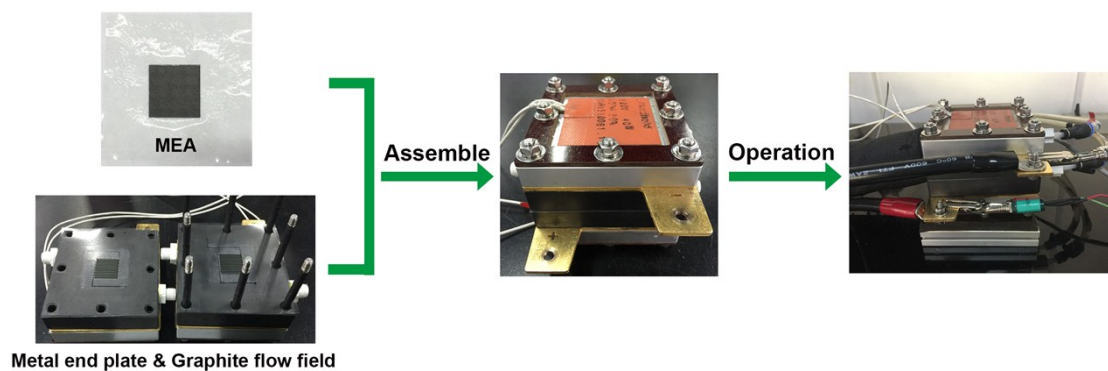


Fig. S9. The process of fabricating the single cell

Table S1. Comparison of ORR behavior on the 3D Pt/FCB-rGO composite and various Pt-based electrocatalysts.

catalysts	Mass activity (mA mg ⁻¹ _{Pt})	Specific activity (mA cm ⁻² _{Pt})	References
Pt/FCB-rGO	249	0.401	This work
Pt-N/C PMC	163	0.213	Carbon 2018, 128, 38
Pt/GA	12	0.034	Electrochim. Acta 2017, 250, 174
Pt/NH ₂ -graphene	172	0.290	ACS Catal. 2016, 6, 2642
Pt/PBI-graphene+FCB	183	n.a.	Nano Energy 2015, 16, 281
Pt@CNx/CNT	111	0.150	ACS Catal. 2015, 5, 2903
Pt/MWCNT	60	n.a	J. Power Sources 2017, 360, 196
Pt/CNT-G	169	<0.16	Carbon 2016, 107, 739