

Supporting Information

Noble metal-free electrocatalysts for oxygen reduction reaction based on iron and nitrogen-doped porous graphene

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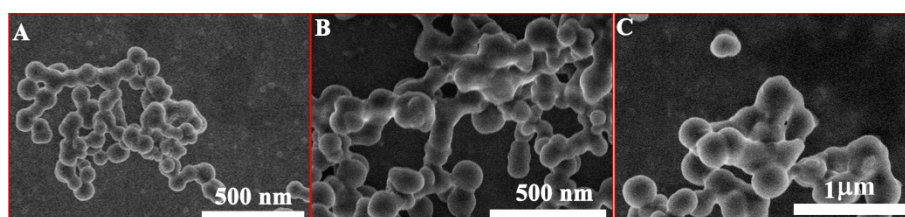


Figure S1 SEM images of ZnO particles with different sizes.

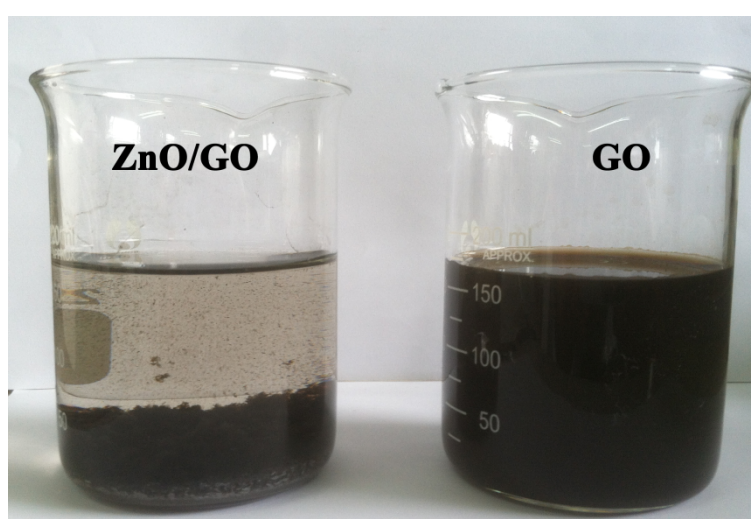


Figure S2 Digital pictures of ZnO/GO and GO solutions stored for 48 h after sonication.

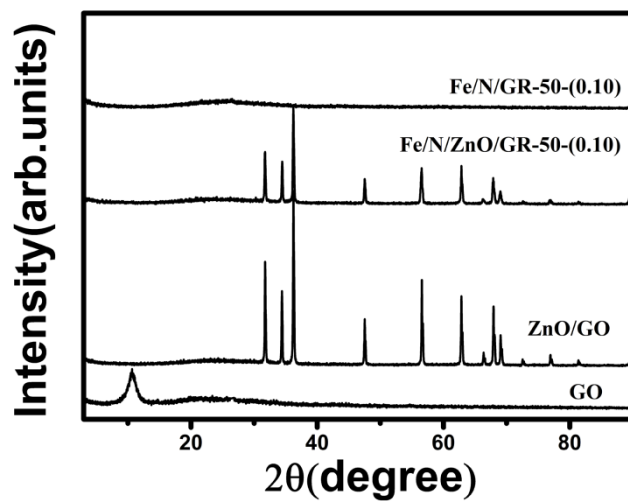


Figure S3 XRD patterns of GO, ZnO/GO, Fe/N/ZnO/GR-50-(0.10), and Fe/N/GR-50-(0.10).

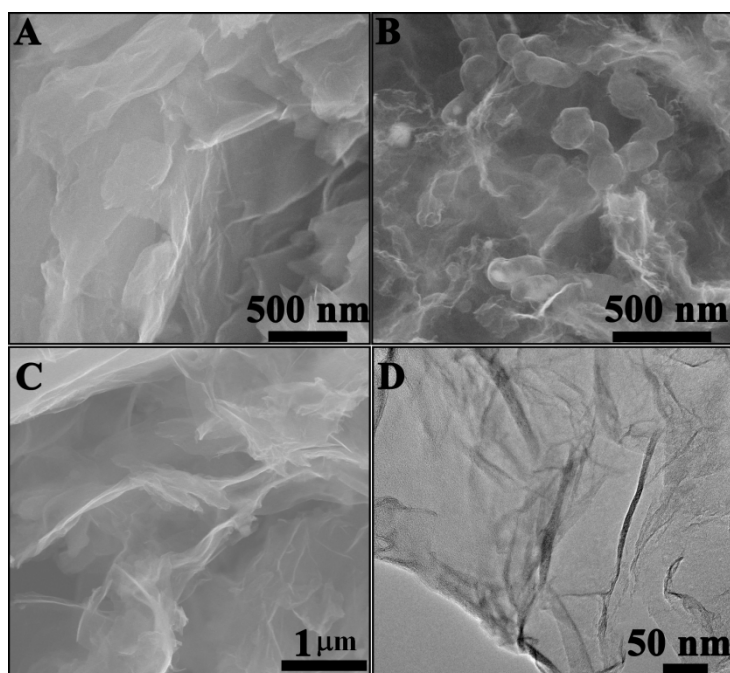


Figure S4 SEM images of (A) GO, (B) Fe/N/ZnO/GR-90-(0.10), (C) Fe/N/GR-(0.10), and TEM image of (D) Fe/N/GR-(0.10).

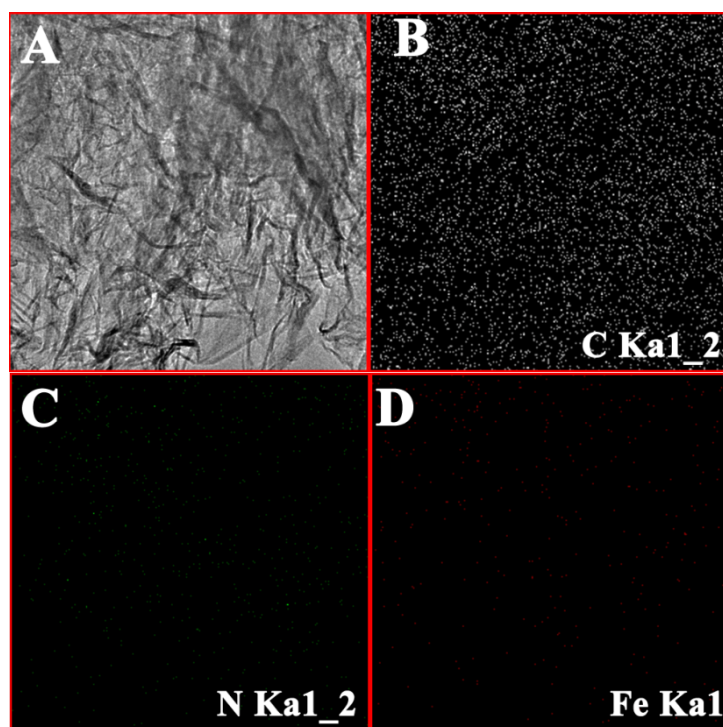


Figure S5 (A) TEM images of Fe/N/GR-X-(0.10). The elemental maps for (B) C element, (C) N element, and (D) Fe element corresponding to (A).

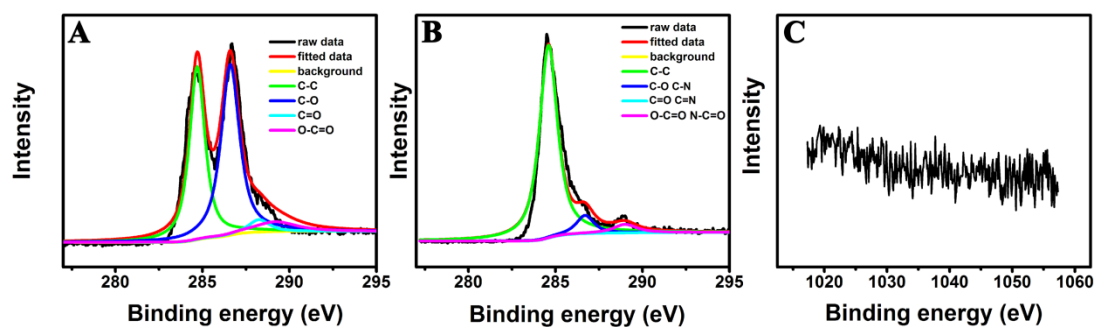


Figure S6 C1s XPS spectra of (A) GO and (B) Fe/N/GR-50-(0.10). (C) Zn2p XPS spectrum of Fe/N/GR-50-(0.10).

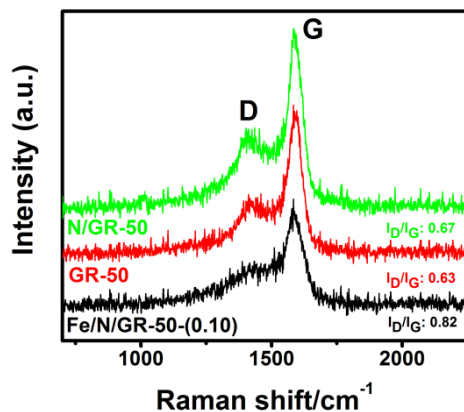


Figure S7 C1s Raman spectra of GR-50, N/GR-50, and Fe/N/GR-50-(0.10).

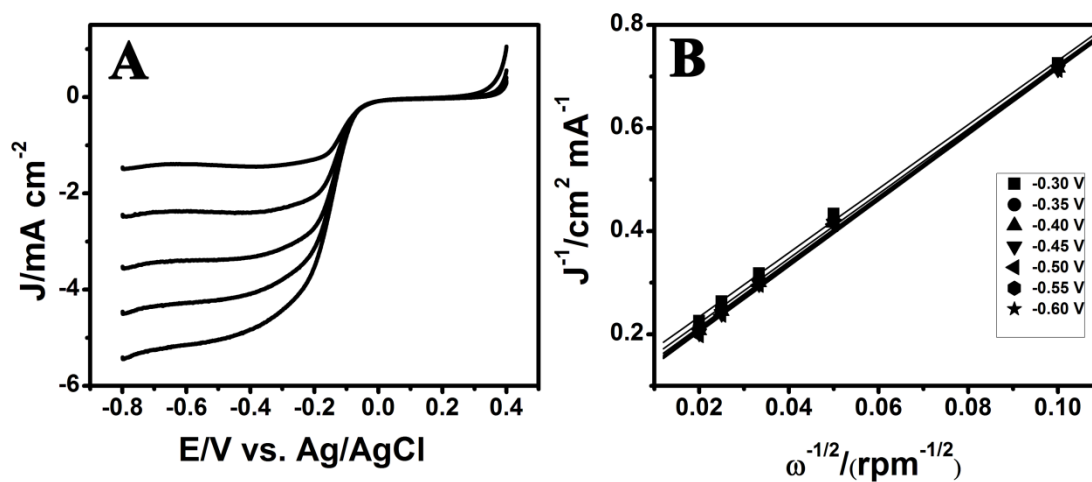


Figure S8 (A) LSV curves at different rotation rates recorded for ORR at Pt/C in oxygen-saturated 0.1 M KOH. Scan rate: 5 mV s⁻¹. Rotation rate: 100, 400, 900, 1600, and 2500 rpm. (B) Koutecky-Levich plots of Pt/C at different electrode potentials.

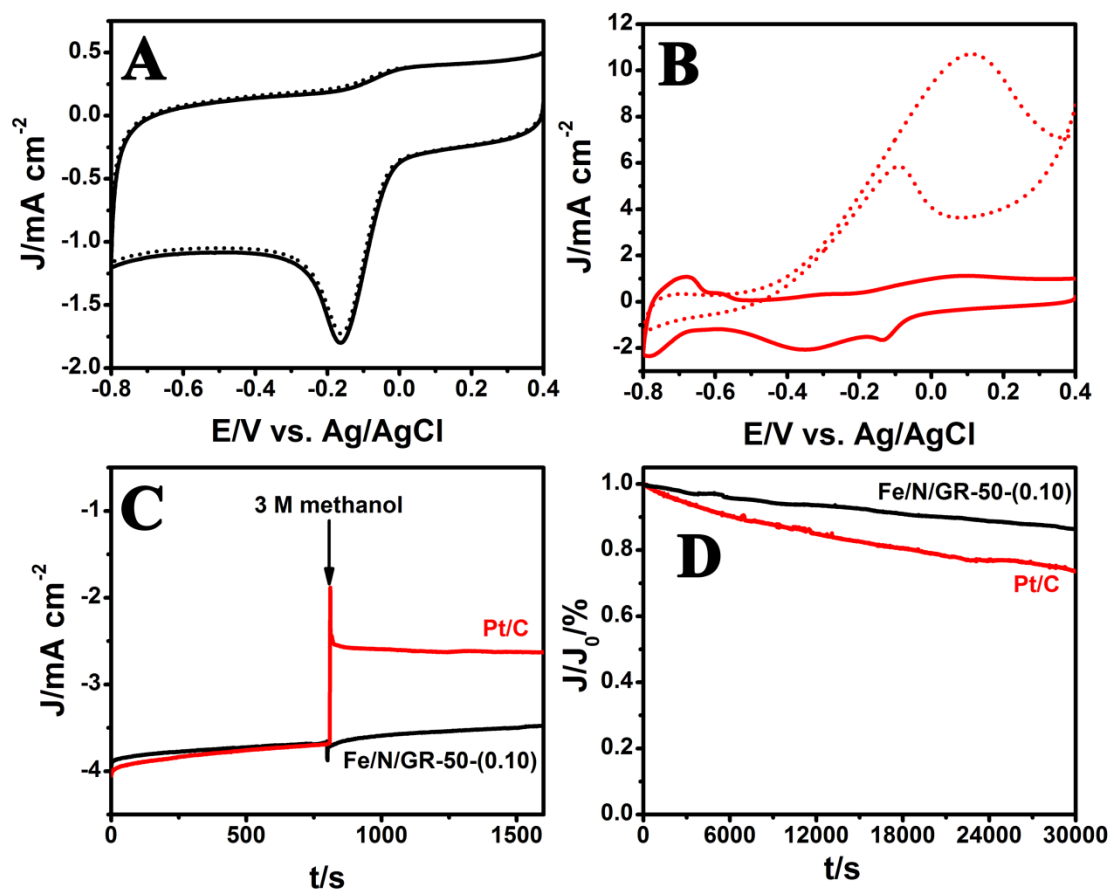


Figure S9 CVs of (A) Fe/N/GR-50-(0.10) and (B) Pt/C in oxygen-saturated 0.1 M KOH (solid line) and oxygen-saturated 0.1 M KOH containing 3 M methanol (dot line). (C) The current-time response for Fe/N/GR-50-(0.10) and Pt/C at -0.35 V with the addition of 3 M methanol into oxygen-saturated 0.1 M KOH at 800 s. (D) The relative decrease of the current density with time for Fe/N/GR-50-(0.10) and Pt/C.

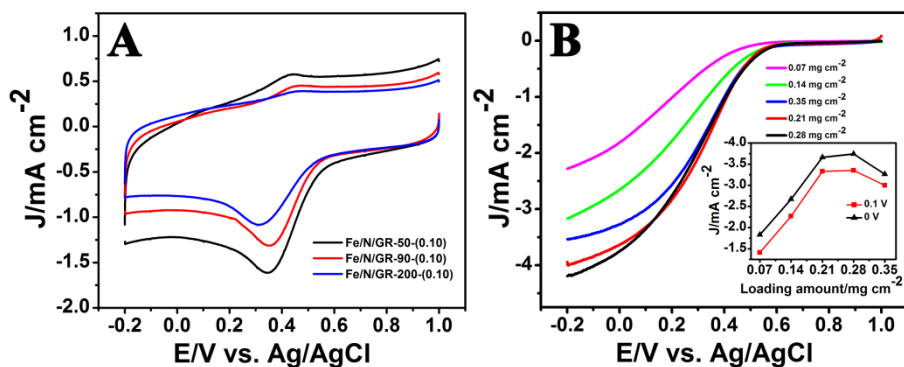


Figure S10 (A) CVs of Fe/N/GR-50-(0.10) (black), Fe/N/GR-90-(0.10) (red), and Fe/N/GR-200-(0.10) (blue) in oxygen-saturated 0.5 M H₂SO₄. Scan rate of CVs: 50 mV s⁻¹. (B) LSVs of Fe/N/GR-50-(0.10) with the loading amount of 0.07, 0.14, 0.21, 0.28, and 0.35 mg cm⁻². Inset: The dependence of activity on loading amount for Fe/N/GR-50-(0.10) at 0 and 0.1 V.