Electronic Supplementary Material (ESI) for RSC Advances.

Supporting Information

Effect of annealing temperature and element composition of the titanium dioxide/graphene/hemin catalysts for oxygen reduction reaction

Yuewu Zhao, Linqun Zhang, Wei Wei, Ying Li, Anran Liu, Yuanjian Zhang*, Songqin Liu*

Jiangsu Province Hi-Tech Key Laboratory for Bio-medical Research, School of Chemistry and Chemical Engineering, Southeast University, Nanjing 210096, China. Fax: +86-25-52090618; Tel: +86-25-52090613; E-mail address: liusq@seu.edu.cn; yuanjian.zhang@seu.edu.cn

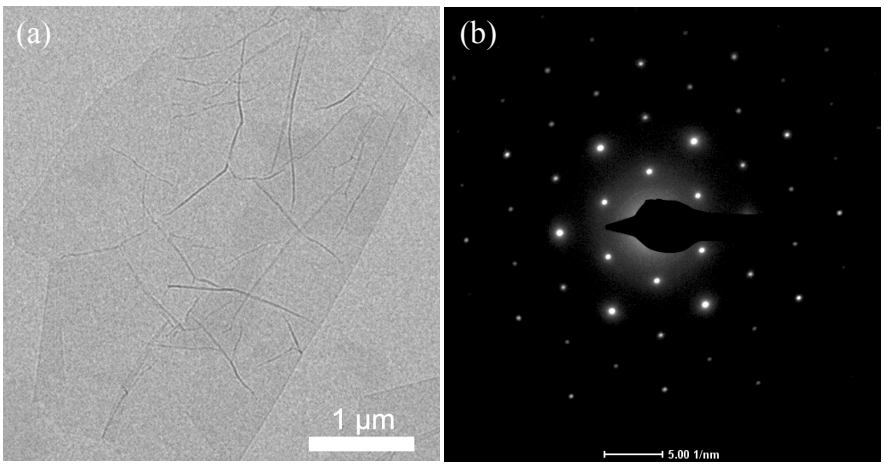


Fig. S1 Typical TEM image (a) and SAED pattern (b) of the graphene.

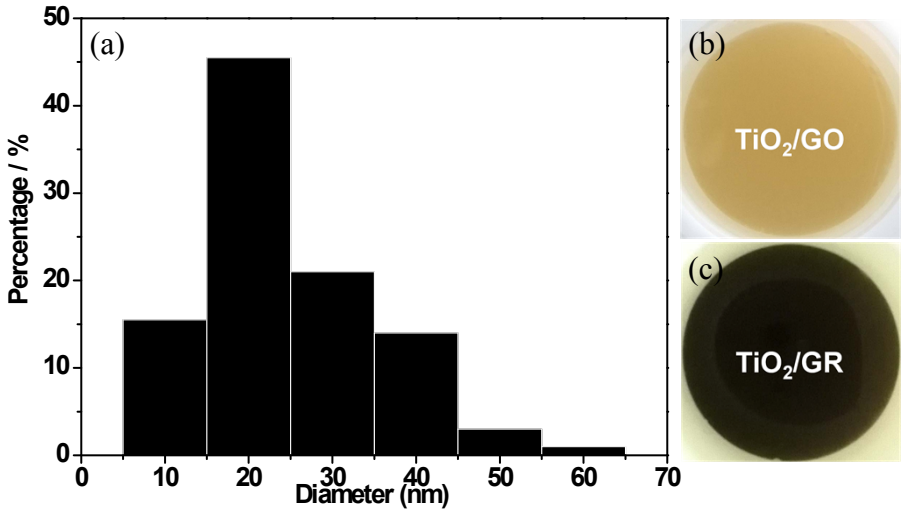


Fig. S2 (a) Particle size distribution of the as-prepared TiO_2 was investigated in the TiO_2/GR hybrids. (b) TiO_2-graphene oxide before solvothermal reaction. (c) TiO_2-reduced graphene obtained after solvothermal reaction.

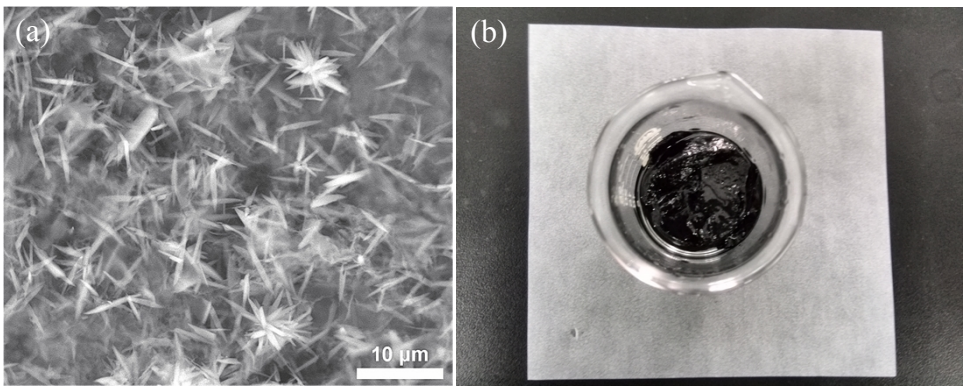


Fig. S3 SEM and photograph images of the as-prepared TiO_2/Gr/Hem samples with different ratio of hemin and TiO_2/Gr: (a) 3/1, and (b) 1/3.

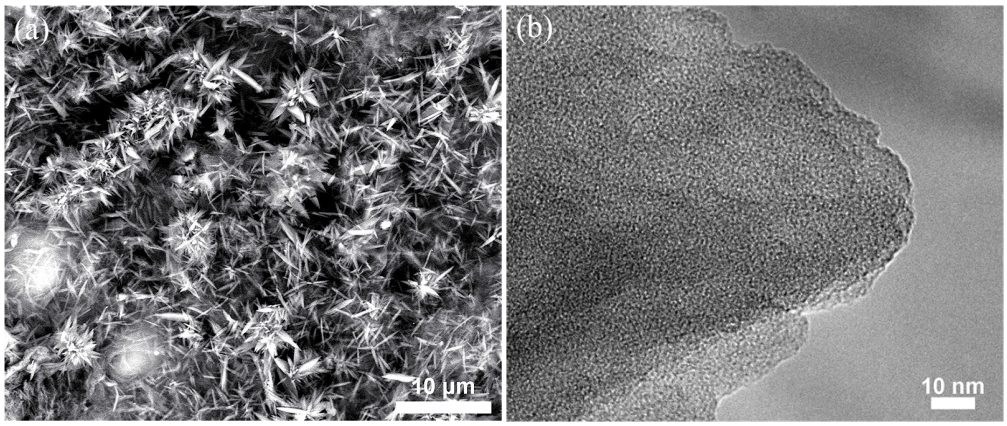


Fig. S4 (a) SEM image of the as-prepared TiO_2/Gr/Hem samples. (b) HRTEM image of the as-prepared TiO_2/Gr/Hem samples.

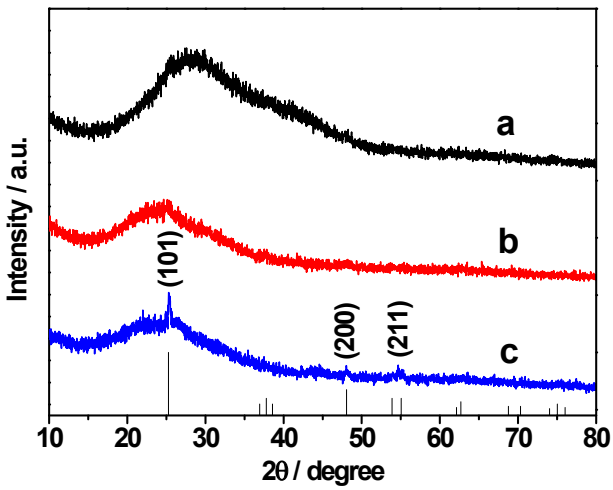


Fig. S5 XRD patterns of the as-prepared (a) TiO_2/Gr, (b) TiO_2/Gr/Hem, and (c) TiO_2/Gr/Hem-700 °C. The standard pattern derived from the anatase TiO_2 (JCPDS card No. 21-1272). It can be seen that the anatase TiO_2 in the TiO_2/Gr/Hem was obtained after the annealing temperature at 700 °C.

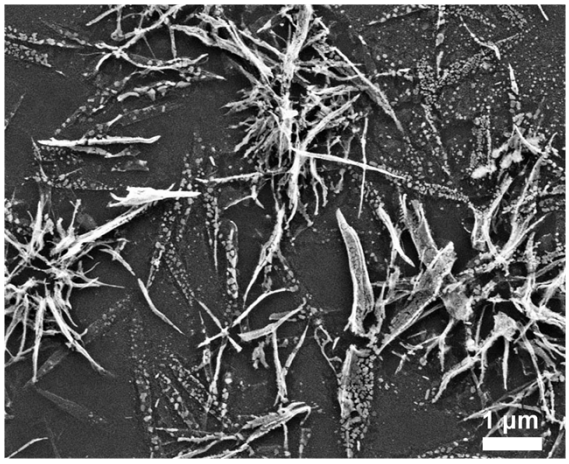


Fig. S6 SEM images of the as-obtained TiO_2/Gr/Hem-700 ^oC.

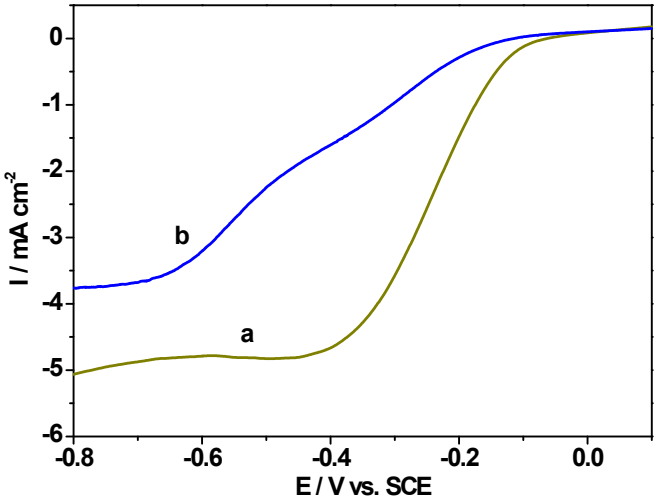


Fig. S7 LSV curves of the (a) TiO_2/Gr/Hem-700 ^oC materials (b) TiO_2, graphene, and hemin were directly mixed and annealed at 700 ^oC. Scan rate, 10 mV s^{-1}; rotation rate, 1600 rpm.

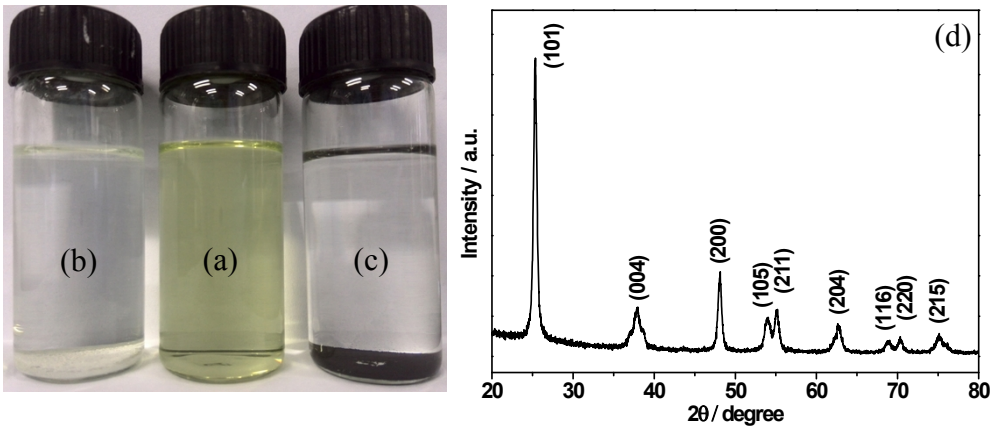
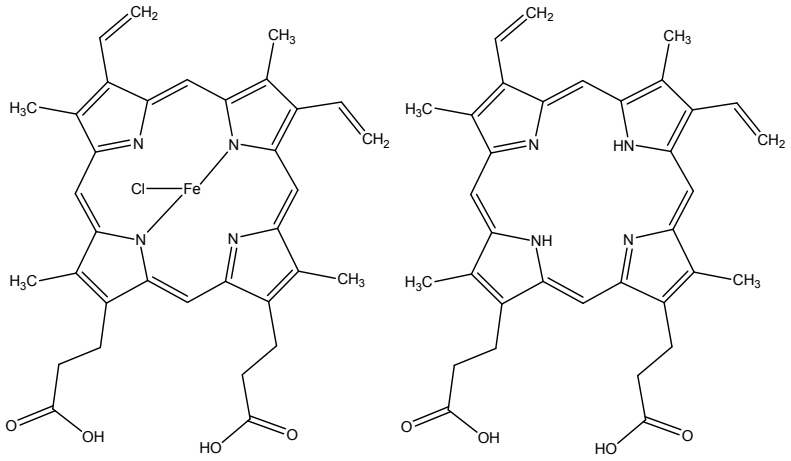


Fig. S8 (a) The amorphous TiO_2 can be dissolved in hydrochloric acid. (b) The obtained anatase TiO_2 after the annealing temperature at 700 ^oC, it cannot be dissolved in hydrochloric acid. (c) The TiO_2/Gr-700 ^oC also cannot be dissolved in hydrochloric acid. (d) XRD pattern of the obtained anatase TiO_2 after the annealing temperature at 700 ^oC.

(a)



(b)

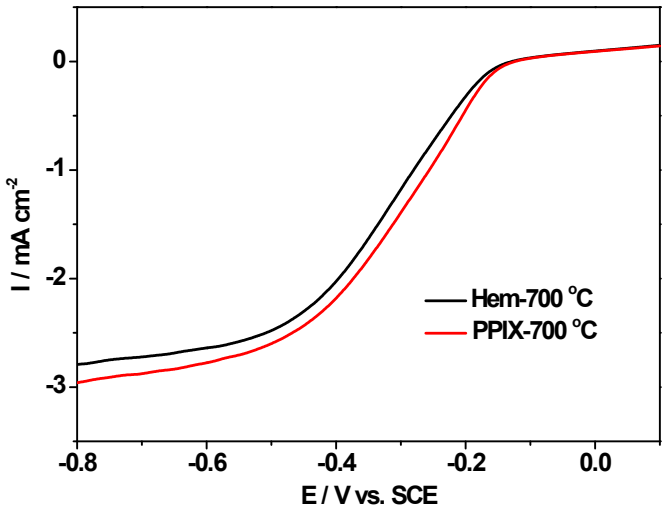


Fig. S9 (a) Structural diagrams of the hemin and PPIX. (b) LSV curves of Hem-700 ^{o}C (black line) and PPIX-700 ^{o}C (red line) in O_2-saturated 0.1 M KOH. Scan rate, 10 mV s^{-1}; rotation rate, 1600 rpm.