A Hybrid Composite Catalyst of Fe₃O₄ nanoparticles-based Carbon for Electrochemical Reduction of Oxygen

Zongkun Chen, a Fei Lin, a Dandan He, a,b Heqing Jiang b, Jingjing Zhang, a Xin Wang, a and Minghua Huang a*

a Institute of Materials Science and Engineering, Ocean University of China, Qingdao 266100, China
b Qingdao Key Laboratory of Functional Membrane Material and Membrane Technology, Qingdao Institute of Bioenergy and Bioprocess Technology, Chinese Academy of Sciences, Qingdao 266101, China

Figure S1. The TEM images of Fe₃O₄/HCS-900.
Figure S2. (a) XPS spectrum of Fe₃O₄/HCS-600. (b) High-resolution Fe2p spectrum of Fe₃O₄/HCS-600.

Figure S3. Fitted Raman spectra of (a) HCS-600, (b) Fe₃O₄/HCS-600, (c) Fe₃O₄/HCS-900.
**Figure S4.** CVs of HCS-600, Fe$_3$O$_4$/HCS-600, Fe$_3$O$_4$/HCS-600+AB and Fe$_3$O$_4$/HCS-900 in 0.1M KOH solution (O$_2$-saturated or N$_2$-saturated).

**Figure S5.** TEM image of AB. Scale bar: 50 nm.
Figure S6. (a) RDE curves from Fe$_3$O$_4$/HCS-600+AB and Pt/C. (b) Koutecky-Levich plots of the ORR for Fe$_3$O$_4$/HCS+AB. (O$_2$-saturated 0.1M KOH solution was employed in these measurements).

Figure S7. (a) RDE curves for Fe$_3$O$_4$/HCS-900 and Fe$_3$O$_4$/HCS-900+AB.
Figure S8. (a), (b) Polarization curves measured during cycling durability tests at 1600 rpm in O₂-saturated 0.1M KOH (cycling tests were carried out in a potential window of -0.1V to -0.5V vs. Ag/AgCl with 100 mV s⁻¹).