

Phosphate functionalized activated carbon as an efficient metal-free electrocatalyst for oxygen reduction reaction

Supporting Information

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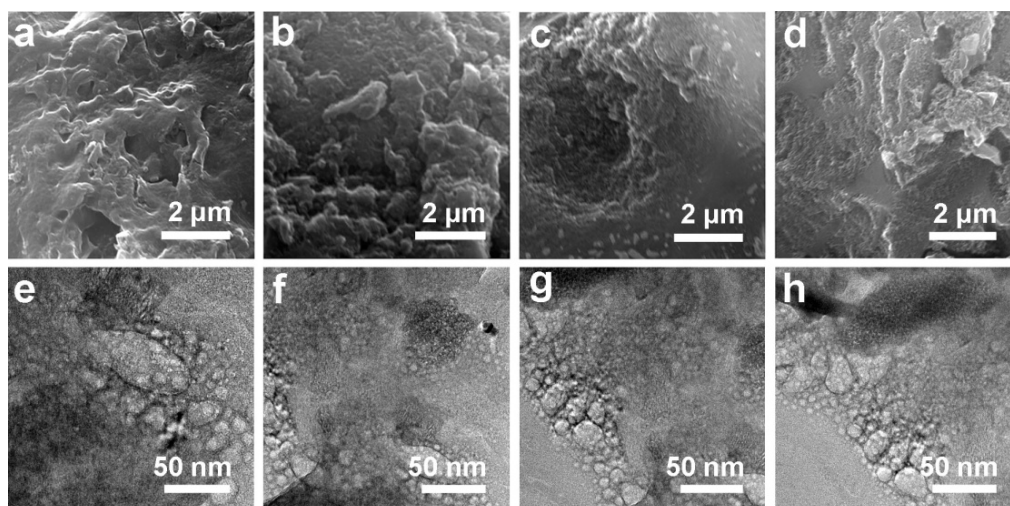


Fig. S1 (a) SEM and (e) TEM images of AC, (b) SEM and (f) TEM images of PAC, (c) SEM and (g) TEM images of PAC-1 and (d) SEM and (h) TEM images of PAC-2.

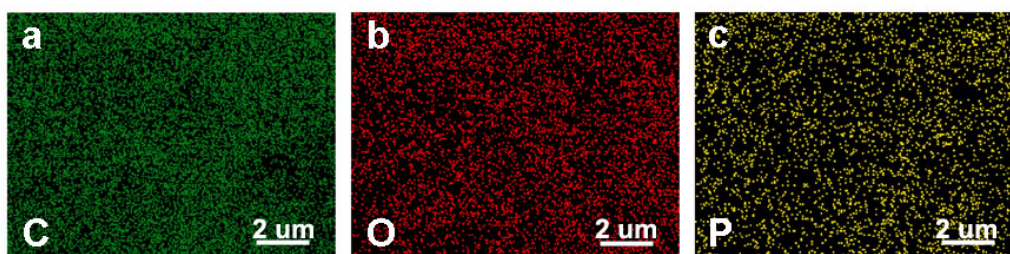


Fig. S2 EDS element mapping images of (a) C, (b) O and (c) P elements of PAC-3.

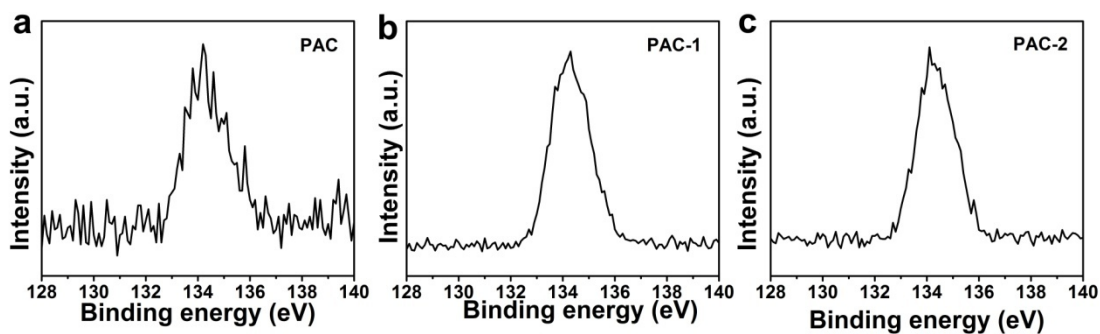


Fig. S3 High-resolution P 2p spectra of (a) PAC, (b) PAC-1 and (c) PAC-2.

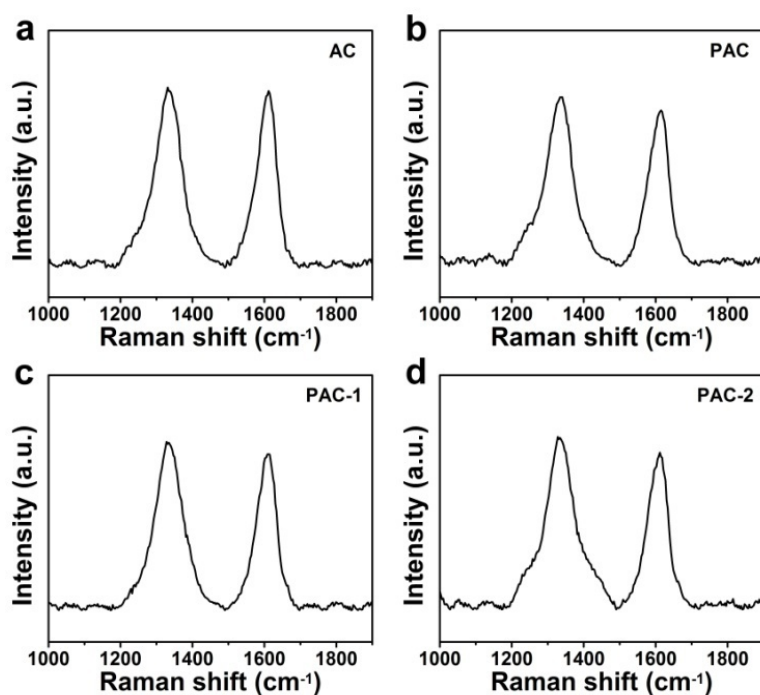


Fig. S4 Raman spectra of (a) AC, (b) PAC, (c) PAC-1 and (d) PAC-2.

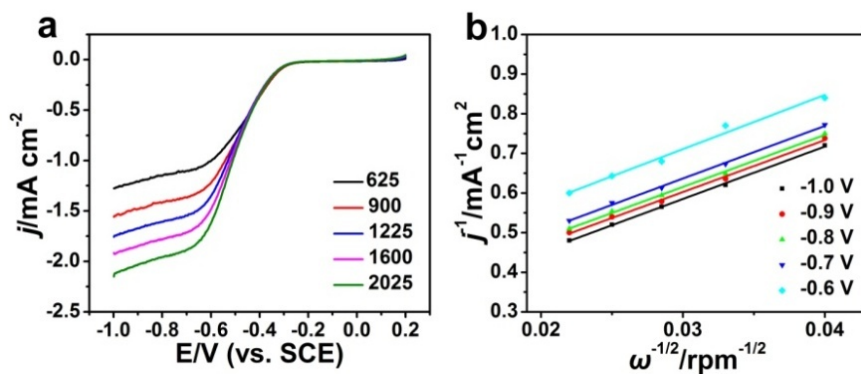


Fig. S5 LSV curves of AC in O₂-saturated 0.1 M KOH solution at various rotation speeds with 10 mV·s⁻¹. (b) Koutecky-Levich plots of AC at different electrode potentials.

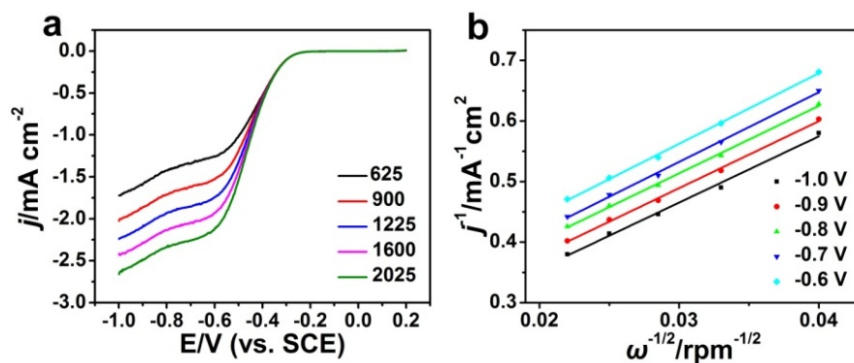


Fig. S6 LSV curves of PAC in O₂-saturated 0.1 M KOH solution at various rotation speeds with 10 mV·s⁻¹. (b) Koutecky-Levich plots of PAC at different electrode potentials.

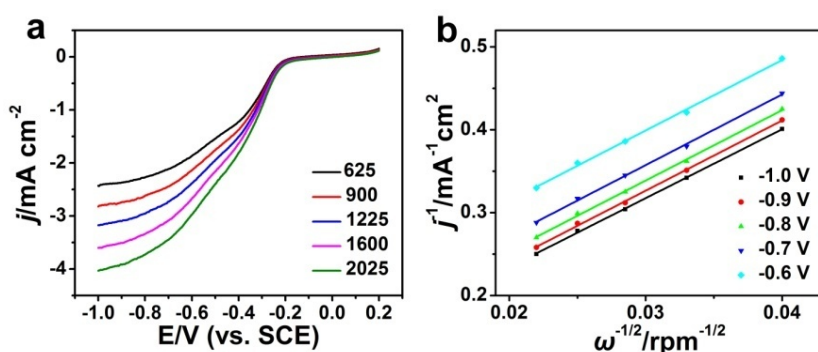


Fig. S7 LSV curves of PAC-1 in O₂-saturated 0.1 M KOH solution at various rotation speeds with 10 mV·s⁻¹. (b) Koutecky-Levich plots of PAC-1 at different electrode potentials.

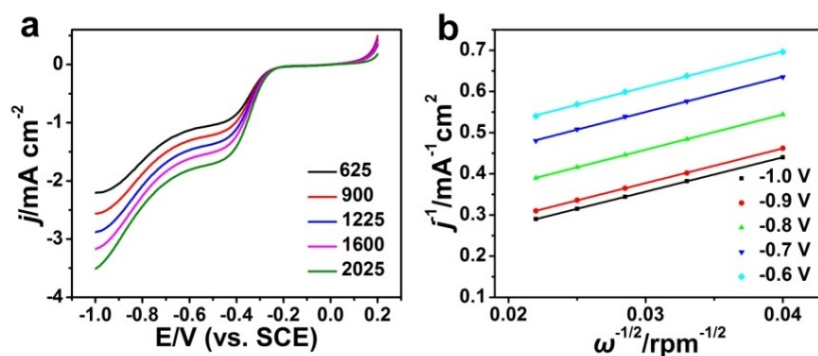


Fig. S8 LSV curves of PAC-2 in O₂-saturated 0.1 M KOH solution at various rotation speeds with 10 mV·s⁻¹. (b) Koutecky-Levich plots of PAC-2 at different electrode potentials.

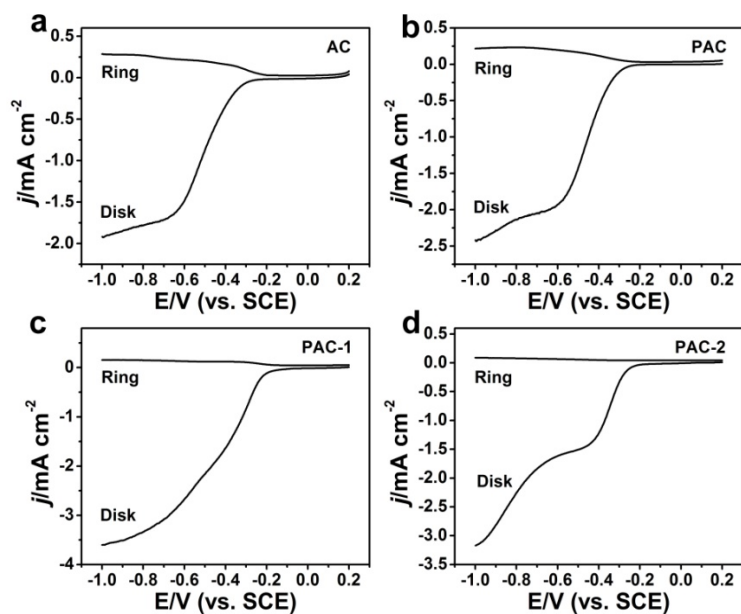


Fig. S9 RRDE curves of (a) AC, (b) PAC, (c) PAC-1 and (d) PAC-2 in O₂-saturated 0.1 M KOH solutions at 10 mV·s⁻¹ and 1600 rpm rotation speed.

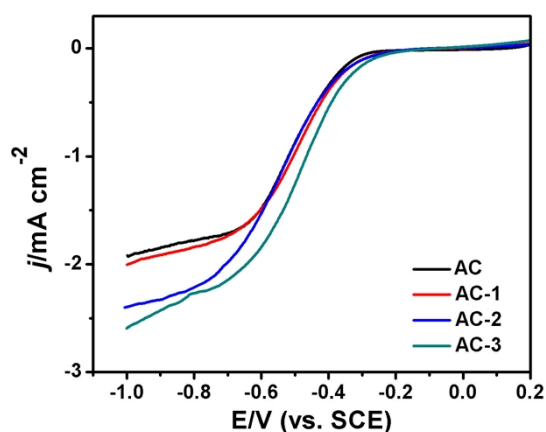


Fig. S10 LSV curves of different AC samples treated with acid (AC-1), base (AC-2), acid and base (AC-3) in O₂-saturated 0.1 M KOH solutions with 10 mV s⁻¹ and 1600 rpm rotation speed.

Table S1. The specific surface area and average pore size of different AC samples treated with acid (AC-1), base (AC-2), acid and base (AC-3).

	AC-1	AC-2	AC-3
Specific surface area (m ² g ⁻¹)	662.3	712.9	856.5
Average pore size (nm)	4.5	4.4	4.2

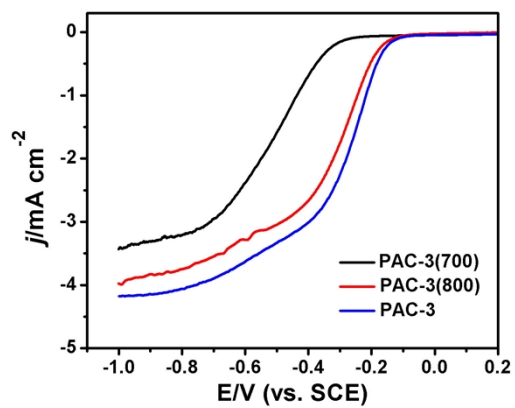


Fig. S11 LSV curves of the PAC-3, PAC-3(700) and PAC-3(800) samples in O_2 -saturated 0.1 M KOH solutions with 10 mV s^{-1} and 1600 rpm rotation speed.