catalysts

MDPI

Supplementary Materials

"Pharaoh's snakes" reaction-derived carbon with favorable structure and composition as metal-free oxygen reduction reaction electrocatalyst

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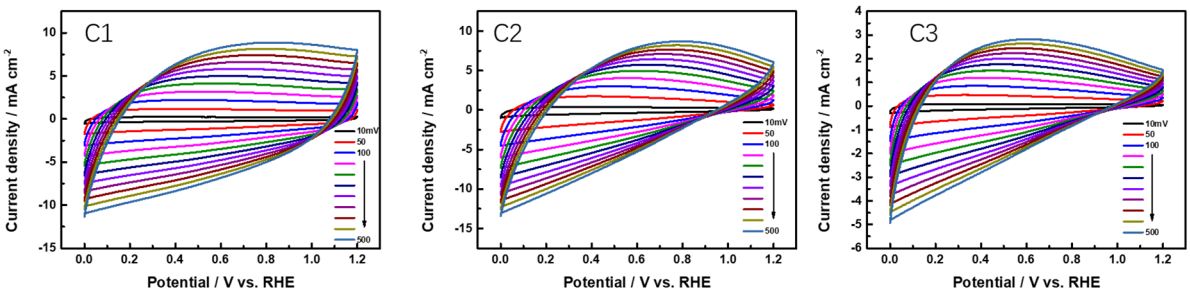

Figure S1. CV curves of C_1, C_2 and C_3.

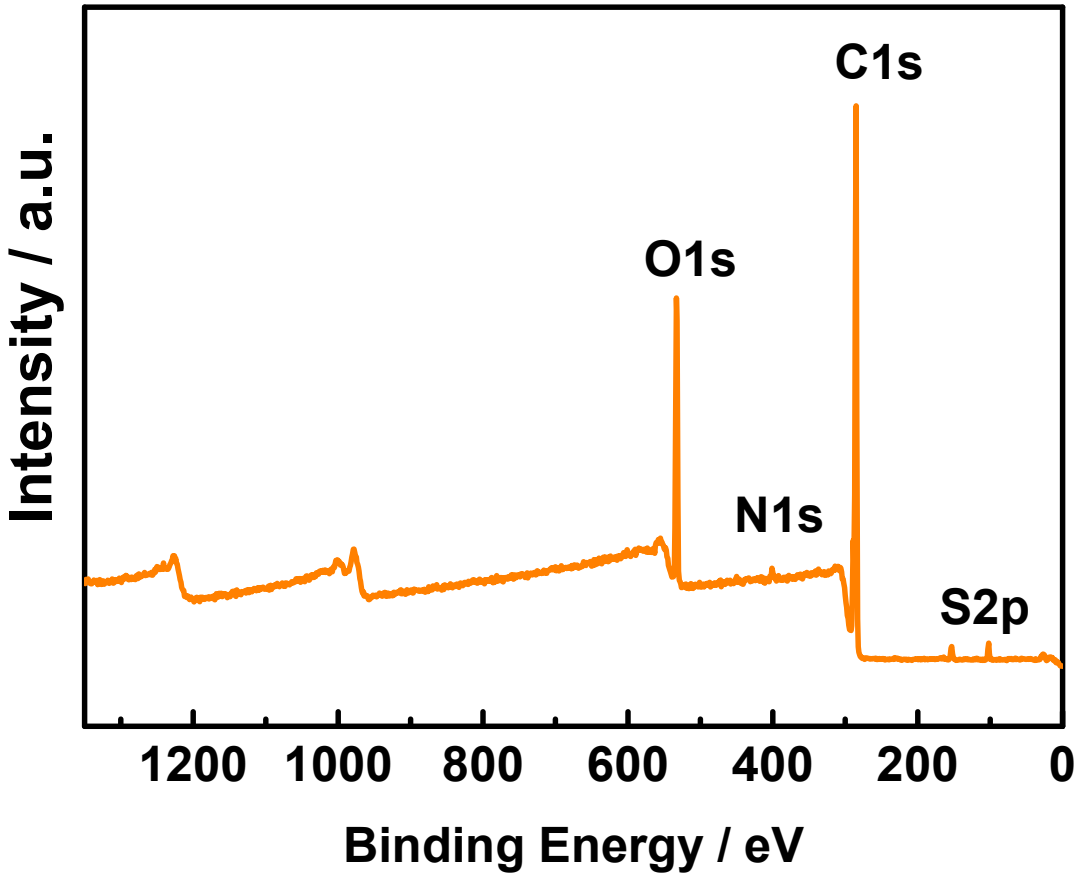

Figure S2. XPS spectra of C_1.

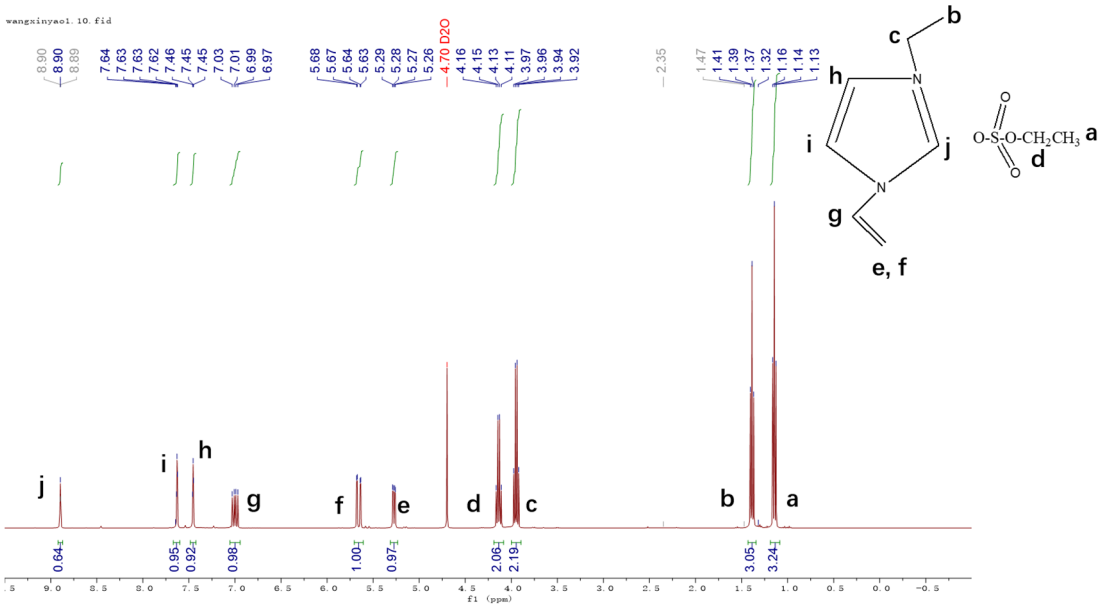

Figure S3. ^{1}H NMR with D_2O as the solvent.

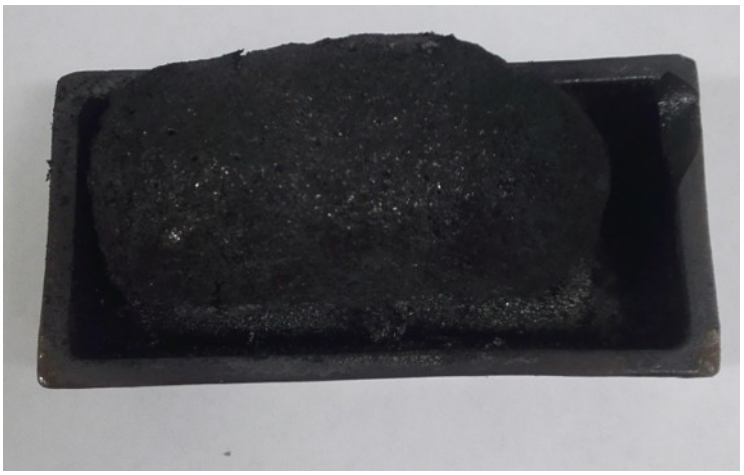

Figure S4. Picture of the prepared carbon from sugar powder, NH_4HCO_3, melamine and ionic liquid of [Etvim]$EtSO_4$.

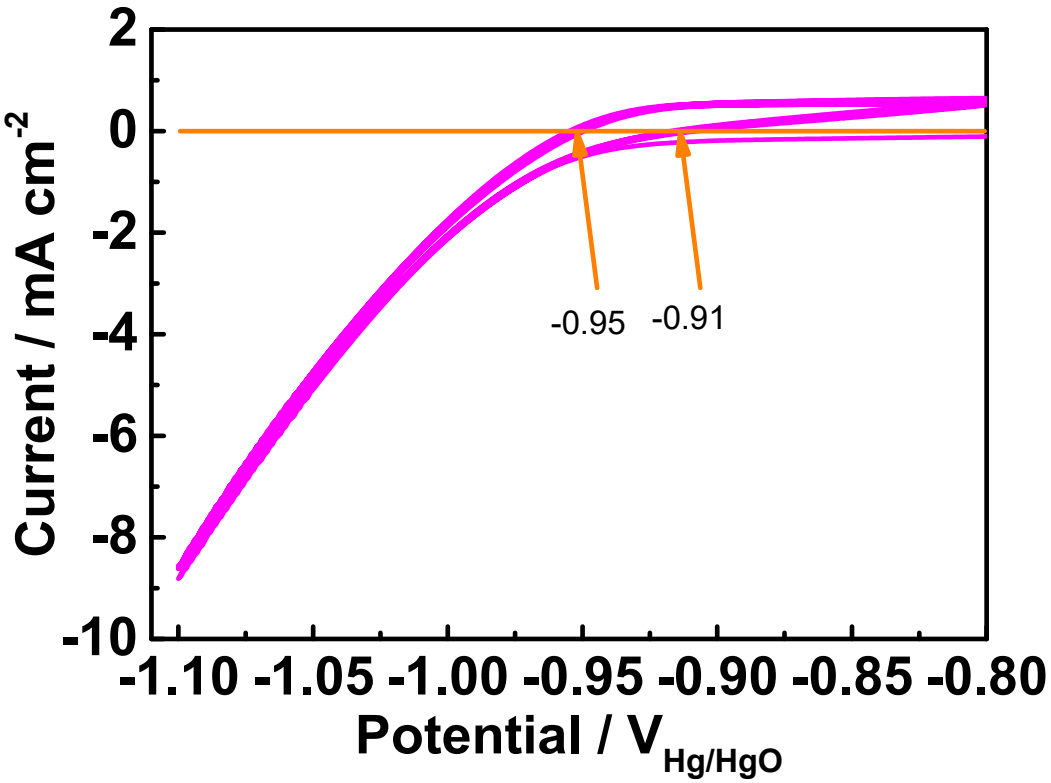

Figure S5. CV curves for the calibration of Hg/HgO reference electrode.

The potential of Hg/HgO can be determined based on the pH using calculations. Alternatively, it can be measured using a method described elsewhere, with some modifications or adjustments as needed [1]. The calibration of Hg/HgO reference electrode is performed in a standard three-electrode system with polished Pt wires as the working and counter electrodes. Electrolytes are pre-purged and saturated with high purity H_2. Cyclic voltammetry (CV) is then run at a scan rate of 0.1 mV s^{-1}. And the average potential at which the current crossed zero is taken to be the thermodynamic potential (*vs.* Hg/HgO) for the hydrogen electrode reactions. For example, in 0.1 M KOH, the zero current point is at -0.95 and- 0.91 V as shown in Figure R3, so $E_{RHE} = E_{Hg/HgO} + 0.93$ V. The converting method is added into the revised manuscript.

Reference:

[1] Y. G. Li, W. Zhou, H. L. Wang, L. M. Xie, Y. Y. Liang, F. Wei, J. C. Idrobo, S. J. Pennycook, H. J. Dai, An oxygen reduction electrocatalyst based on carbon nanotube-graphene complexes, *Nat. Nanotechnol.* 2012, 7, 394-400.