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Supporting Information

Hemin-mediated Construction of Iridium Oxide with Superior Stability for the Oxygen Evolution Reaction

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Figure S1. (A) Cyclic voltammograms (CVs) of glassy carbon (GC) electrodes and the electropolymerised hemin GC prepared with different potential scanning range. The test solution was oxygen-saturated 0.1 M NaOH. (B) CVs of GC and electropolymerised hemin GC prepared in 5, 50, and 500 μ M hemin-containing 0.1 M NaOH.



Figure S2. (A) CVs of the electropolymerised hemin GC electrodes at scan rate of 0.1, 0.2, 0.3, 0.4, 0.5, and 0.55 V s⁻¹. The arrows indicate the redox peaks characteristic of Fe^{III}/Fe^{II} in hemin molecules. (B) Anodic and cathodic peak currents as well as peak potential separation (ΔE) as a function of sweep rate (υ).



Figure S3. SEM surface images of GC (A), and the electropolymerised hemin GC prepared with 3 (B), 10 (C), and 20 (D) electropolymerisation cycle. Electropolymerisation was conducted in 50 μ M hemin / 0.1 M NaOH with potential scanning range in 0–1.5 V.



Figure S4. Confocal images of the bare GC before (A) and after the electropolymerisation process in 0.1 M NaOH (absence of hemin) (B). Scale bar denotes 20 μ m. Staining dye: Alexa Fluor 488.



Figure S5. Representative chronopotentiometric curve of the electropolymerised hemin electrode held at 10 mA cm⁻² in 1 M NaOH. Rotation speed of the GC disk: 1600 rpm. Electropolymerisation was conducted by performing cyclic voltammetry (0–1.5 V) in 0.1 M NaOH containing 50 μ M monomeric hemin for 10 cycles on the GC electrode.



Figure S6. (A) CVs of the IrO_x catalysts obtained on the electropolymerised hemin GC in 0.1 M NaOH containing 0, 0.5, 5, 50, and 500 μ M hemin. (B-D) Chronopotentiometric curves, stability time, and overpotential (t = 0) characteristic of the IrO_x electrodes shown in (A). The rotation speed of GC disk was 1600 rpm. Electroflocculation time: 10 min.



Figure S7. CVs of the IrO_x catalysts obtained on electropolymerised hemin GC with 3, 5, 10, 20, and 30 electropolymerisation cycles. The rotation speed of GC disk was 1600 rpm. The electroflocculation time was 5 min.



Figure S8. (A) CVs of the IrO_x catalysts measured in a non-faradaic region for double-layer capacitance measurement. The scan rate was 5 (black), 10 (red), 25 (blue), 50 (olive), 100 (magenta), 200 (orange), 400 (navy), and 800 (wine) mV s⁻¹. (B) The anodic (red open square) and cathodic (blue open circle) charging currents recorded at -0.65 V vs SCE plotted as a function of the scan rate. The slope printed was from the linear fits to the data and was taken as the double-layer capacitance of the system.



Figure S9. Representative 30 s current steps from 0.1 to 20 mA cm⁻² in 1 M NaOH (A) and 1 M H_2SO_4 (C). The measured overpotentials at each electrolysis current density are shown as red open circles in (B) and (D), and compared with the CVs at scan rate of 20 mV s⁻¹. The rotation speed of GC disk was 1600 rpm.



Figure S10. CVs of GC electrode (black), and after the electropolymerization process in the absence (blue), and presence of 50 μ M hemin (red), 50 μ M protoporphyrin IX (green) in air-saturated 0.1 M NaOH. The scan rate for all CVs was 100 mV s⁻¹.