Electronic Supplementary Material (ESI) for Journal of Materials Chemistry A.

Direct electrochemical formation of nanostructured amorphous $Co(OH)_2$ on gold electrodes with enhanced activity for the oxygen evolution reaction

Md Abu Sayeed, Tenille Herd and Anthony P. O'Mullane

Electronic Supplementary Information

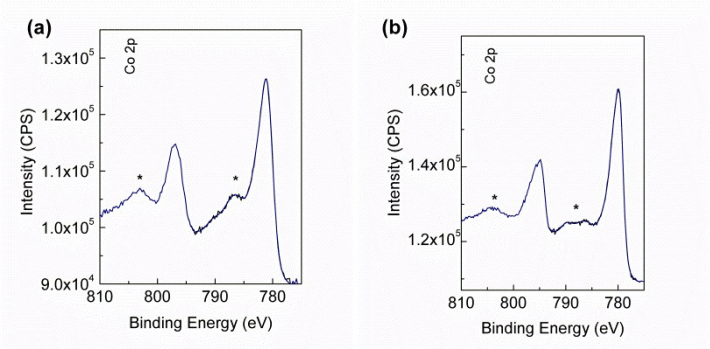

Figure S1: XPS spectra of Co 2p for (a) as deposited $Co(OH)_2$ on Au and (b) after 5 cycles into the OER region.

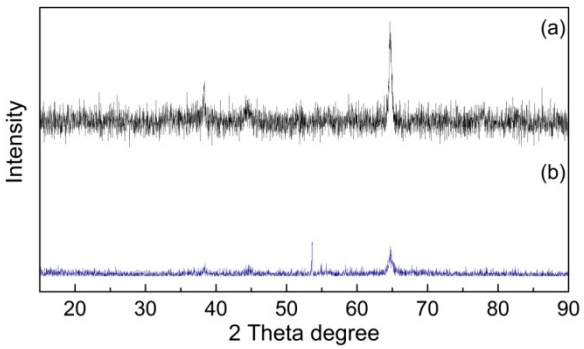

Figure S2: GIXRD patterns of amorphous $Co(OH)_2$; (a) after deposition and (b) after OER on Au substrate.

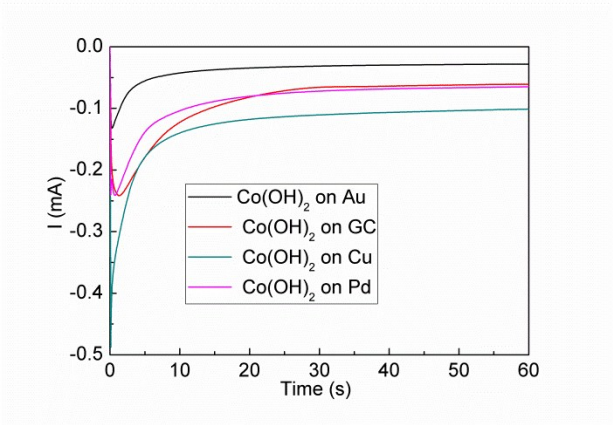

Figure S3: Current-time transients for the electrodeposition of $Co(OH)_2$ on Au, GC, Pd and Cu electrodes at a potential of -0.95 V in a solution of 10 mM $Co(NO_3)_2 \bullet 6H_2O$.

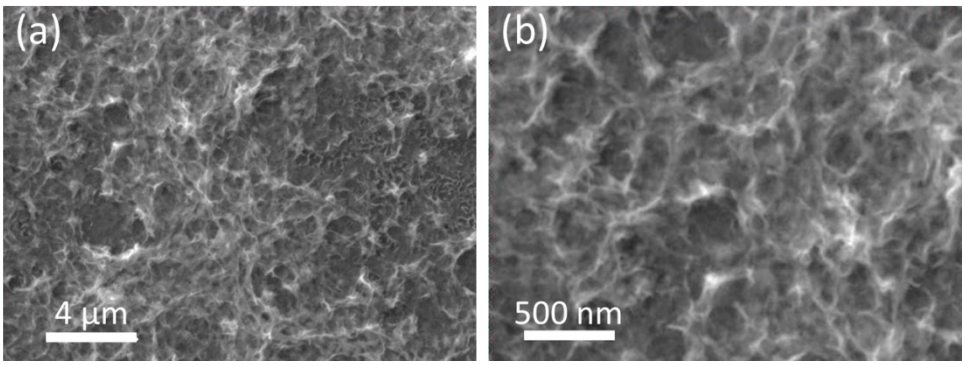

Figure S4: SEM images of $Co(OH)_2$ electrodeposited film on GC electrode for 60 sec at -0.95 V.

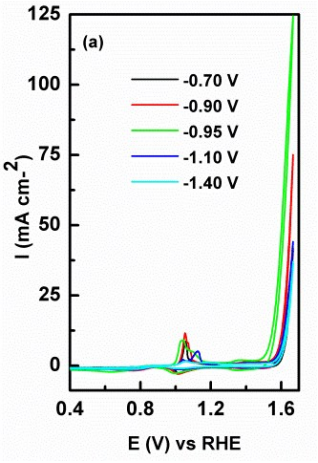

Figure S5: OER performance for Au/$Co(OH)_2$ electrodeposited from 10 mM $Co(NO_3)_2.6H_2O$ at different potentials. Cyclic voltammograms were recorded at 50 mV s^{-1} in 1 M NaOH (5^{th} cycle is shown).

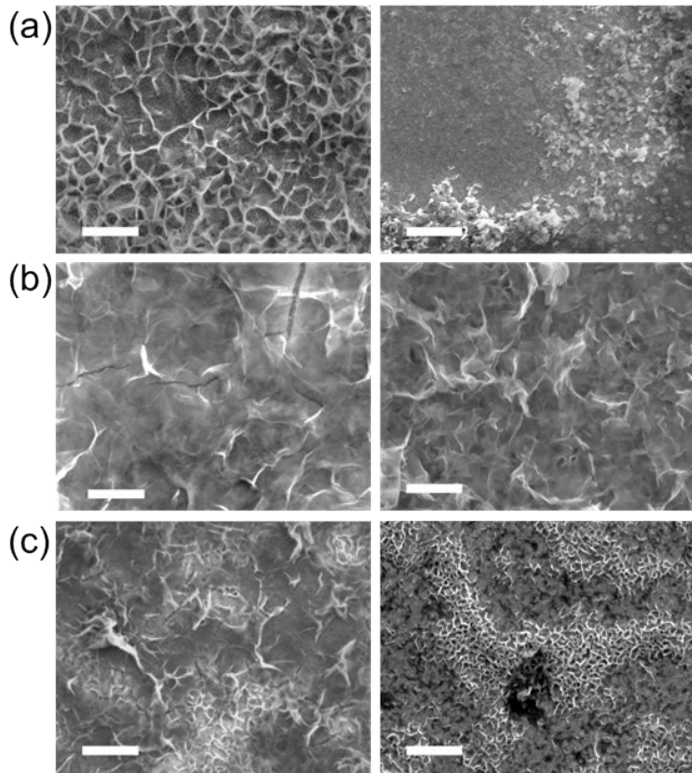

Figure S6: SEM images of a $Co(OH)_2$ electrodeposited film on Au substrate for 60 sec as a function of potential where the applied potential was (a) -0.75 V, (b) -0.95 V and (c) -1.40 V; $Co(OH)_2$: as-deposited (left panel), after OER (right panel). Scale bar is 1 µm in each case.

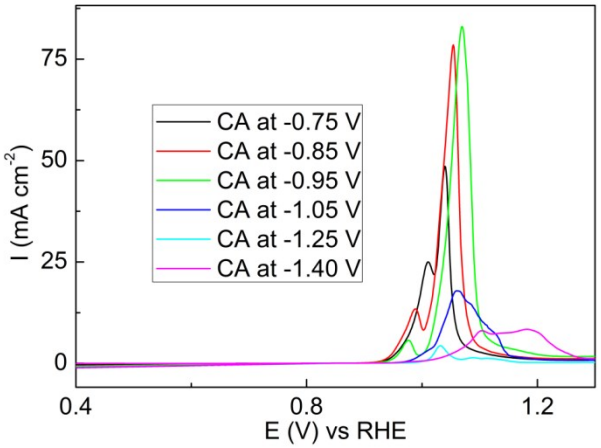

Figure S7: Linear sweep voltammograms for electrodeposited $Co(OH)_2$ on Au electrode formed at different potentials for 60 sec in 1 M NaOH at a scan rate of 50 mV s^{-1}.

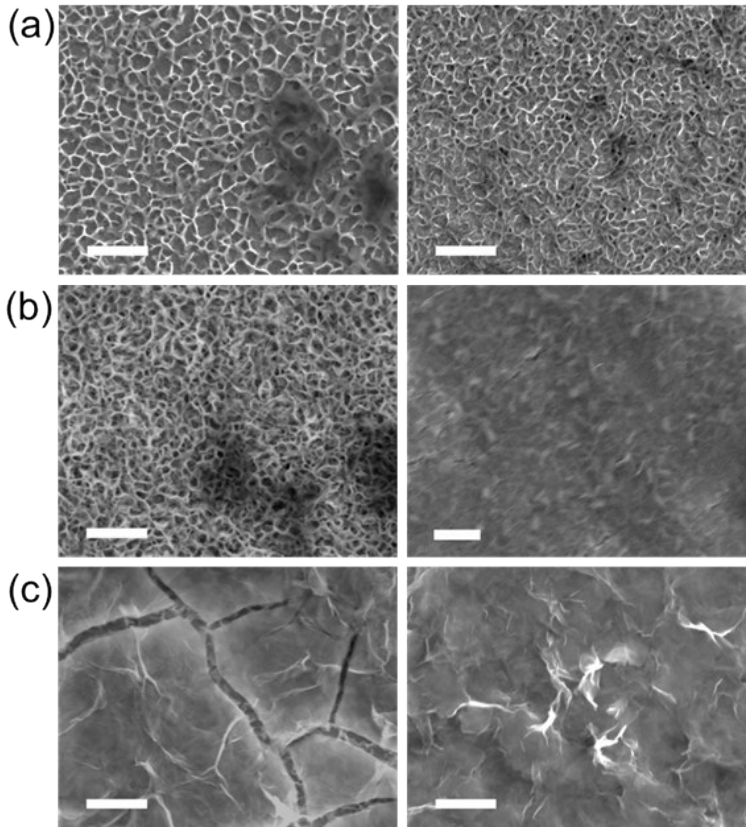

Figure S8: SEM images of a $Co(OH)_2$ electrodeposited film on Au substrate at -0.95 V as a function of deposition time; (a) 10 sec, (b) 30 sec and (c) 90 sec; $Co(OH)_2$: as-deposited (left panel) and after OER (right panel). Scale bar is 1 µm in each case.

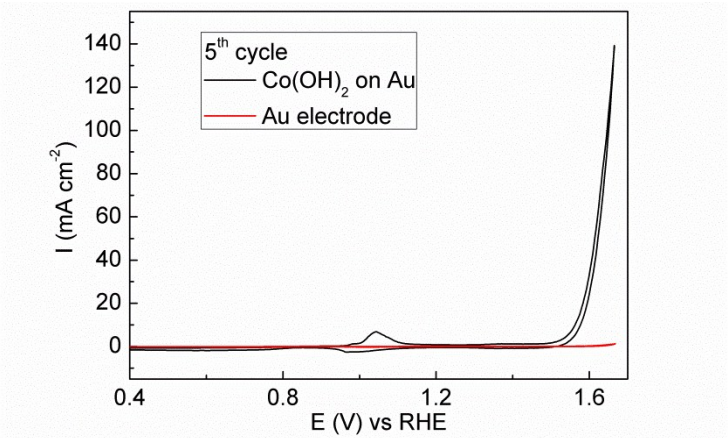

Figure S9: OER performance for Au/$Co(OH)_2$ and Au electrode. Cyclic voltammograms were recorded at 50 mV s^{-1} in 1 M NaOH (5^{th} cycle is shown).

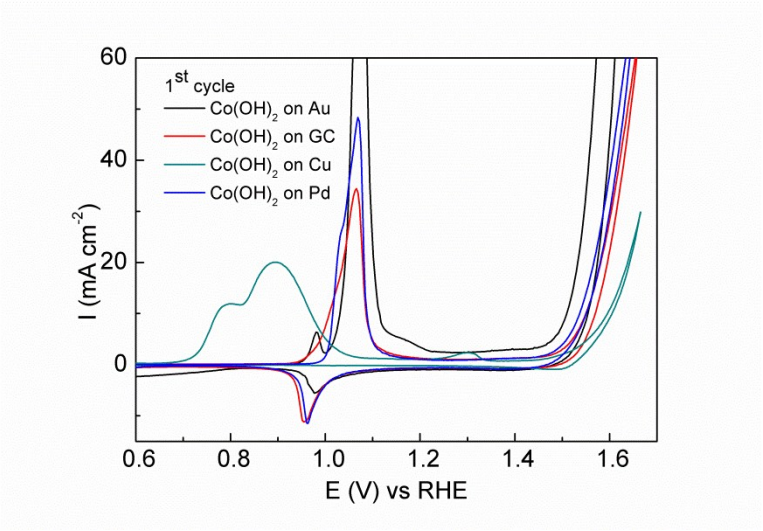

Figure S10: Cyclic voltammograms recorded at $Co(OH)_2$ electrodeposited on Au, GC, Pd and Cu electrodes in 1 M NaOH recorded at 50 mV s^{-1} showing a zoomed in section of the data shown in Figure 5a of the main manuscript.

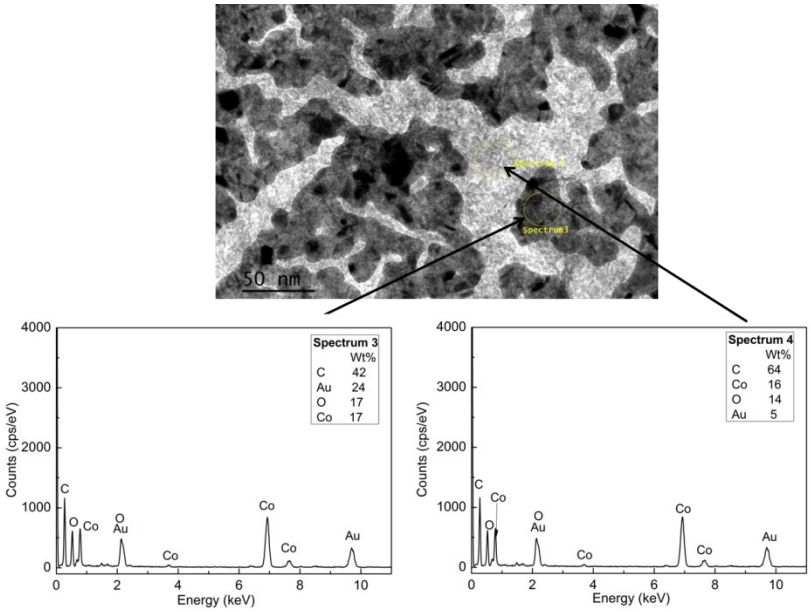

Figure S11: EDS spectra of different sites of $Co(OH)_2$ electrodeposited onto a Au TEM grid post OER.