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

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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:** GIAXRD 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$_3$)$_2$•6H$_2$O.

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$_2$O 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.