Low temperature hydrothermal synthesize delafossite $CuCoO_2$ as an efficient electrocatalyst for the oxygen evolution reaction in alkaline solution

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Supplementary Figures:

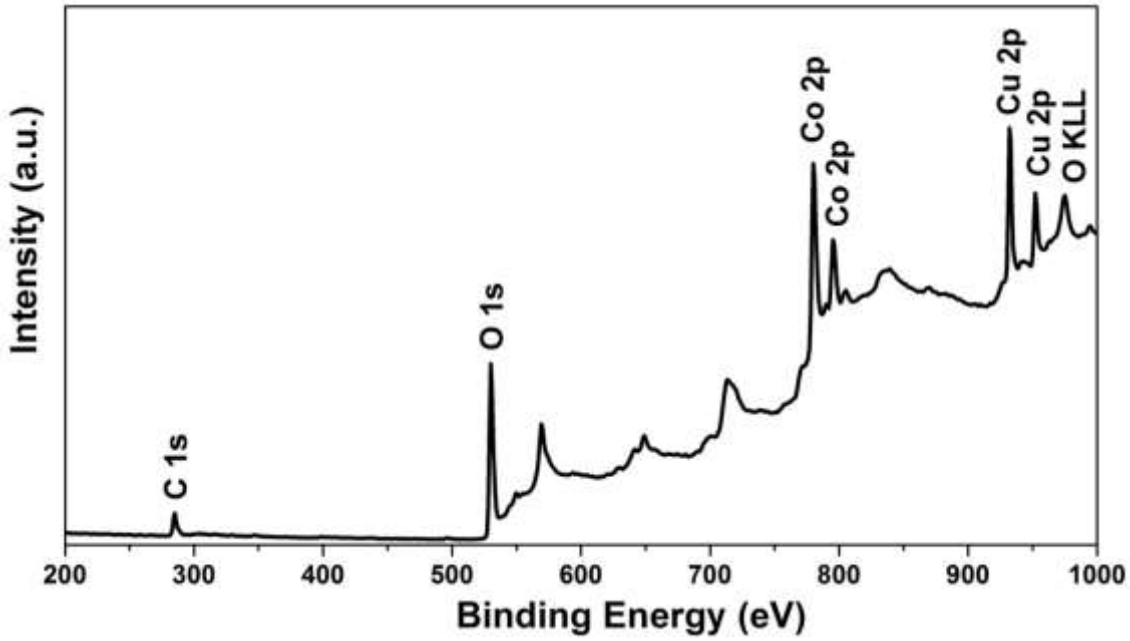

Fig. S1 XPS survey spectrum of the freshly prepared $CuCoO_2$.

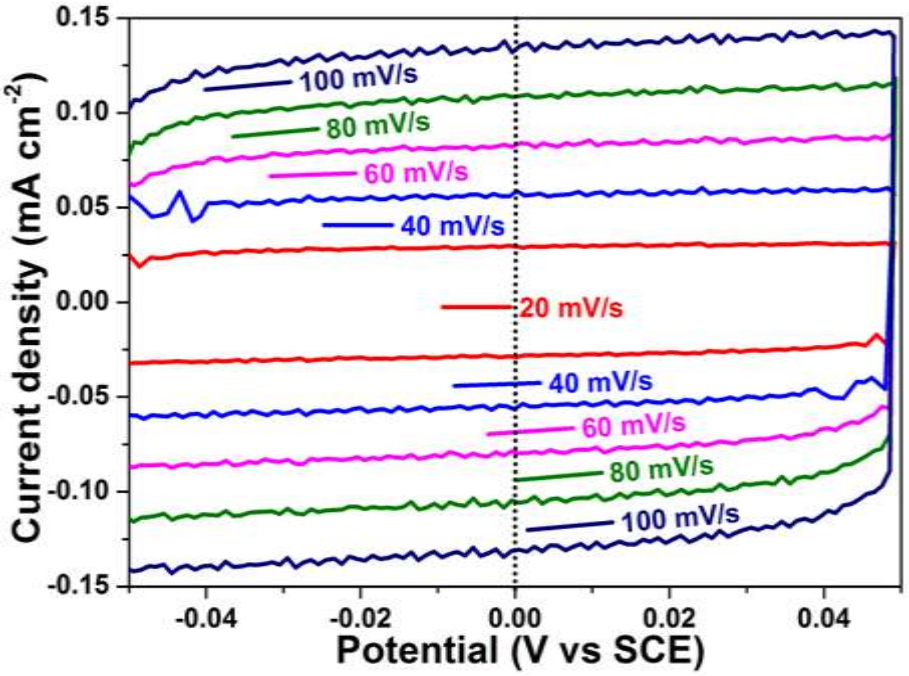

Fig. S2 CV curves of GC@ $CuCoO_2$-0.1 mg electrode measured in 1 M KOH in the non-Faradaic region with different scan rates from 20 to 100 mV s^{-1}.

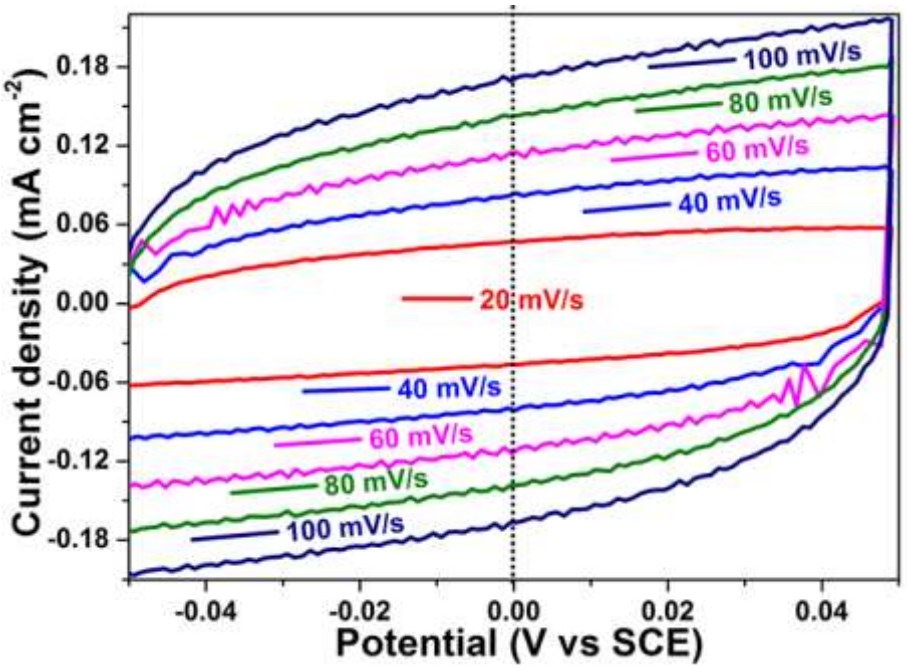

Fig. S3 CV curves of GC@ $CuCoO_2$-0.2 mg electrode measured in 1 M KOH in the non-Faradaic region with different scan rates from 20 to 100 mV s^{-1}.

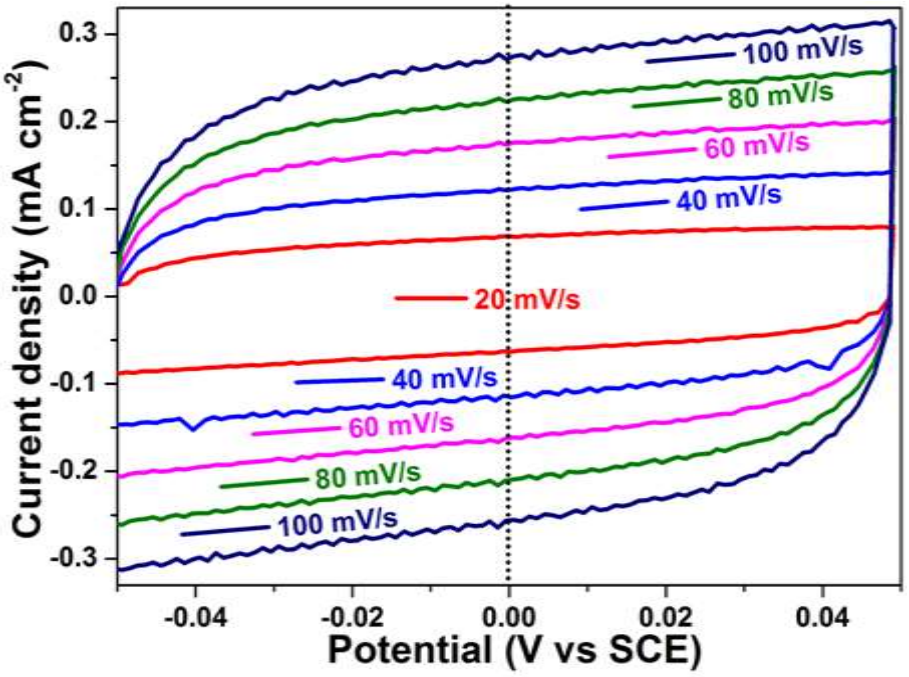

Fig. S4 CV curves of GC@ $CuCoO_2$-0.3 mg electrode measured in 1 M KOH in the non-Faradaic region with different scan rates from 20 to 100 mV s^{-1}.

Supplementary Tables:

Table S1. The OER activity of GC@$CuCoO_2$ electrodes in comparison to that of other delafossite oxides based OER catalysts as well as perovskite oxide catalysts recently reported in the literatures.

Catalysts	Electrolyte	Loading mass (mg cm^{-2})	Tafel slope (mV dec^{-1})	J_{geo} (current density in mA cm^{-2} @overpotential in mV)	Reference
GC@$CuCoO_2$	1.0 M KOH	0.1	126	1@η=410 10@η=500	This work
		0.3	93	1@η=390 10@η=440	
5%-La-excess $LaNiO_3$	0.1 M KOH	-	~70	0.042@η=400	Nano Lett. 2017, 17, 3126-3132.
5%-Ni-excess $LaNiO_3$			~70	0.121@η=400	
$LaCoO_3$-bulk	0.1 M KOH	0.25	102	10@η=620	Nat. Commun., 2016, 7, 11510.
$LaCoO_3$- 60 nm			78	10@η=550	
$LaCoO_3$- 80 nm			69	10@η=490	
$LaCoO_3$- 200 nm			89	10@η=540	
$Ba_{0.5}Sr_{0.5}Co_{0.8}Fe_{0.2}O_{3-\delta}$	0.1 M KOH	-	~60	1@η=330 10@η=370	Science, 2011, 334, 1383-1385.
$CuRhO_2$	1.0 M	20 μmol/c	-	10@η=420	J. Phys. Chem. C 2015, 119,
$CuCrO_2$			-	5@η=710	

$CuCoO_2$	KOH	m^2	-	10@η=430	6495-6501.
$CuFeO_2$			-	5@η=670	
$CuGaO_2$- 40 nm	0.5 M KOH	-	-	18@η=370	J Alloys Compd., 2016, 688, 1157-1161.
$CuRhO_2$	1.0 M KOH	20 μmol/c m^2	-	0.1@η=280	Electrochem. Commun., 2013, 35, 142-145.
$CuFeO_2$			-	0.1@η=310	
$CuAlO_2$			-	0.1@η=370	
Nanocrystalline $CuGaO_2$ hexagons	0.5 M KOH	-	-	26@η=0.60 V vs Ag/AgCl	J. Solid State Chem., 2016, 242, 77-85.
$CuGaO_2$ sub-micron sized plates			-	23@η=0.60 V vs Ag/AgCl	
$CuGaO_2$ micron-sized particles			-	5@η=0.60 V vs Ag/AgCl	
$LaFeO_3$	0.1 M KOH	0.464	77	10@η=510	Chem. Mater. 2016, 28, 1691-1697.
$La_{0.95}FeO_{3-\delta}$			48	1@η=320 10@η=410	
$SrCoO_3$	0.1 M KOH	-	145	0.7@η=350	Mater. Horiz., 2015, 2, 495-501.
$SrSc_{0.025}Nb_{0.025}Co_{0.95}O_{3-\delta}$			~70	10@η=350	
$LaCoO_3$	1.0 M KOH	0.25	-	0.03@η=320	Nat. Chem., 2017, 9, 457-465.
$SrCoO_{3-\delta}$			-	3@η=320	
$La_{0.5}Sr_{0.5}CoO_{3-\delta}$			-	0.3@η=320	
$Pr_{0.5}Ba_{0.5}CoO_{3-\delta}$				0.3@η=320	

Table S2. Fitting parameters for the Nyquist plots of GC@$CuCoO_2$ electrodes.

Samples	R_s(Ω)	R_{sc}(Ω)	C_{sc} (F cm^{-2} S^{m-1})	R_{ct} (Ω)	C_h (F cm^{-2} S^{m-1})
GC@ $CuCoO_2$-0.1 mg	0.462	9.377	0.036	87.86	0.009
GC@ $CuCoO_2$-0.2 mg	0.548	0.287	0.104	85.22	0.002
GC@ $CuCoO_2$-0.3 mg	0.447	0.388	0.022	65.35	0.002