

Amorphous film of cerium doped cobalt oxide as a highly efficient electrocatalyst for oxygen evolution reaction

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Electronic Supplementary Information (ESI)

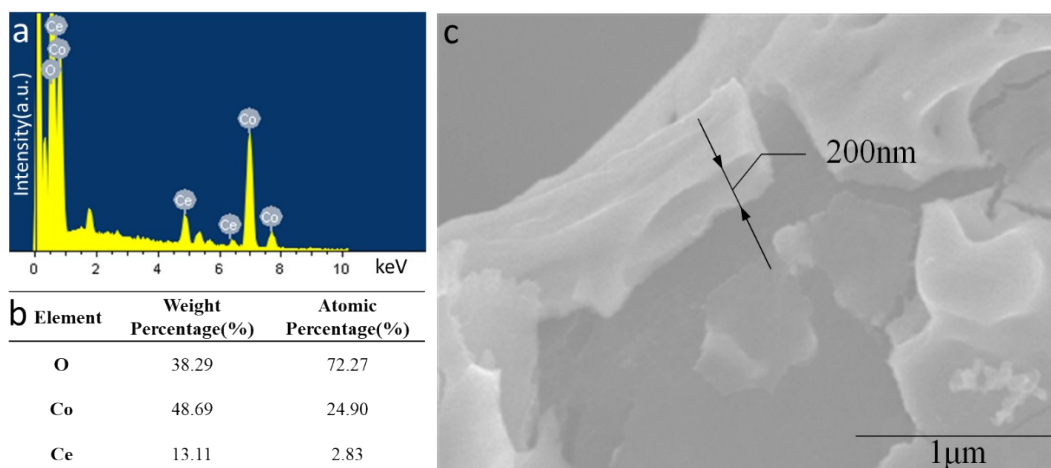


Figure S1. (a) EDS spectrum, (b) element content, and (b) SEM image of CoO_x(Ce).

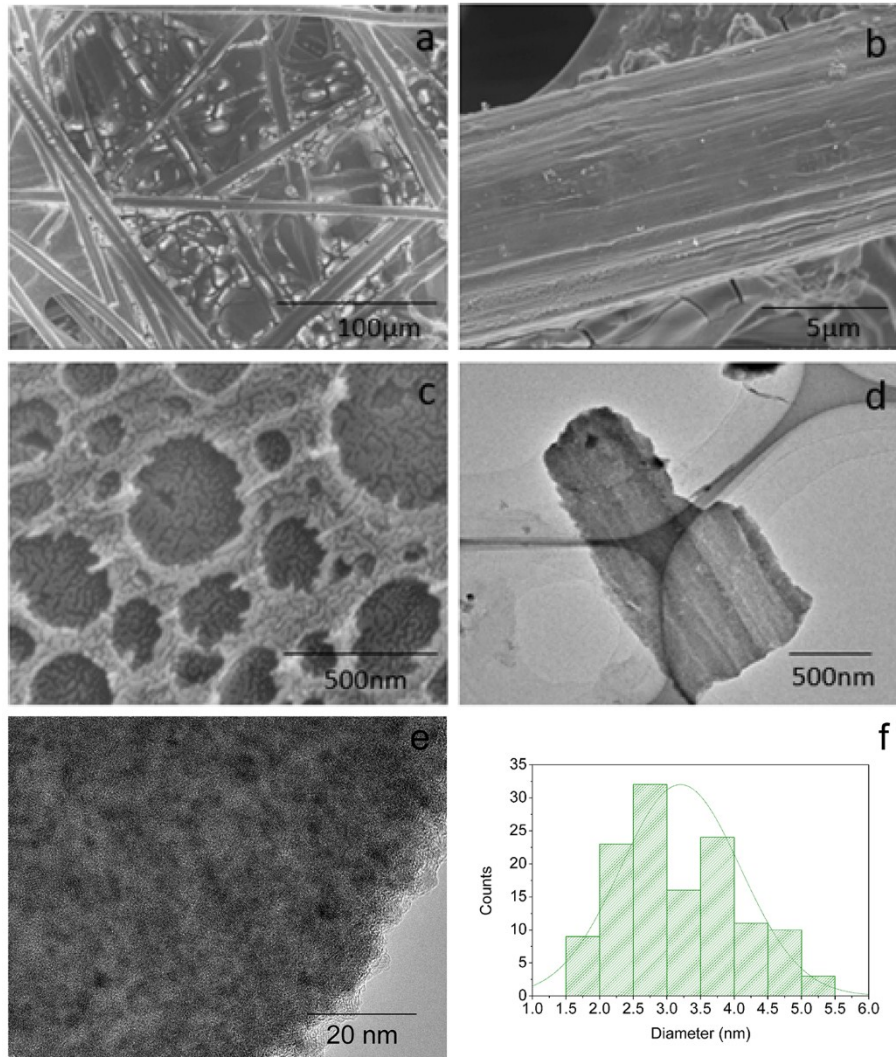


Figure S2. (a, b, c) SEM images and (d,e) TEM image of CoO_x . (f) Size distribution histogram of CoO_x grains derived TEM images.

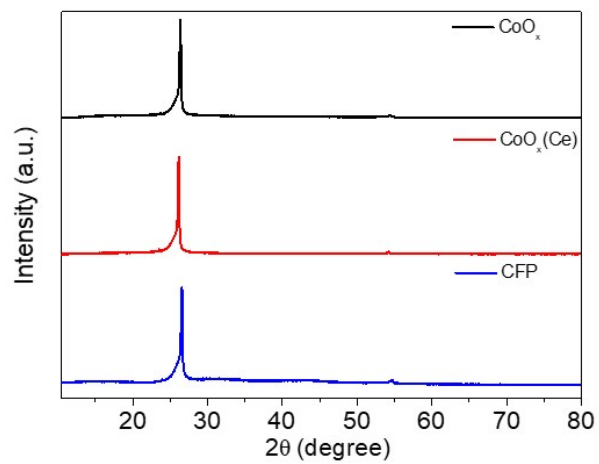
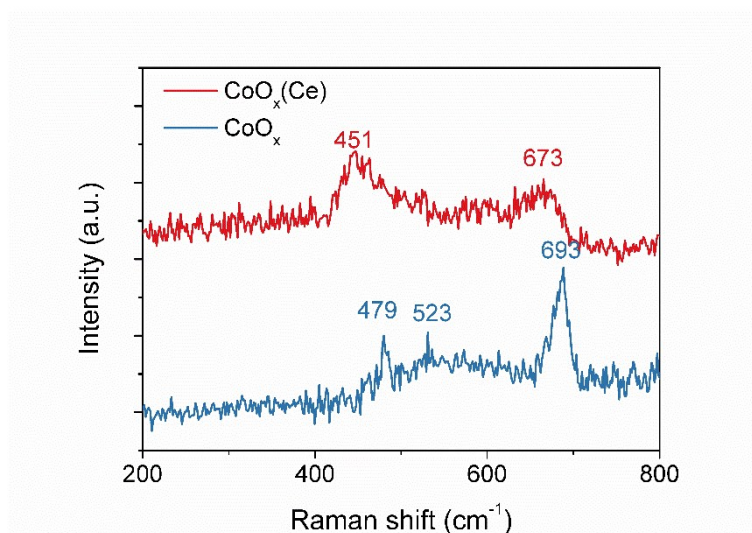


Figure S3. XRD pattern of CoO_x(Ce), CoO_x, and bare CFP.



FigureS4. Raman spectra of CoO_x(Ce) and CoO_x.

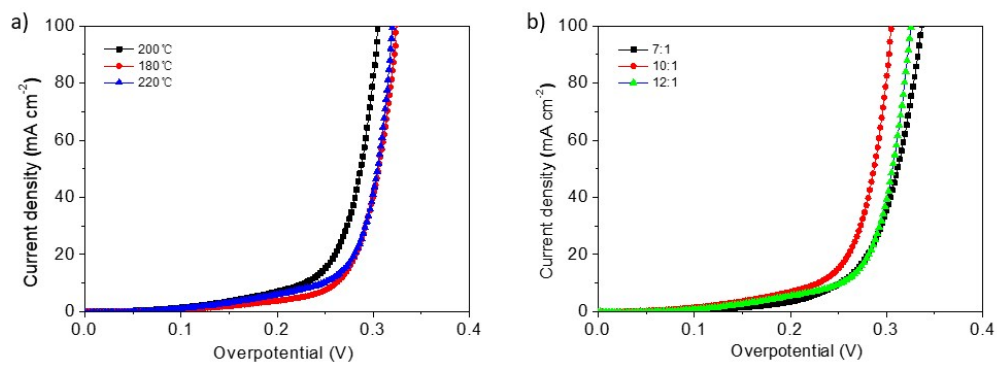


Figure S5. Polarization curves of $\text{CoO}_x(\text{Ce})$ synthesized (a) at different temperatures and (b) with different atomic ratio of Co to Ce.

Table S1. Performance of typical reported OER electrocatalysts in alkaline media.

Electrocatalysts	η_{10} (mV)	η_{20} (mV)	η_{100} (mV)	Tafel slope (mV/dec)	Electrolyte (M KOH)
CoO _x (Ce) (This work)	229	261	302	63.7	1.0
CoO _x PHCS ^[1]		270	300	40	1.0
CeO ₂ /CoSe ₂ ^[2]	288	324		44	0.1
Co ₃ O ₄ ^[3]	270			70	0.1
Co ₃ O ₄ /Co-Fe oxide DSNBs ^[4]	297			61	1.0
Co-B@CoO/Ti ^[5]	190			78	1.0
CoCH/NF ^[6]	332			126	1.0
NiFe-NS ^[7]	304	333		40	1.0
CoS@NF ^[8]	297	330		106	1.0
Co(OH) ₂ -Co ₂ [Fe(CN) ₆] ^[9]	304			38	1.0
Co/Fe ^[10]	330	350		37	1.0
Ni ₂ Fe-LDHs ^[11]	289			39	1.0
CoP@RGO ^[12]	280	320	440	75	1.0
CuO/Co ₃ O ₄ ^[13]	227	290	360		1.0
NiCoO ₂ /CoO/Ni ₃ N ^[14]	247			35	1.0
NiO/CoN PINWs ^[15]	300	325	385	35	1.0

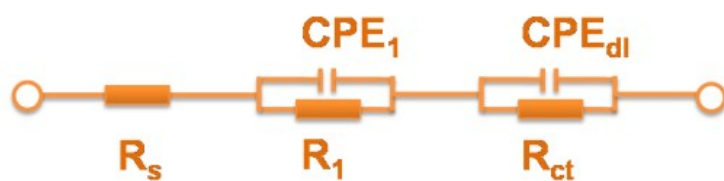


Figure S6. Equivalent circuit used to fit the EIS data. R_0 is series resistance, CPE_1 and R_1 are the constant phase element and the resistance describing electron transport at the substrate/catalyst interface, respectively, CPE_{dl} is the constant phase element of the catalyst/electrolyte interface, and R_{ct} is the charge-transfer resistance at the catalyst/electrolyte interface.

Table S2. Values of equivalent circuit elements resulted from fitting of EIS data.

Sample	R_s (Ω)	Q_1 ($F\text{ cm}^{-2}\text{ S}^{n-1}$)	n_1	R_1 (Ω)	Q_{dl} ($F\text{ cm}^{-2}\text{ S}^{n-1}$)	n_{dl}	R_{ct} (Ω)
CoO _x (Ce)	2.313	4.19E-5	0.0395	3.462	0.7881	0.5783	15.2
CoO _x	2.436	2.57E-5	0.0216	4.279	0.8149	0.6155	70.8

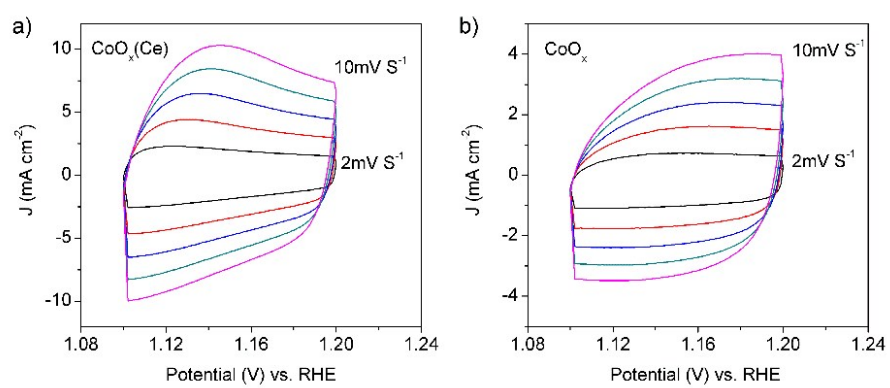


Figure S7. CV of (a) CoO_x(Ce) and (b) CoO_x measured with different scan rates.

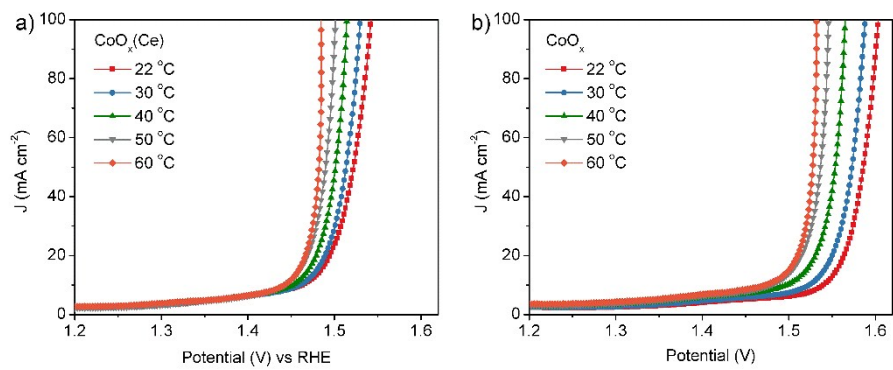


Figure S8. Temperature dependent polarization curves of (a) $\text{CoO}_x(\text{Ce})$ and (b) CoO_x .

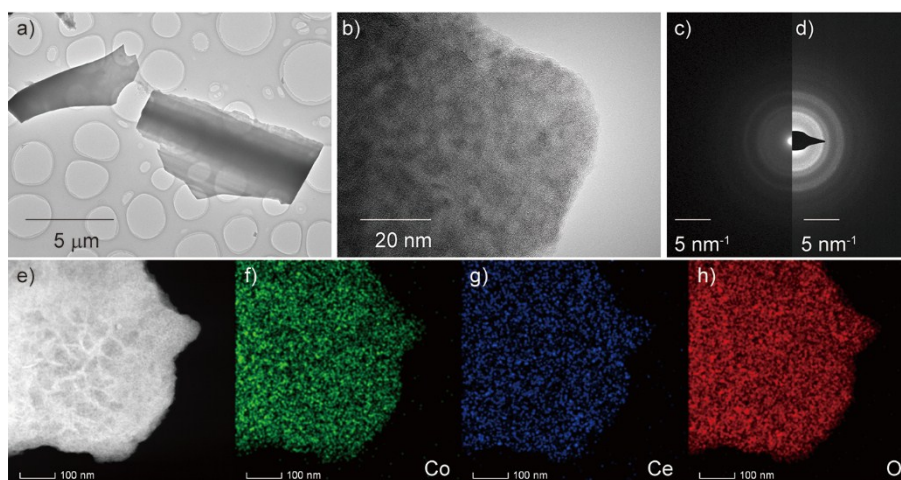


Figure S9. (a,b) TEM image of post-OER CoO_x(Ce). SAED pattern of (c) post-OER CoO_x(Ce) and (d) pristine CoO_x(Ce). (e) STEM image of post-OER CoO_x(Ce). EDS mapping of (f) Co, (g) Ce, and (h) O from post-OER CoO_x(Ce).

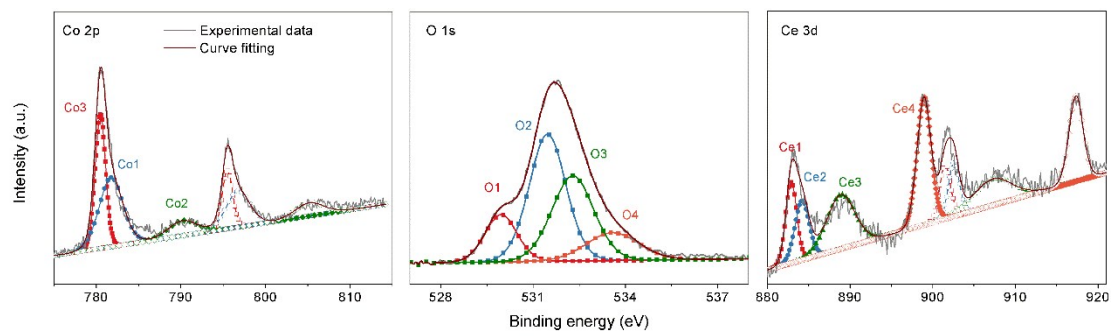


Figure S10. XPS of post-OER $\text{CoO}_x(\text{Ce})$.

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