Supporting information

Water oxidation catalysis: Tuning the electrocatalytic properties of amorphous lanthanum cobaltite through calcium doping

Cuijuan Zhang[*a,b], Xinyue Zhang[b], Katelynn Daly[a], Curtis P. Berlinguette[a,c] and Simon Trudel [*a]

[a] Department of Chemistry and Centre for Advanced Solar Materials, University of Calgary, 2500 University Drive N. W., Calgary, Canada T2N 1N4

[b] School of Chemical Engineering and Technology, Tianjin University, Tianjin, China 300350

[c] Departments of Chemistry and Chemical & Biological Engineering, The University of British Columbia, 2026 Main Mall, Vancouver, BC Canada V6K 1Z6

Corresponding Authors: cjzhang@tju.edu.cn; trudels@ucalgary.ca

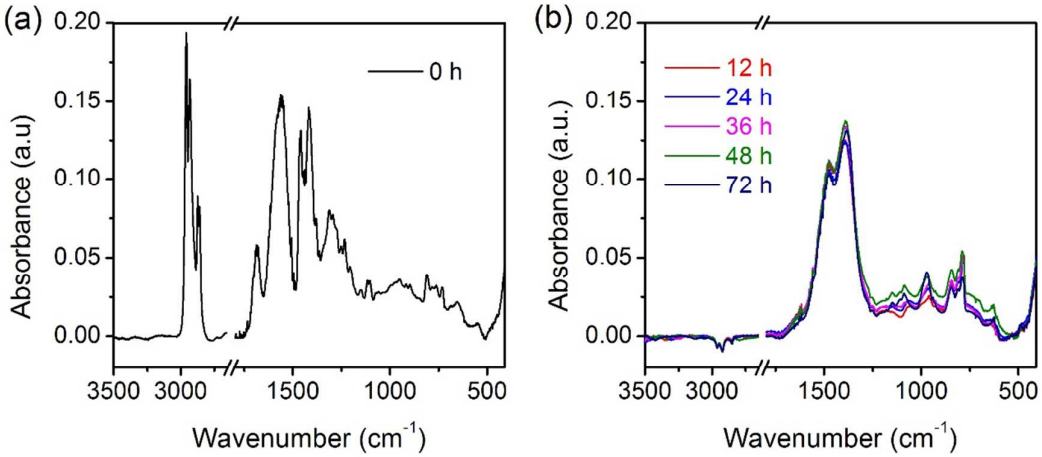

Figure S1. Evolution of FT-IR spectroscopy of *a*-$La_{0.5}Ca_{0.5}CoO_x$ precursor with time under UV irradiation.

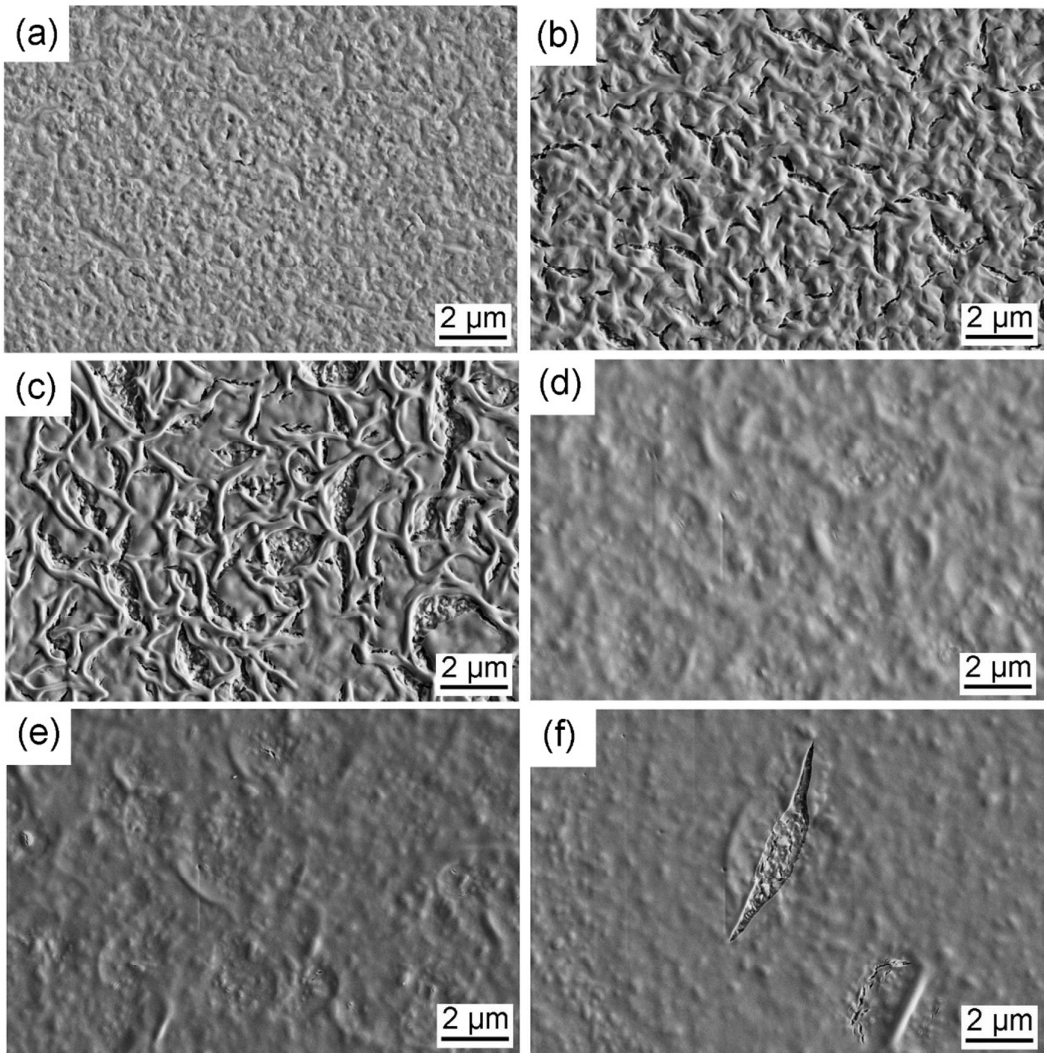

Figure S2. Top-view SEM images of *a*-$La_{1-y}Ca_yCoO_x$ calcined at 100 ^oC for 1 h in air. (a) y = 0; (b) y = 0.1; (c) y = 0.2; (d) y = 0.3; (e) y = 0.4; (f) y = 0.5.

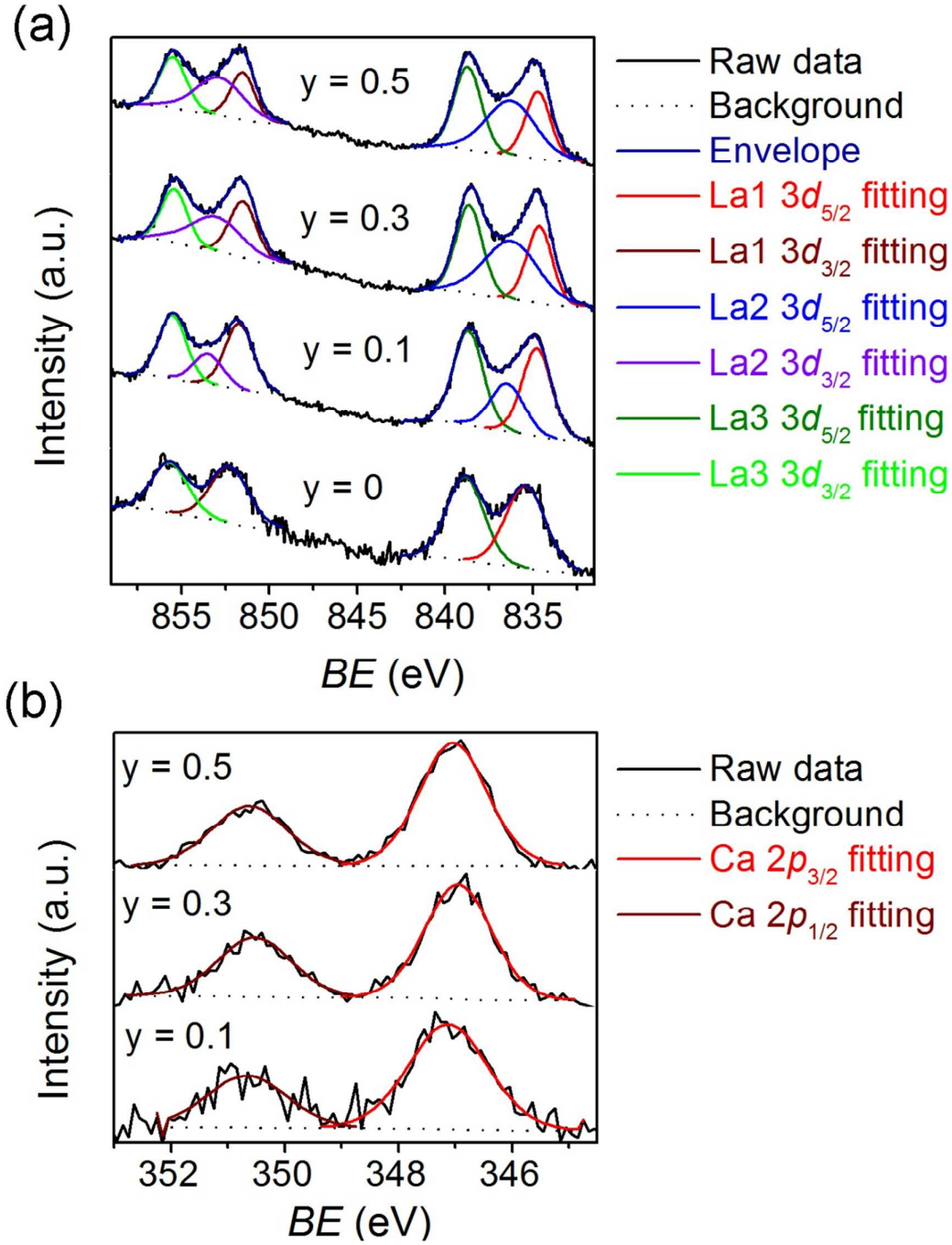

Figure S3. La 3*d* (a) and Ca 2*p* (b) XPS spectra of *a*-$La_{1-y}Ca_yCoO_x$ along with the fitting curves.

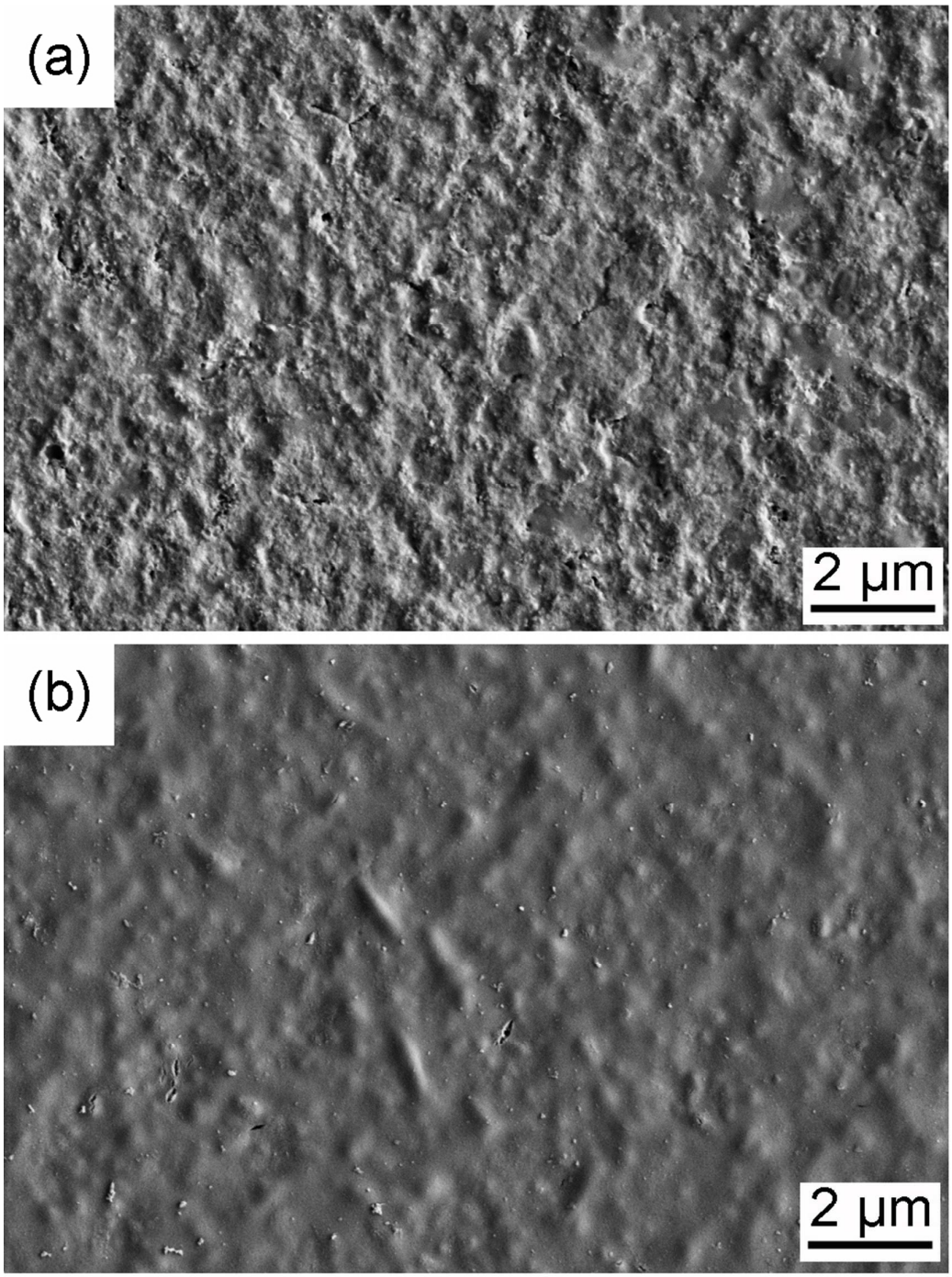

Figure S4. Top-view SEM images of *a*-$LaCoO_x$ (a) and *a*-$La_{0.7}Ca_{0.3}CoO_x$ (b) after chronopotentiometric test at a constant current density of 1 mA cm^{-2} in 0.1 M KOH.

Table S1. XPS fitting results of La 3*d* and Ca 2*p*.

Composition	Element	*BE* (eV)	Atom%	Assignment
y = 0	La 3d	835.2/852.1	52.6	La_2O_3
		838.3/855.5	47.4	La_2O_3
y = 0.1	La 3d	834.6/851.5	38.7	La_2O_3
		836.3/853.3	21.9	$La_2(CO_3)_3$
		838.5/855.3	39.5	La_2O_3
	Ca	346.9/350.5		CaO
y = 0.3	La	834.4/851.3	28.5	La_2O_3
		836.0/852.8	41.0	$La_2(CO_3)_3$
		838.4/855.2	30.5	La_2O_3
	Ca	346.7/350.3		CaO
y = 0.5	La	834.5/851.3	25.7	La_2O_3
		836.1/852.6	41.2	$La_2(CO_3)_3$
		838.5/855.3	33.1	La_2O_3
	Ca	346.8/350.4		CaO

Table S2 OER activity of *a*-$La_{1-y}Ca_yCoO_x$ in this work.

Composition	Tafel slope (mV dec^{-1})	Onset η (V)	η@1 mA cm^{-2} (V)
y = 0	46.9 ± 0.7	0.201 ± 0.001	0.307 ± 0.001
y = 0.1	49.3 ± 0.5	0.223 ± 0.008	0.350 ± 0.013
y = 0.2	50.5 ±0.7	0.208 ± 0.010	0.355 ± 0.008
y = 0.3	48.6 ± 0.5	0.198 ± 0.003	0.335 ± 0.009
y = 0.4	49.7 ±0.5	0.189 ± 0.003	0.342 ± 0.002
y = 0.5	51.4 ± 0.7	0.216 ± 0.001	0.334 ± 0.007