Supplementary Information

Reduced alkaline earth metal (Ca, Sr) substituted $LaCoO_3$ catalysts for the succinic acid conversion.

Mabel Rojas, *[a,b] Gabriel Bernales, [a,c] Ana Belen Dongil, [d] Gina Pecchi [a,c] and Néstor Escalona *[a,b,e,f]

[a.] *Millennium Nuclei on Catalytic Processes towards Sustainable Chemistry (CSC), Chile.*
[b.] *Facultad de Química y de Farmacia, Pontificia Universidad Católica de Chile, Avenida Vicuña Mackenna 4860, Macul, Santiago, 7820436, Chile.*
[c.] *Departamento Físico Química, Facultad de Ciencias Químicas, Universidad de Concepción.*
[d.] *Instituto de Catálisis y Petroleoquímica CSIC, Marie Curie 2 28049 Madrid Spain.*
[e.] *Departamento de Ingeniería Química y Bioprocesos, Escuela de Ingeniería, Pontificia Universidad Católica de Chile, Avenida Vicuña Mackenna 4860, Macul, Santiago, 7820436, Chile.*
[f.] *Universidad de Concepción, Unidad de Desarrollo Tecnológico, UDT.*

*Corresponding authors: Mabel Rojas, mnrojas1@uc.cl, Néstor Escalona, neescalona@ing.puc.cl

Supplementary Information

500°C and passivated (a) $LaCoO_3$, (b) $La_{0.8}Ca_{0.2}CoO_3$, (c) $La_{0.6}Ca_{0.4}CoO_3$, (d) $La_{0.8}Sr_{0.2}CoO_3$ and (e) $La_{0.6}Sr_{0.4}CoO_3$ perovskites.	

Table S1. Prepared solids, labels, Co, Sr and a bulk wt% (nominal in parenthesis) for $La_{1-x}Ca_xCoO_3$ and $La_{1-x}Sr_xCoO_3$ (x=0.0, 0.2, 0.4) perovskites.

Perovskites	**Label**		**%**		
	Oxide	**Reduced**	**Co**	**Sr**	**Ca**
$LaCoO_3$	x=0 calc	x=0 red	15.8 (24.0)	-	-
$La_{0.8}Ca_{0.2}CoO_3$	xCa=0.2-calc	xCa=0.2-red	18.6 (26.0)	-	3.2 (3.5)
$La_{0.6}Ca_{0.4}CoO_3$	xCa=0.4-calc	xCa=0.4-red	21.4 (28.6)	-	6.1 (7.8)
$La_{0.8}Sr_{0.2}CoO_3$	xSr=0.2-calc	xSr=0.2-red	16.6 (25.0)	(7.4)	-
$La_{0.6}Sr_{0.4}CoO_3$	xSr=0.4-calc	xSr=0.4-red	18.5 (26.2)	(15.6)	-

Table S2. Surface atomic (%) for reduced-passivated $La_{1-x}Ca_xCoO_3$ and $La_{1-x}Sr_xCoO_3$ (x=0.0, 0.2, 0.4) perovskites.

Perovskites	**Surface atomic (%)**				
	La	**O**	**C[a]**	**Co**	**Sr or Ca**
$LaCoO_3$	12.4	58.3	24.5	4.4	-
$La_{0.8}Ca_{0.2}CoO_3$	8.9	58.0	22.3	3.9	6.9
$La_{0.6}Ca_{0.4}CoO_3$	6.8	56.6	25.0	3.0	8.6
$La_{0.8}Sr_{0.2}CoO_3$	11.9	57.3	22.6	4.9	3.3
$La_{0.6}Sr_{0.4}CoO_3$	10.9	58.3	23.7	4.8	3.2

[a] C 1S acts as reference

Figure S1. N_2 adsorption isotherms of the calcined at 700°C perovskites: a) $La_{1-x}Ca_xCoO_3$; b) $La_{1-x}Sr_xCoO_3$.

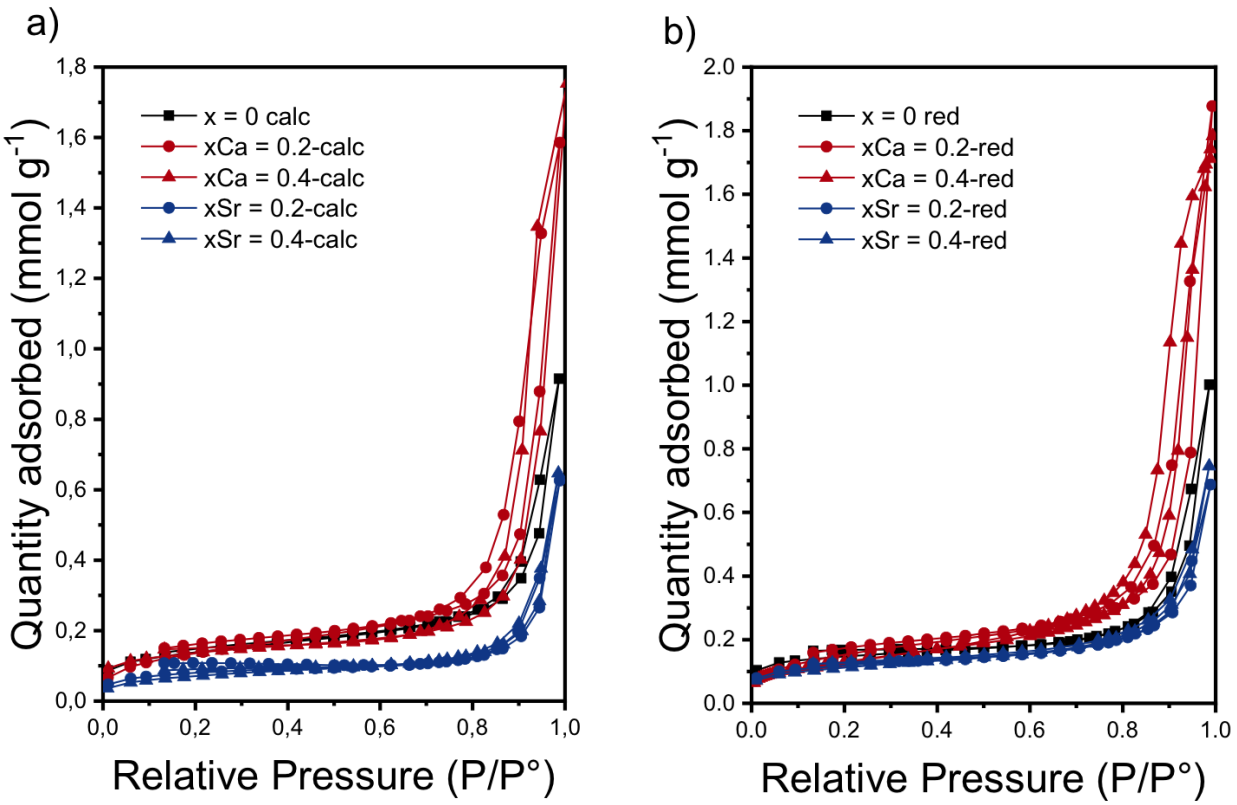


Figure S2. Zoom of the 2θ values of the 47° diffraction peaks.

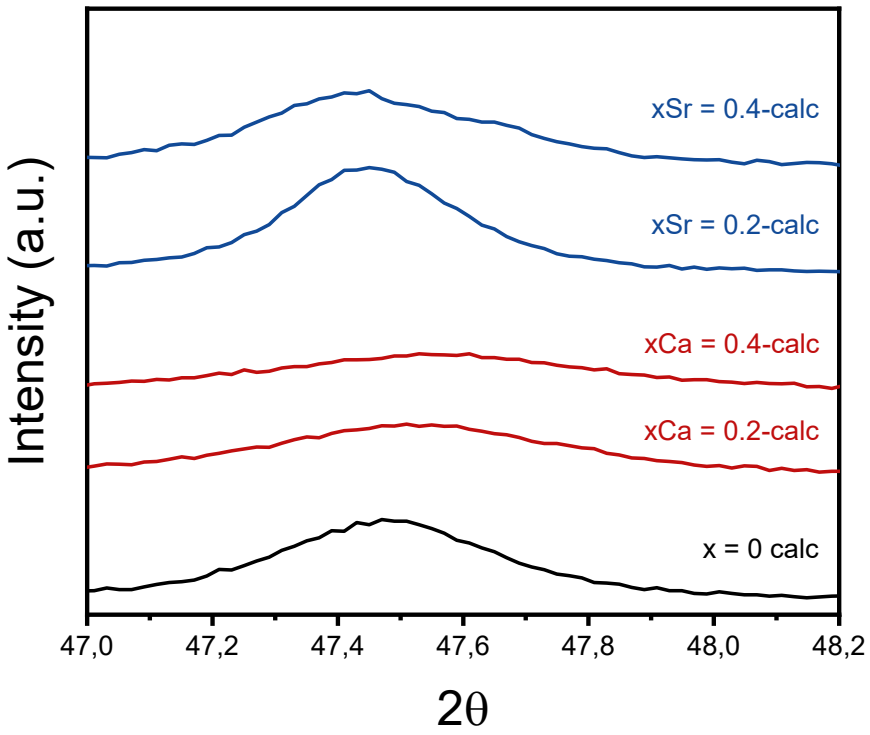


Figure S3. FTIR of the calcined at 700°C $La_{1-x}A_xCoO_3$ (A = Ca, Sr; x = 0, 0.2, 0.4) perovskites.

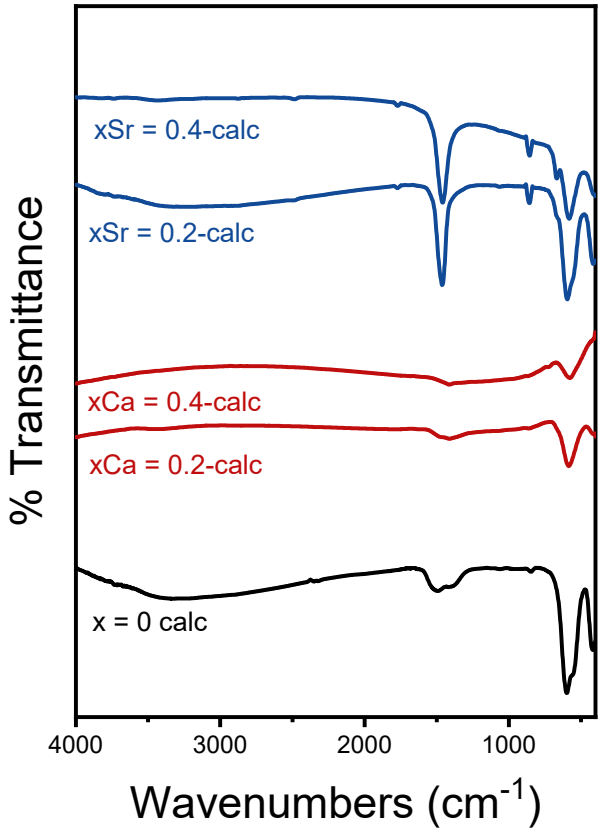


Figure S4. FTIR of the reduced at 550°C and passivated $La_{1-x}A_xCoO_3$ (A = Ca, Sr; x = 0, 0.2, 0.4) perovskites.

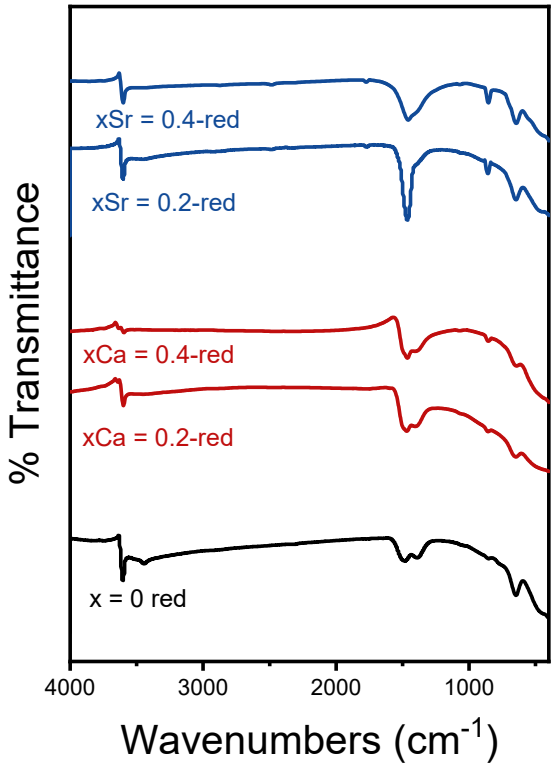


Figure S5. XPS spectra of the O 1s, Co 2p, La 3d, Ca 2p and Sr 3d regions of reduced and passivated $La_{1-x}A_xCoO_3$ (A = Ca, Sr; x = 0, 0.2, 0.4) perovskites.

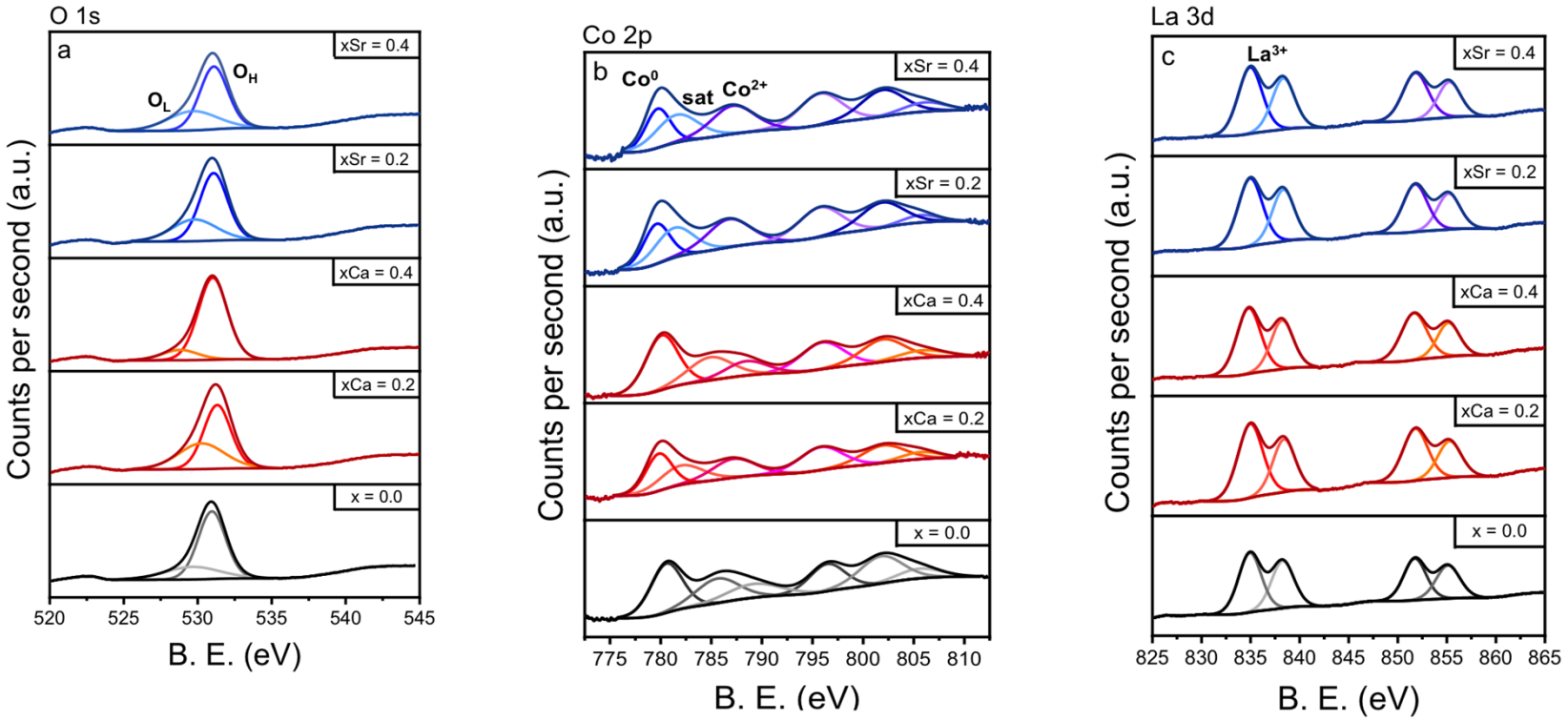
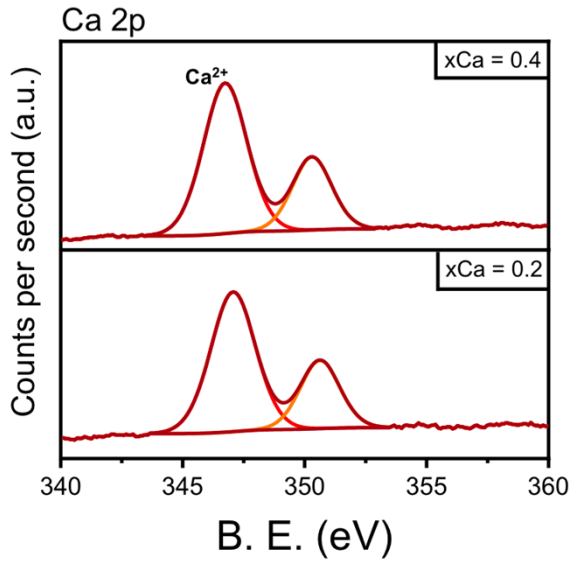


Figure S5. (continued)


Ca 2p
Ca2+
xCa = 0.4
xCa = 0.2
Counts per second (a.u.)
340
345
350
355
360
B. E. (eV)

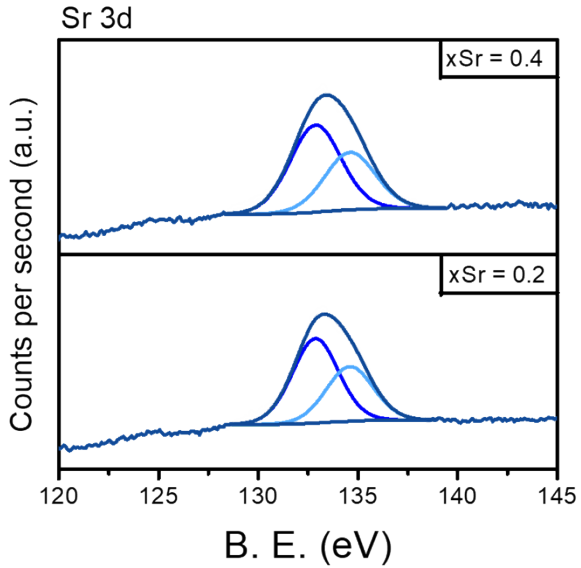

Sr 3d
xSr = 0.4
xSr = 0.2
Counts per second (a.u.)
120
125
130
135
140
145
B. E. (eV)

Figure S6. TEM micrography of a) $LaCoO_3$, b) $La_{0.8}Ca_{0.2}CoO_3$, c) $La_{0.6}Ca_{0.4}CoO_3$, d) $La_{0.8}Sr_{0.2}CoO_3$, e) $La_{0.6}Sr_{0.4}CoO_3$ and f) electron diffraction performed for the xCa=0.2.

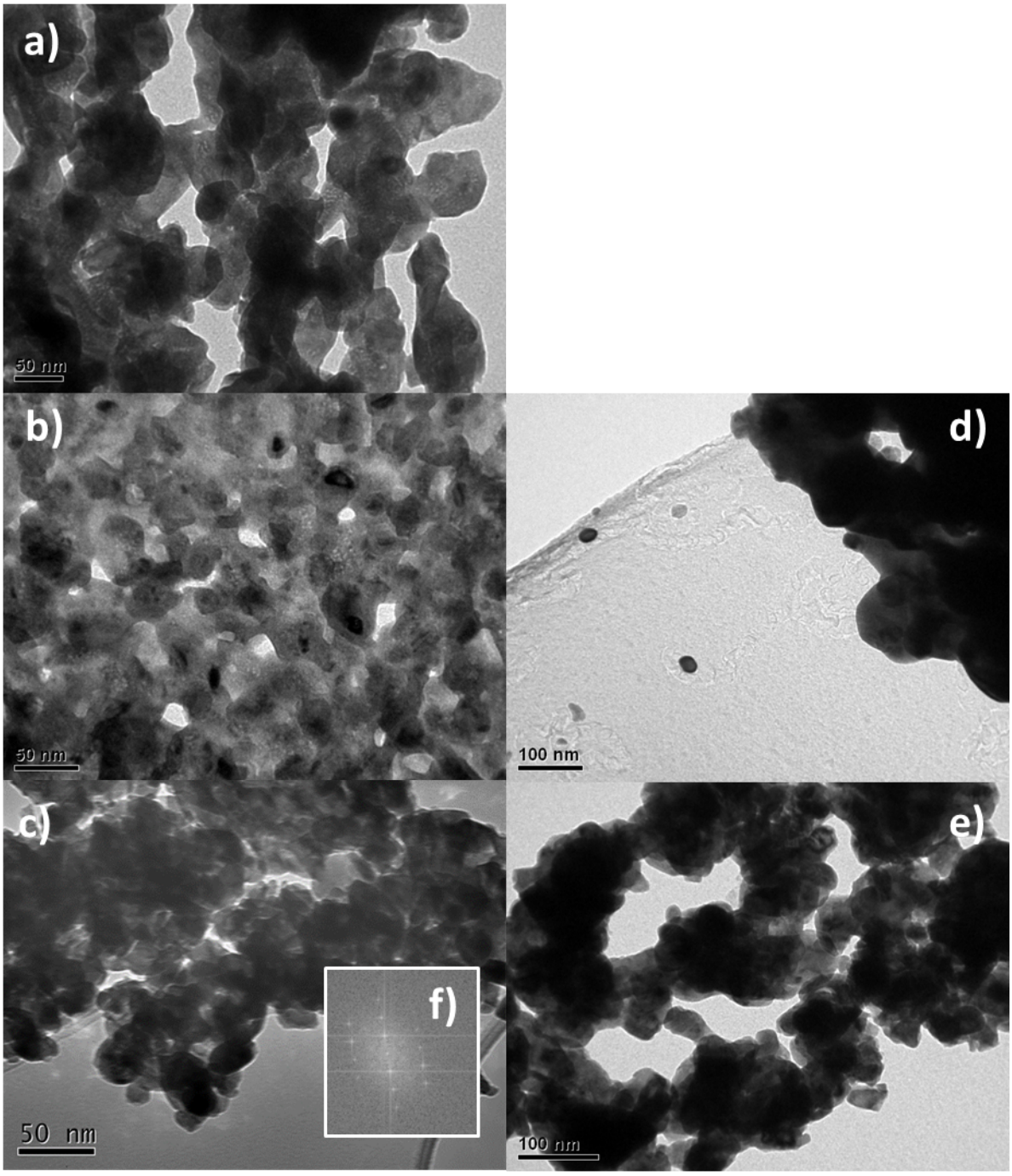


Figure S7. NH_3 DTP-MS of the reduced at 500°C and passivated $La_{1-}xA_xCoO_3$ (A = Ca, Sr; x = 0, 0.2, 0.4) perovskites.

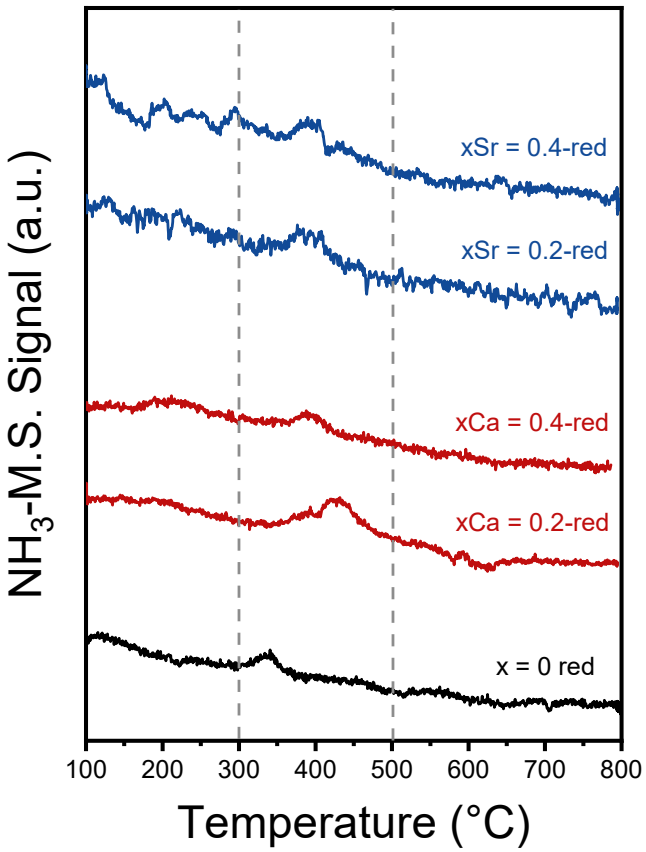


Figure S8. CO_2 DTP-MS of the reduced at 500°C and passivated $La_{1-x}A_xCoO_3$ (A = Ca, Sr; x = 0, 0.2, 0.4) perovskites.

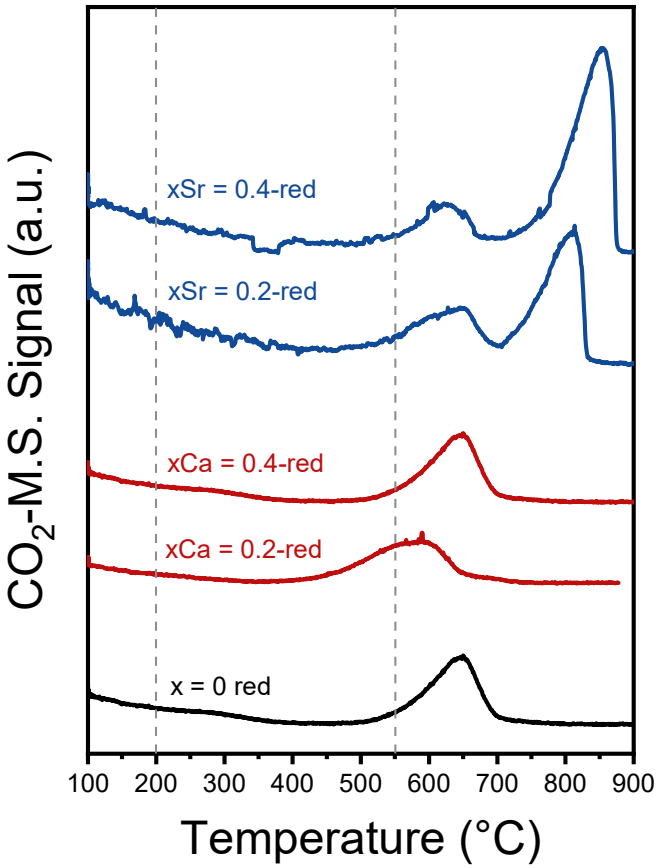


Figure S9. He DTP-MS of the reduced at 500°C and passivated $La_{1-x}A_xCoO_3$ (A = Ca, Sr; x = 0, 0.2, 0.4) perovskites.

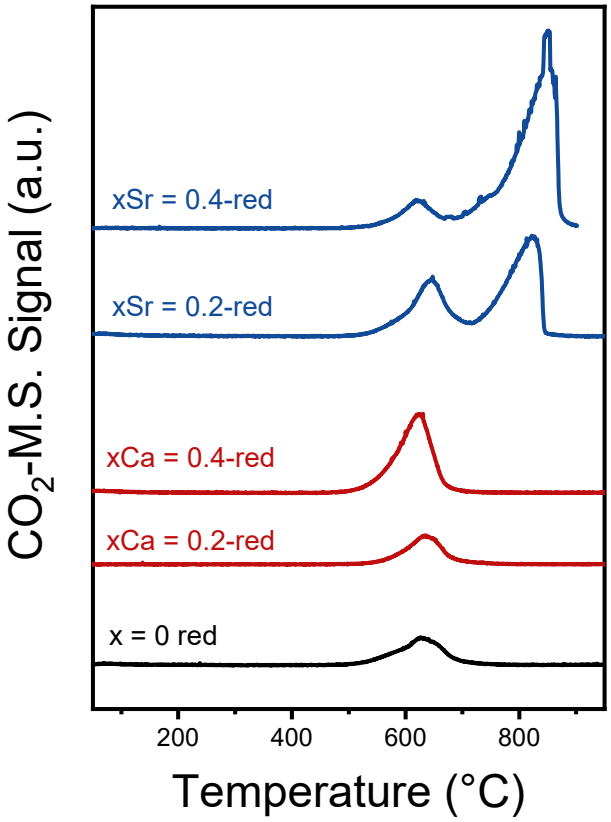


Figure S10. Conversion of succinic acid and yield of products vs. time over reduced at 500°C and passivated (a) $LaCoO_3$, (b) $La_{0.8}Ca_{0.2}CoO_3$, (c) $La_{0.6}Ca_{0.4}CoO_3$, (d) $La_{0.8}Sr_{0.2}CoO_3$ and (e) $La_{0.6}Sr_{0.4}CoO_3$ perovskites.