Electronic Supplementary Material (ESI) for RSC Advances.

Supporting Information

Highly Dispersed CoO_x in Layered Double Oxide for Oxidative Dehydrogenation of Propane: Guest-Host Interactions

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Table S1 Catalytic performances of various LDO catalysts for ODHP at a different ratio of propane to oxygen in the reactant feed (PA/O) [a]

Sample	PA/O	X / %		S / %						Y_{C3H6} / %
		C_3H_8	O_2	C_3H_6	CH_4	C_2H_4	CO	CO_2	Others [b]	
CA-N	1:3	40.8	100	8.3	0.0	1.0	0.0	90.6	0.1	3.4
	1:2	32.7	100	11.9	0.1	1.6	0.0	86.3	0.1	3.9
	1:1.5	25.9	100	15.0	0.1	2.4	0.0	82.4	0.1	3.9
	1:1	23.2	100	19.9	0.1	2.5	0.0	77.3	0.2	4.1
	1.5:1	20.4	100	22.8	0.1	3.0	0.0	73.9	0.2	3.6
	2:1	15.7	100	26.1	0.2	3.0	0.8	69.6	0.3	3.2
	3:1	12.4	100	30.6	0.2	3.4	0.9	64.5	0.4	2.6
CA-C	1:3	41.0	100	9.2	0.0	1.1	0.0	89.6	0.1	3.4
	1:2	32.9	100	13.4	0.1	2.3	0.5	83.6	0.1	4.4
	1:1.5	27.5	100	17.9	0.1	4.0	1.6	76.3	0.1	4.9
	1:1	23.0	100	22.2	0.1	5.7	1.2	70.6	0.2	5.1
	1.5:1	17.2	100	25.2	0.1	6.8	0.6	67.1	0.2	4.3
	2:1	13.1	100	28.2	0.2	9.7	0.8	60.8	0.3	3.7
	3:1	9.3	100	31.6	0.3	8.7	0.6	58.3	0.5	2.9
CA-S	1:3	46.1	100	18.3	0.0	1.4	5.4	74.8	0.1	8.4
	1:2	37.2	100	22.8	0.1	2.0	3.7	71.3	0.1	8.5
	1:1.5	30.1	100	27.3	0.1	3.0	3.0	66.5	0.1	8.2
	1:1	24.5	100	31.1	0.1	3.6	2.4	62.6	0.2	7.6
	1.5:1	19.1	100	36.1	0.1	3.7	2.2	57.7	0.2	6.9
	2:1	14.4	100	41.1	0.2	2.4	1.7	54.2	0.3	5.9
	3:1	10.6	100	42.9	0.3	1.9	1.7	52.8	0.4	4.5
CA-P	1:3	50.1	100	21.7	0.0	1.3	2.0	74.9	0.1	10.9
	1:2	39.9	100	28.1	0.1	1.9	3.6	66.3	0.1	11.2
	1:1.5	32.5	100	33.3	0.1	2.6	4.4	59.6	0.1	10.8
	1:1	25.4	100	36.8	0.1	3.5	4.0	54.5	0.2	10.1
	1.5:1	20.3	100	41.3	0.1	3.1	3.1	52.1	0.2	8.4
	2:1	15.5	100	46.9	0.2	2.2	3.0	47.4	0.3	7.3
	3:1	11.9	100	49.0	0.2	1.7	2.0	46.0	0.4	5.8

[a] The data were obtained after 30 min on stream (reaction conditions: T = 400 °C; C_3H_8:O_2:He=PA:O:4; GHSV=30,000 mL·g_{cat}^{-1}·h^{-1}; [b] Others=C_3H_4O+CH_3CH_2CHO+CH_3COCH_3).

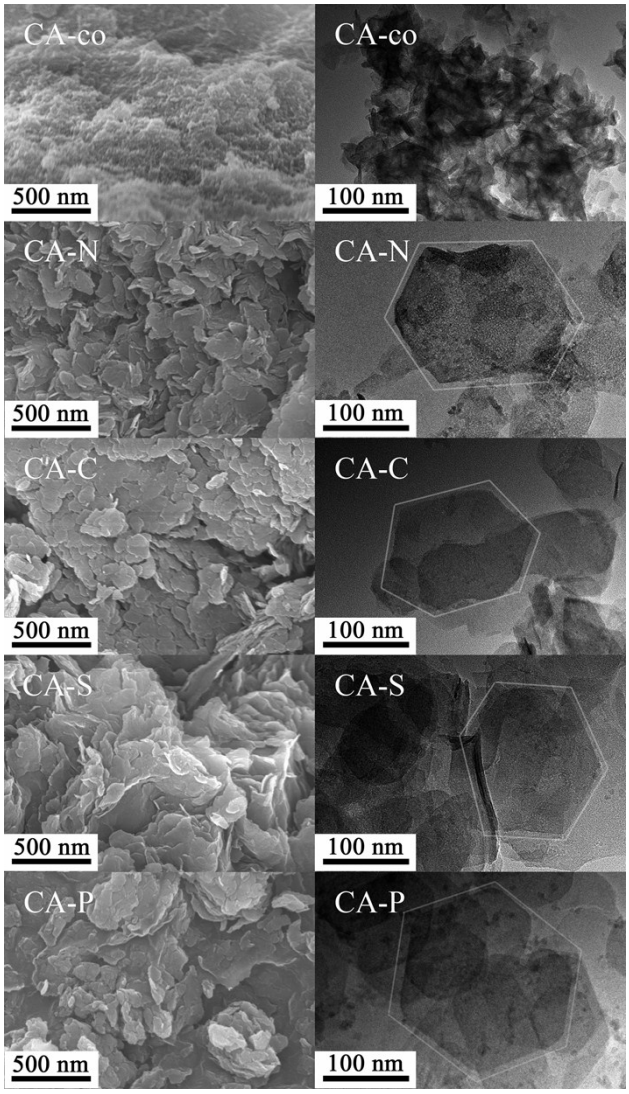

Fig.S1 Morphology of the LDH samples: The SEM (left) and TEM (right) images.

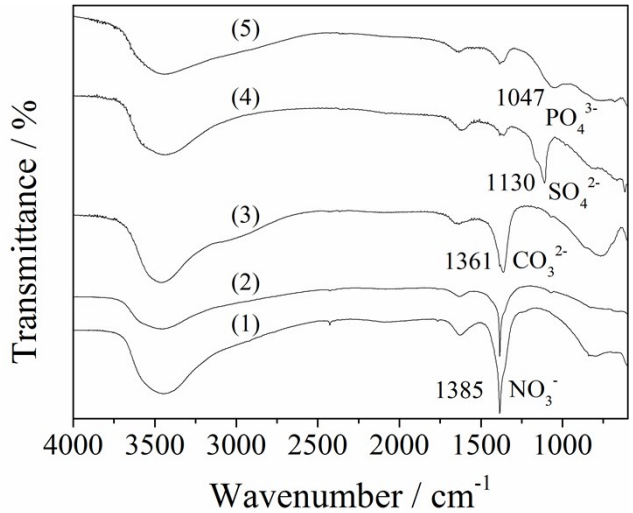

Fig.S2 FT-IR spectra of the LDH samples: (1) CA-co, (2) CA-N, (3) CA-C, (4) CA-S, and (5) CA-P.

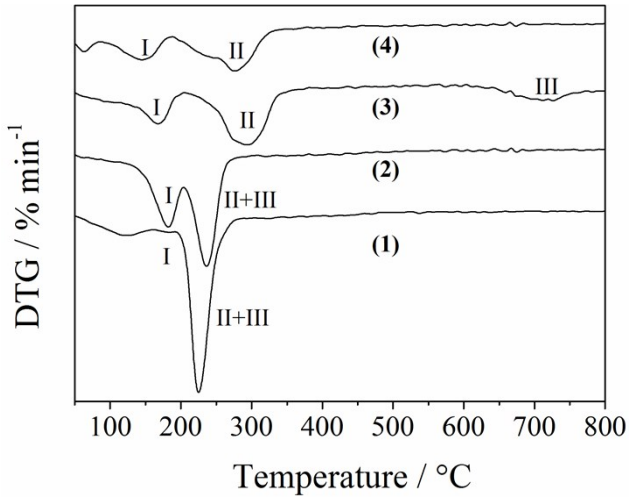

Fig.S3 Differential thermal gravimetric (DTG) profiles for the decomposition of the LDH samples: CA-N (1), CA-C (2), CA-S (3), and CA-P (4). ((I) loss of interlayer water; (II) dehydroxylation of the brucite-like sheets; (III) loss of interlayer anions)

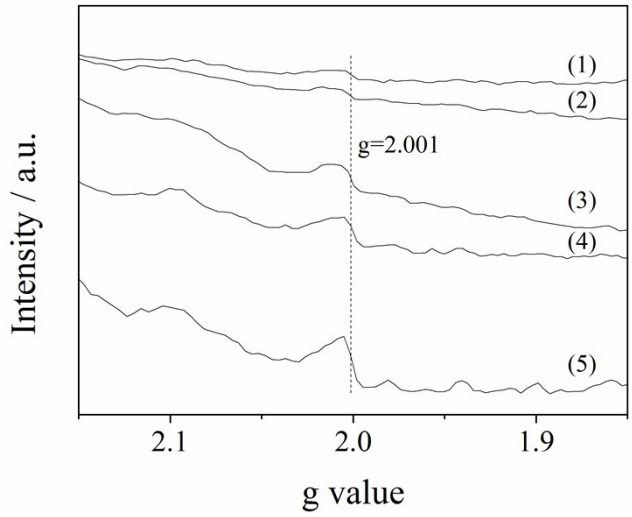

Fig.S4 EPR spectra of the LDO samples: (1) CA-co, (2) CA-N, (3) CA-C, (4) CA-S, and (5) CA-P.

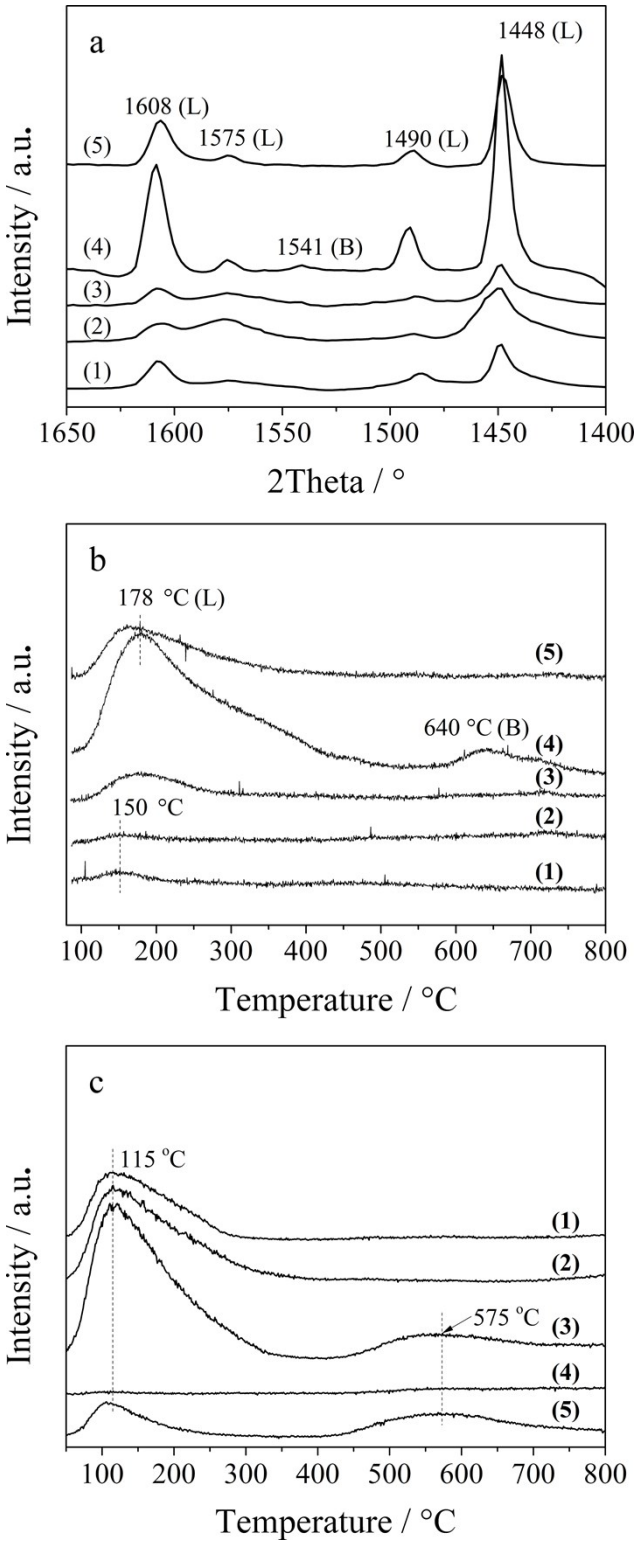

Fig.S5 The FT-IR spectra (a) of pyridine adsorbed on the LDO samples, NH_3-TPD profiles (b) and CO_2-TPD profiles (c) of the LDO samples for Lewis (L) and Brønsted (B) acid/base measurements. CA-co (1), CA-N (2), CA-C (3), CA-S (4) and CA-P (5).

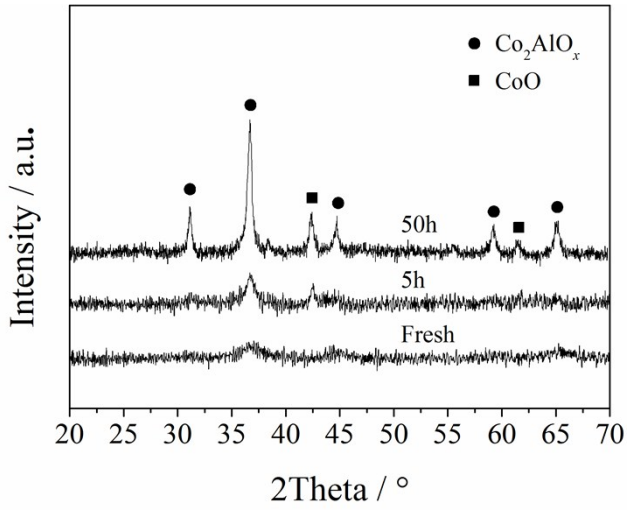

Fig.S6 XRD patterns of the CA-P LDO through ODHP for both 5 hours and 50 hours

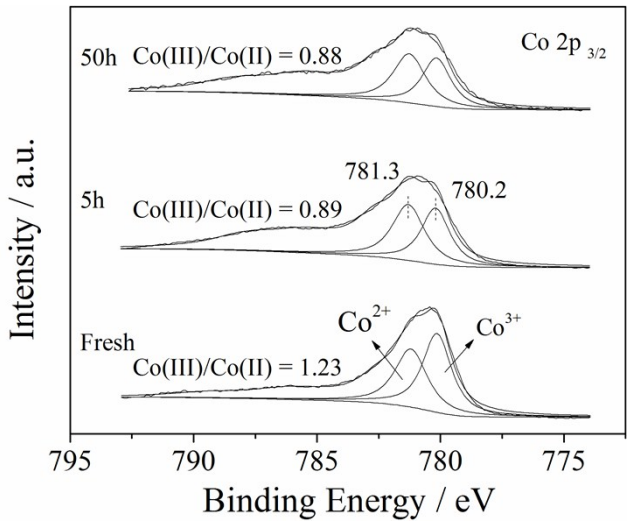

Fig.S7 XPS spectra of CA-P LDO through ODHP for both 5 hours and 50 hours