Electronic Supplementary Material (ESI) for New Journal of Chemistry

Supporting information

Core-Shell Co@CoO Catalysts for the Hydroformylation of Olefins

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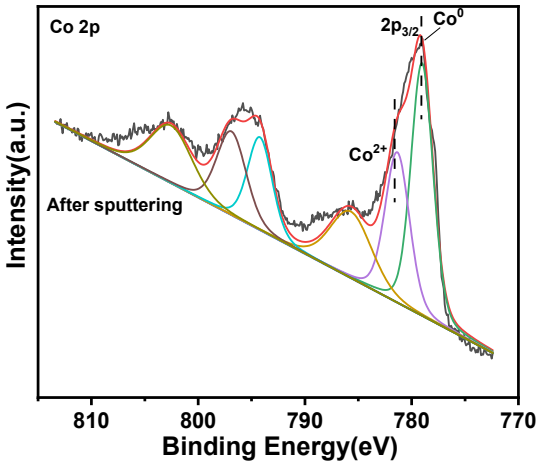

Fig. S1. XPS spectra of Co 2p for Co@CoO-PEG after Argon ion sputtering.

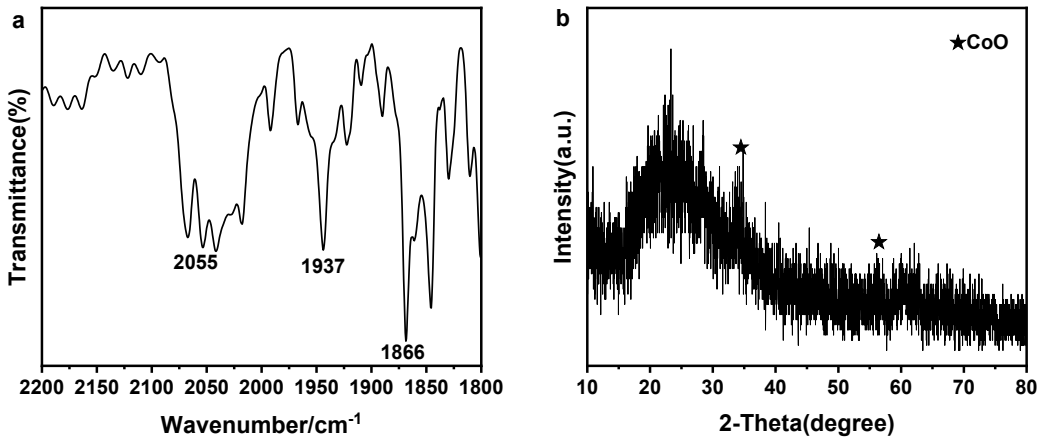

Fig. S2. (a) FT-IR spectra of the filtrate after reaction on CoO_x-W catalyst; (b) XRD patterns of the residual solid after the solvent in the filtrate was evaporated.

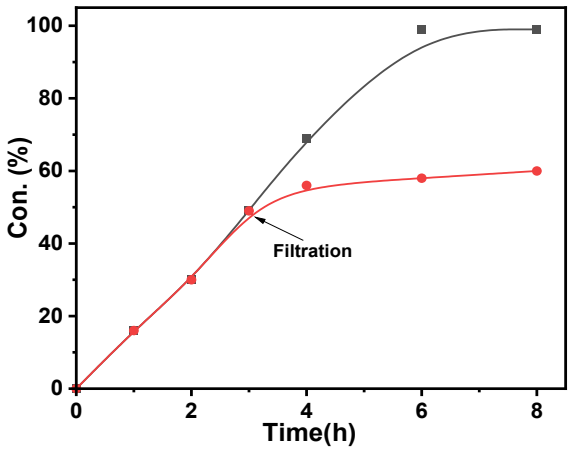

Fig. S3. Time profile of the 1-octene hydroformylation catalyzed by Co@CoO-PEG. The solid squares denoted the original time profile of hydroformylation. The solid circles represent the catalytic activities without catalyst after hot filtration. Reaction condition: 50 mg catalyst, 2 mmol 1-octene, 4 MPa (CO/H_2, V/V=1), 10 ml toluene, 130 °C.

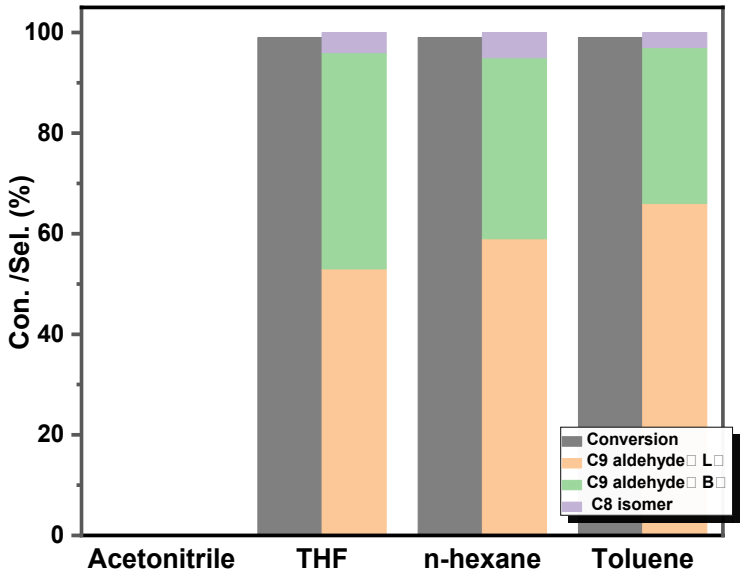

Fig. S4. The catalytic performance of Co@CoO-PEG in different solvents. Reaction condition: 50 mg catalyst, 2 mmol 1-octene, 4 MPa (CO/H_2, V/V=1), 10 ml solvent, 130 °C, 8 h. L:linear and B: branch

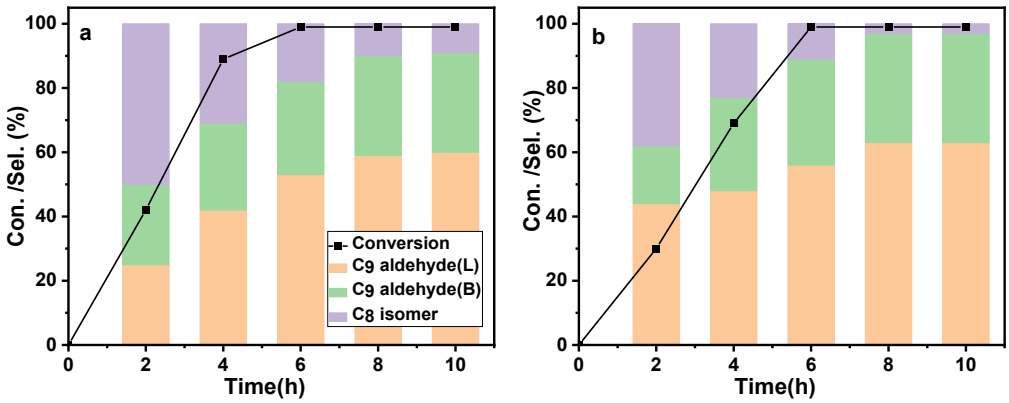

Fig. S5. The selectivity and conversion of 1-octene with different reaction time on (a) CoO_x-W and (b) Co@CoO-GLY catalysts. Reaction condition: 50 mg catalyst, 2 mmol 1-octene, 4 MPa (CO/H_2, V/V=1), 10 ml toluene, 130 °C. L:linear and B: branch

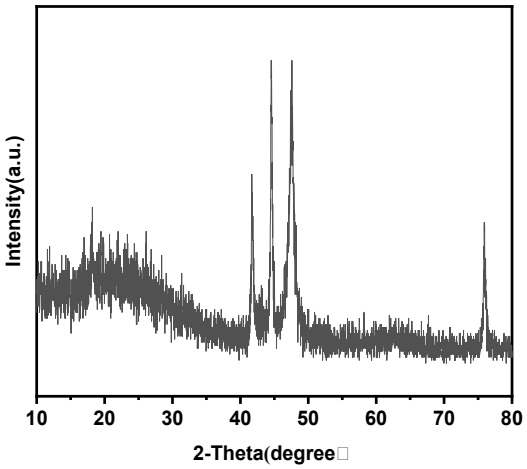

Fig. S6. XRD patterns of the spent Co@CoO-PEG catalyst after nine rounds.

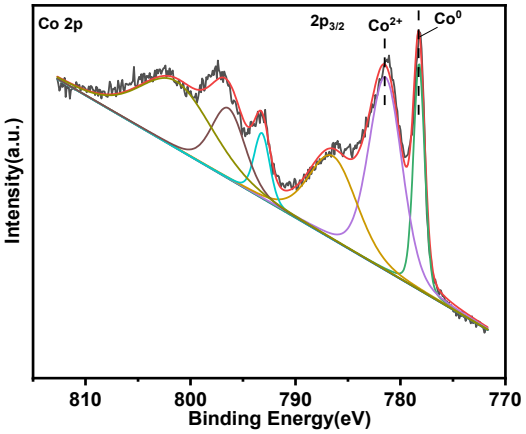

Fig. S7. Co 2p XPS spectra of for the used Co@CoO-PEG catalyst after nine rounds.

Table S1. Comparison of the catalytic performance of Co@CoO-PEG with those reported cobalt-based catalysts in the hydroformylation of olefin.

Entry	Catalyst	Substrate	$P_{H2/CO}$ (MPa)	T/°C	t/h	Con.(%)	Aldehyde Sel.(%)	Ref.
1	Fibrous Co_3O_4	1-octene	5.5	150	12	92[a]	-	1
2	Octahedral Co_3O_4	1-heptene	4	170	12	88	75	2
3	Co/β-Mo_2C	propene	4	160	10	28[b]	-	3
4	CoZrP-2.0	1-octene	4	160	6	99	91	4
5	Co/Q-6	1-hexene	5	130	2	37	88	5
6	Co-B	1-octene	5	120	2.5	71	99	6
7	Ultrafine cobalt	1-hexene	2.4	100	1	95	38	7
8	Co/SiO_2	1-hexene	5	100	5	61	90	8
9	Co/phen@C	1-octene	4	100	18	94	73	9
10	Co@CoO-PEG	1-octene	4	130	8	99	97	This work

[a]The products includes alcohols, isomerized and hydrogenated substrates. [b]The butyraldehydes and butanols were detected as products.

References

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