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Structural evolution of metal−organic framework and derived hybrids composed of metallic cobalt and copper encapsulated in nitrogen-doped porous carbon cubes with high catalytic performance

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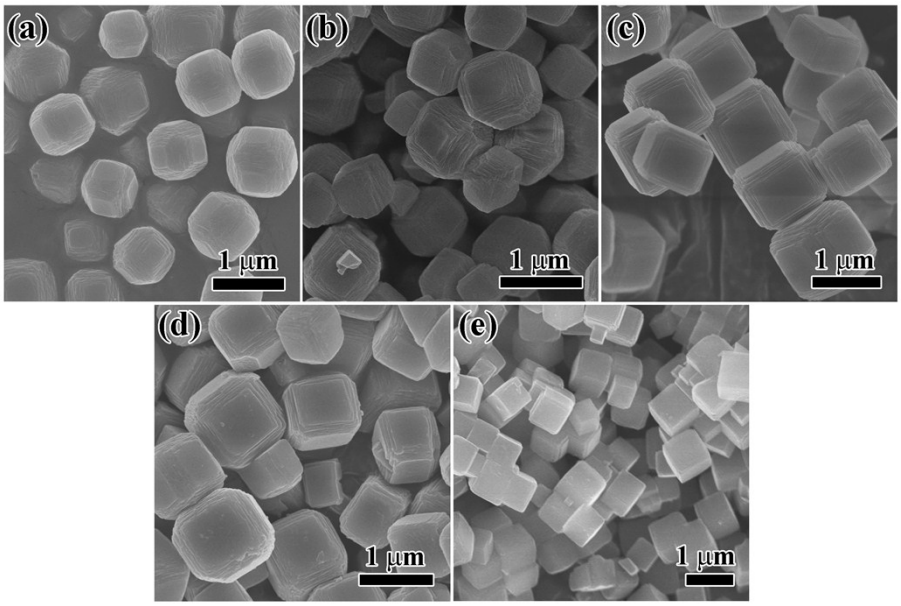

Fig. S1 Low magnification SEM images of Cu-Co PBA as a function of synthesis time: (a) 10 min; (b) 1 h; (c) 6 h; (d) 12 h and (e) 24 h.

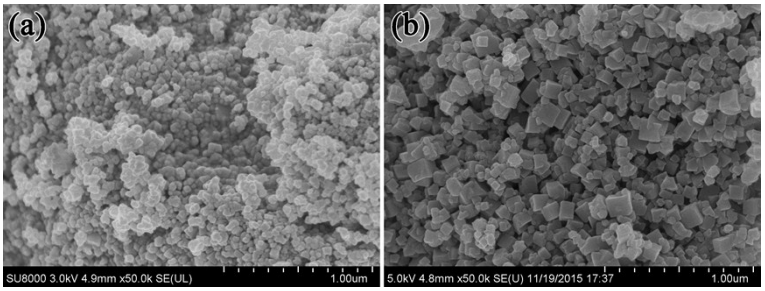

Fig. S2 SEM images of the products after precipitation process with different amounts of sodium citrate: (a) 0 mmol and (b) 4.5 mmol

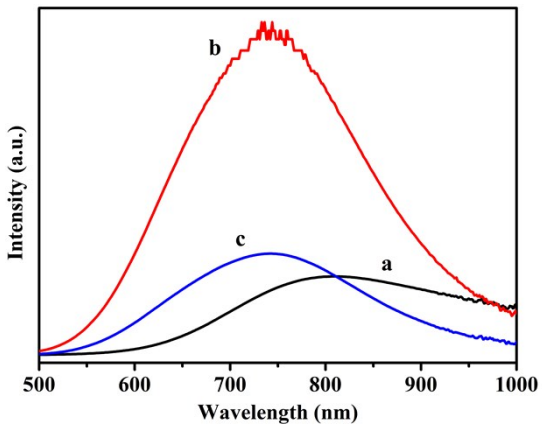

Fig. S3 UV-vis absorption of (a) copper nitrate solution; (b) the mixed solution of copper nitrate and potassium hexacyanocobaltate(III); (c) the filtrate after copper nitrate, sodium citrate and potassium hexacyanocobaltate(III) was mixed for 1 h. The concentrations of all solutions are identical to the part of synthesize Cu-Co PBA

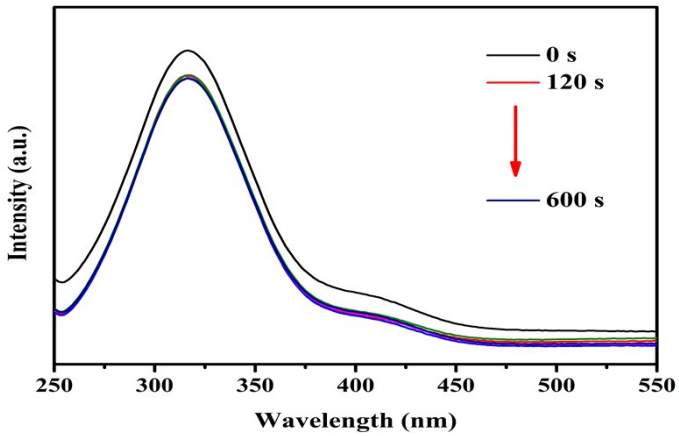

Fig. S4 Changes of time-dependent UV-vis absorption spectra of 4-NP adsorbed by Cu/Co-NPCC-600

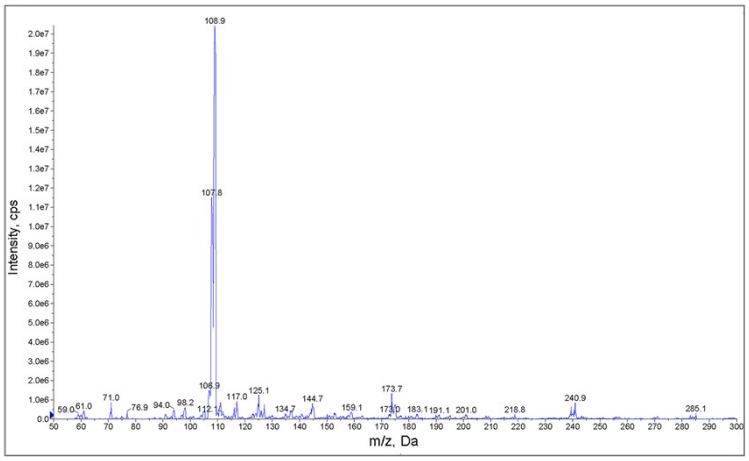

Fig. S5 LC-MS of the 4-NP reduced product catalyzed by the Cu/Co-NPCC-600

Table S1 EDS characterization results of different catalyst

	C (%)	N (%)	O (%)	K (%)	Cu (%)	Co (%)	Total (%)
Cu/Co@NPCC-600	37.54	3.83	5.17	1.09	24.98	27.39	100
Cu/Co@NPCC-700	39.68	0.80	4.63	0.94	24.88	29.07	100
Cu/Co@NPCC-800	21.37	—	3.27	—	37.12	38.24	100
Cu/Co-NPCC-600	78.59	5.63	5.73	0.50	1.14	8.11	100
Cu/Co-NPCC-700	79.33	0.63	8.03	0.48	1.51	10.02	100

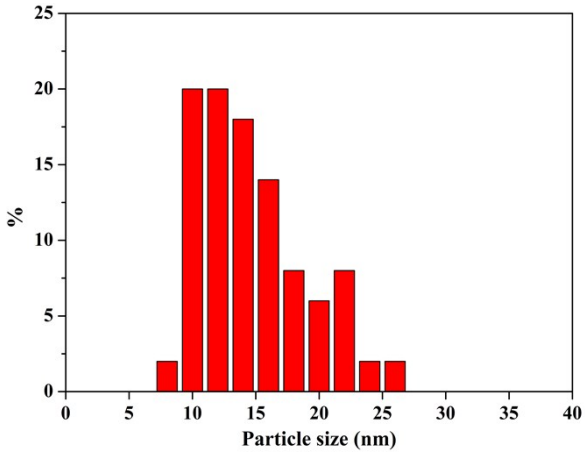

Fig. S6 Particle size distribution diagram of the metal particles in the Cu/Co@NPCC-600

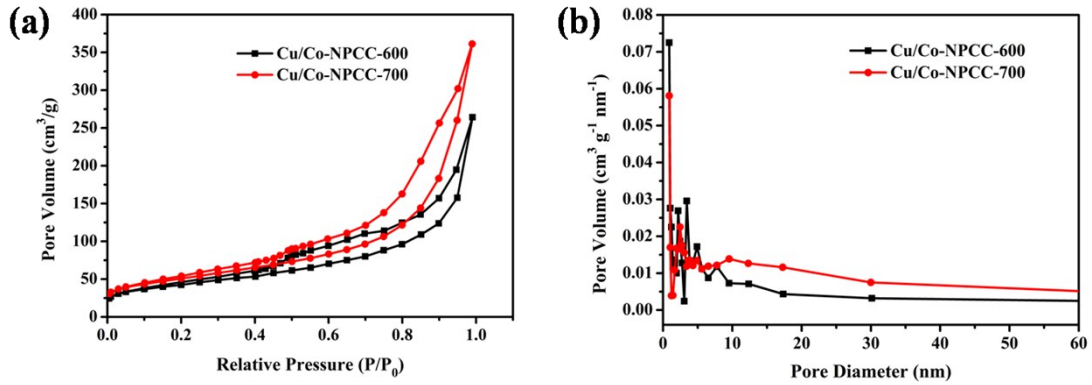

Fig. S7 N_2 adsorption-desorption isotherm (a) and the corresponding pore-size distribution (b) of Cu/Co-NPCC-600 and Cu/Co-NPCC-700.