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Atomically Dispersed Cobalt-Nitrogen-Carbon Catalyst for Efficient Oxidative Esterification of Aromatic Alcohols

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Figure S1. TEM image of $Co_{0.9}Cu_{0.1}$@NG-800-50

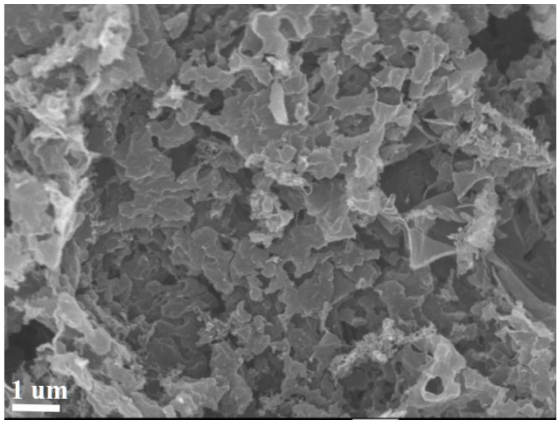

Figure S2. SEM image of Co SACs@NG-800-50

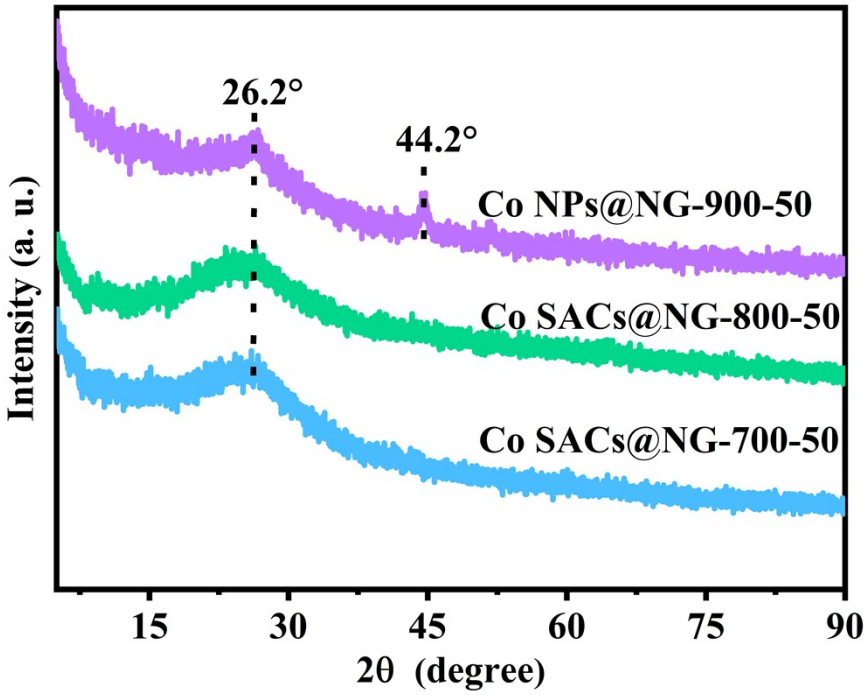

Figure S3. XRD patterns of samples prepared at different pyrolysis temperature

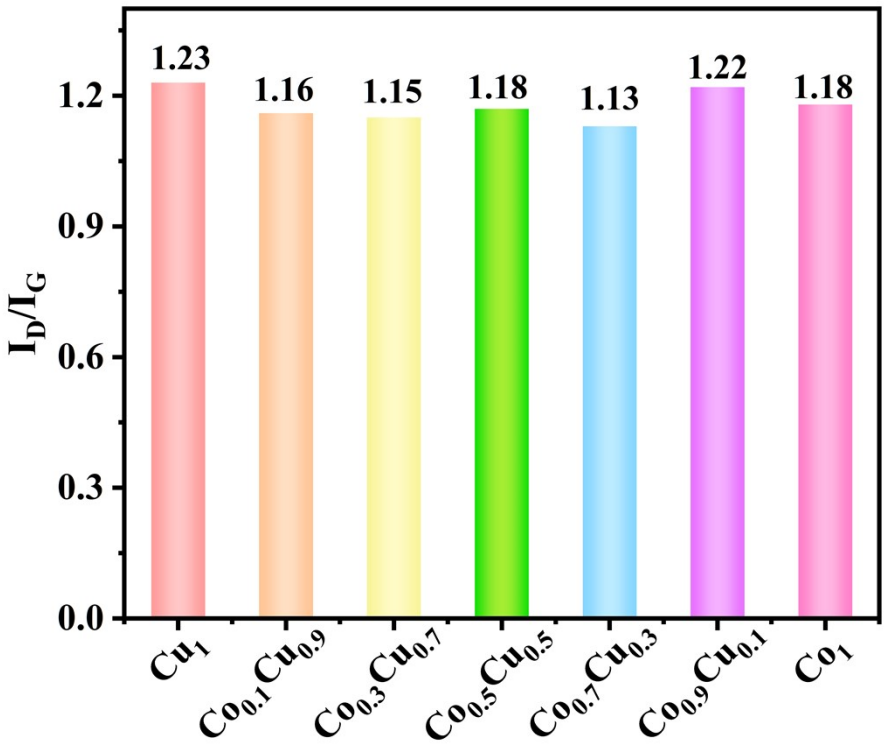

Figure S4. The I_D/I_G ratio of the samples with different Cu loading amount

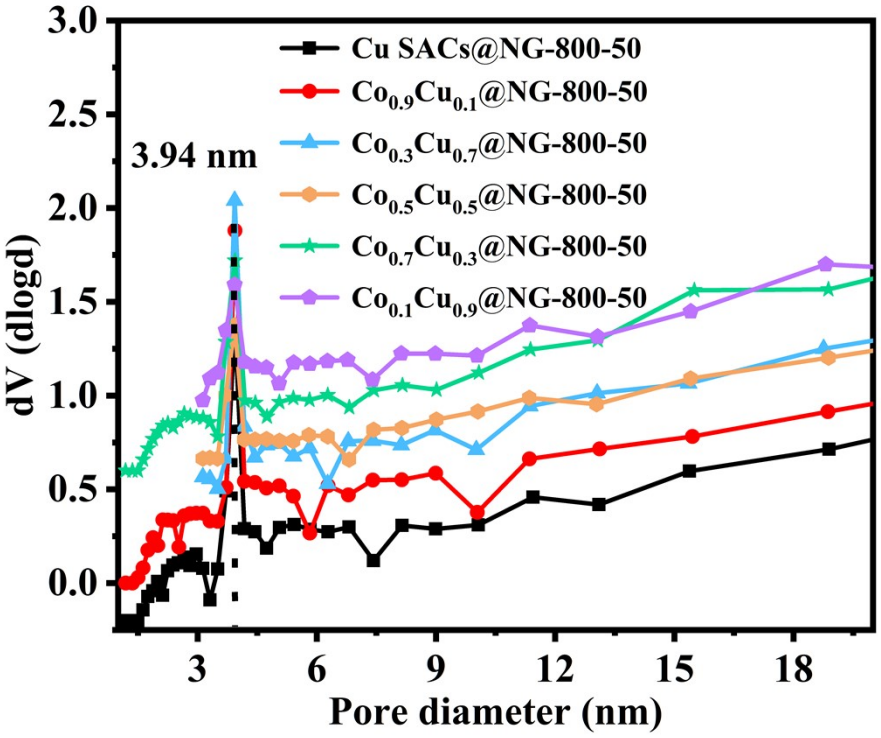

Figure S5. The pore size distribution curves of the samples with different Cu loading

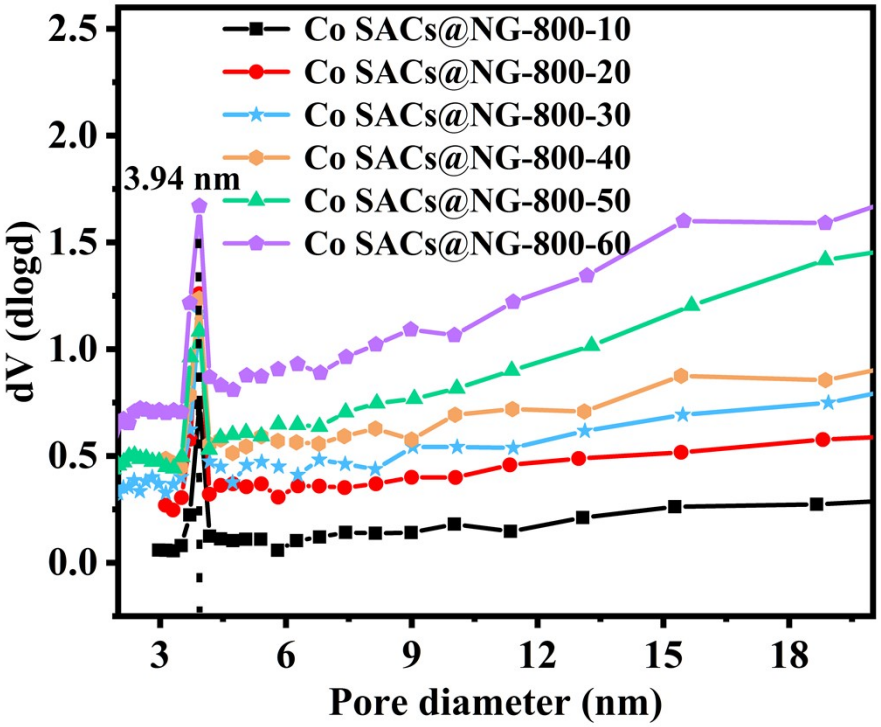

Figure S6. The pore size distribution curves of Co SACs@NG-800-n (n=10, 20, 30, 40, 50, and 60) catalysts

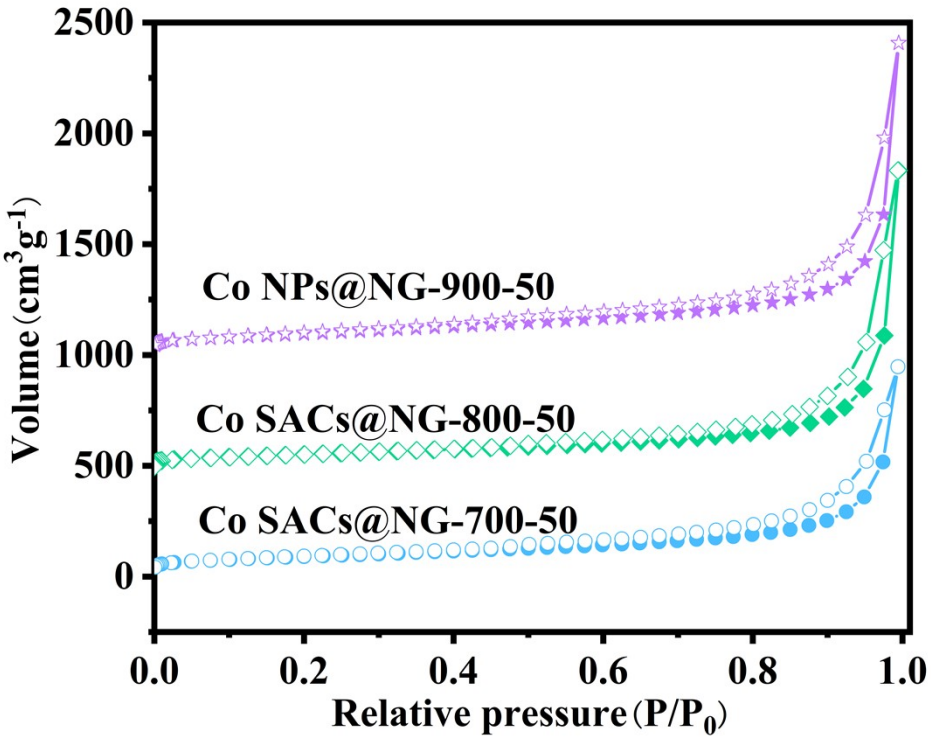

Figure S7. N_2 adsorption-desorption isotherms of Co SACs@NG-T-50 (T = 700 and 800) and Co NPs@NG-900-50 catalysts

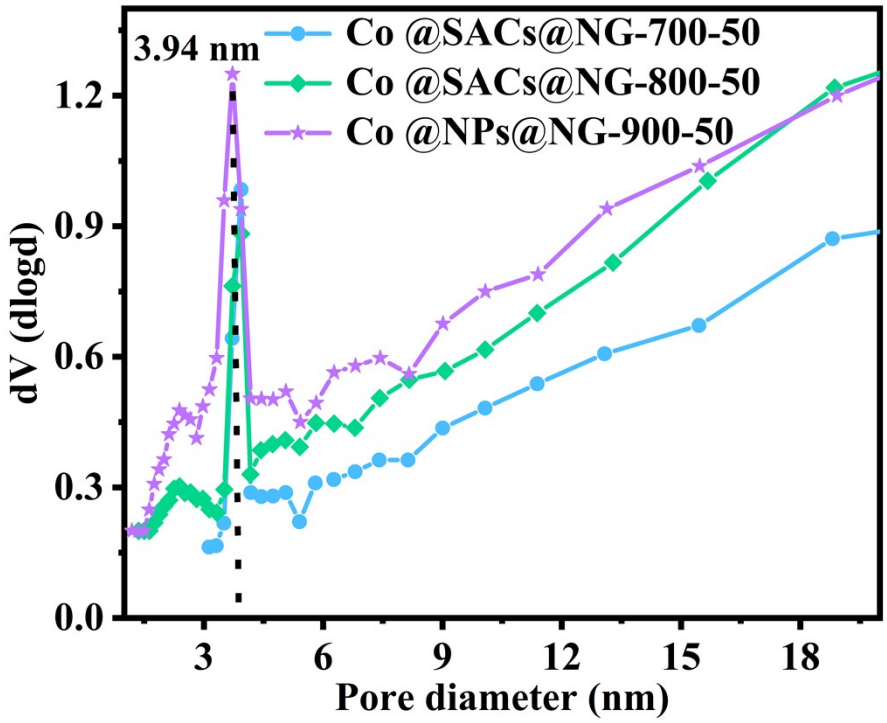

Figure S8. The pore size distribution curves of Co SACs@NG-T-50 (T = 700 and 800) and Co NPs@NG-900-50 catalysts

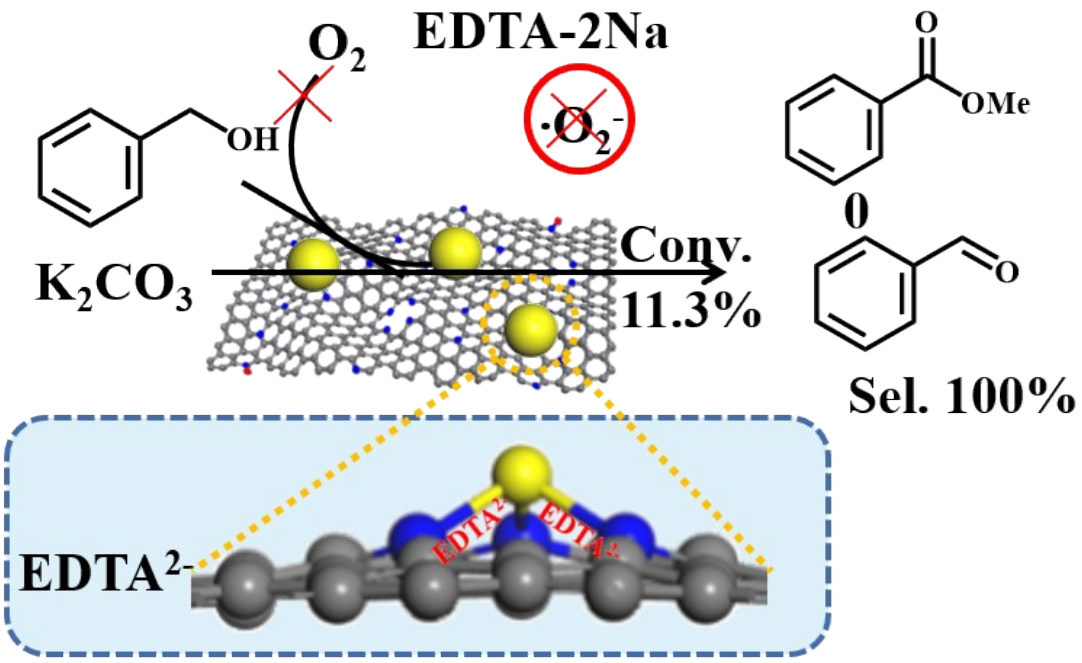

Figure S9. Control experiments of addition of EDTA-2Na poisoning agent.

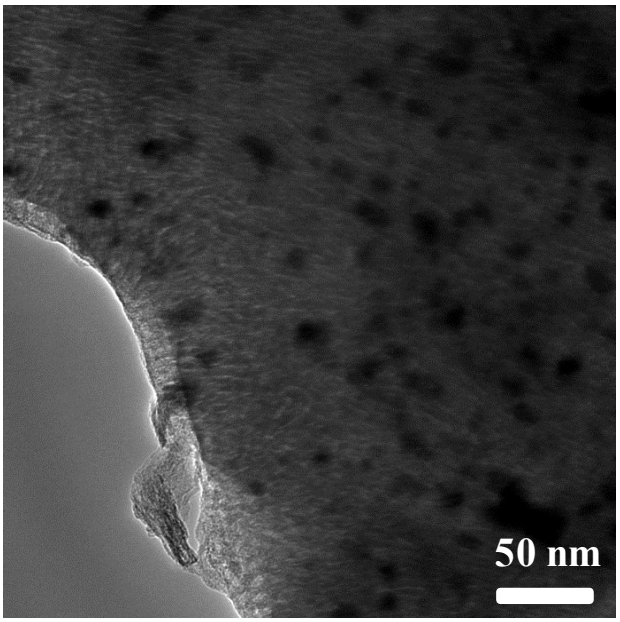

Figure S10. TEM image of the CoPc-800 catalyst.

Table S1 The results of N_2 adsorption-desorption for different samples.

Sample	S_{BET} ($m^2 \cdot g^{-1}$)[a]	V_{total} ($cm^3 \cdot g^{-1}$)[b]	$\overline{D}$ (nm)[c]
Cu SACs@NG-800-50	336	1.541	3.94
$Co_{0.1}Cu_{0.9}$@NG-800-50	358	1.611	3.94
$Co_{0.3}Cu_{0.7}$@NG-800-50	383	1.584	3.93
$Co_{0.5}Cu_{0.5}$@NG-800-50	309	1.210	3.93
$Co_{0.7}Cu_{0.3}$@NG-800-50	344	1.753	3.94
$Co_{0.9}Cu_{0.1}$@NG-800-50	302	1.119	3.93
Co SACs@NG-700-50	321	1.119	3.94
Co SACs@NG-800-50	332	1.760	3.94
Co NPs@NG-900-50	356	1.542	3.92
Co SACs@NG-800-10	104	0.401	3.94
Co SACs@NG-800-20	199	0.729	3.93
Co SACs@NG-800-30	201	0.862	3.94
Co SACs@NG-800-40	218	0.876	3.93
Co SACs@NG-800-60	352	1.875	3.94

[a] S_{BET} is calculated using BET method, [b] V_{total} is the single point adsorption at $P/P_0 = 0.99$,

[c] average pore diameter $\overline{D}$ is calculated using BJH method.

Table S2 Comparison of oxidative esterification performance of various catalysts.

Entry	Catalyst	K_2CO_3 (mol%)	P_{O2} (atm)	Time (h)	Conv. (%)	Sel. (%)	Ref.
1	Co SACs@NG-800-50	20	1.0	24	>99	>99	This work
2	Co@NC-Gr7	11.6	1.0	12	88	96	1
3	Co-MOFs-800	50	5.0	12	96	94	2
4	Au/SiO_2	50	5.0	24	>99	>99	3
5	Au/*p*BN	200	1.0	7	91	>99	4
6	Au/HMS-Ce	40	10	6	98	94	5
7	Co-NC(ST,0.6)	20	1.0	24	99.3	99.4	6
8	Co@NC-2-900	20	1.0	24	>99	98	7
9	CoNC/CB	18.7	20	12	91.4	97.0	8
10	CoO_x-N@C,PANI	10	1.0	24	92	97.8	9
11	Co_3O_4-N@C	20	1.0	24	>99	97	10

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