Electronic Supplementary Material (ESI) for Physical Chemistry Chemical Physics.

Supplementary Information

In situ-synthesized Co and N-doped Mesoporous Hollow Silica Spheres for the Selective Oxidation of Ethylbenzene

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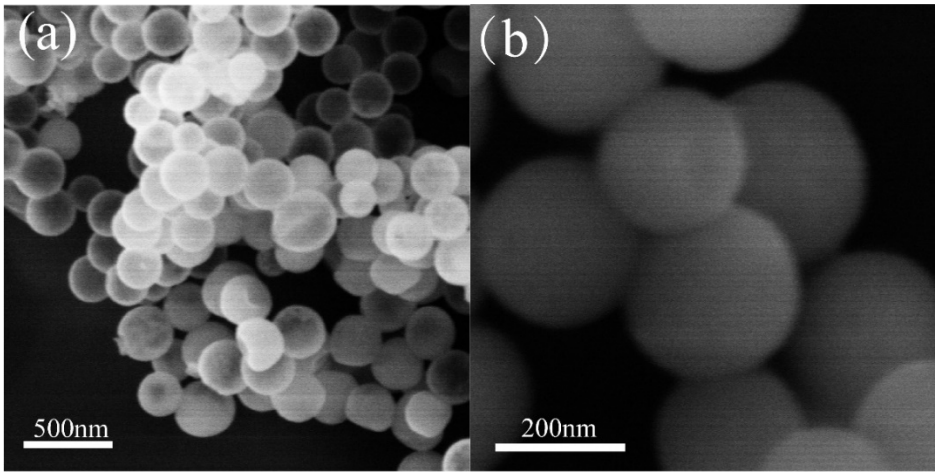

Figure S1. SEM images of $mSiO_2$

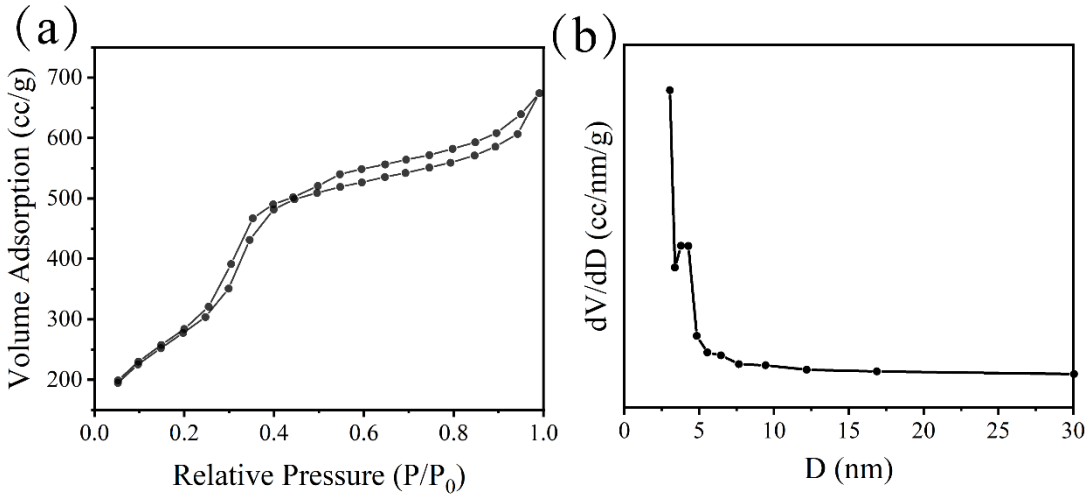

Figure. S2. N_2 adsorption–desorption isotherm and the corresponding pore size distribution curve of $mSiO_2$

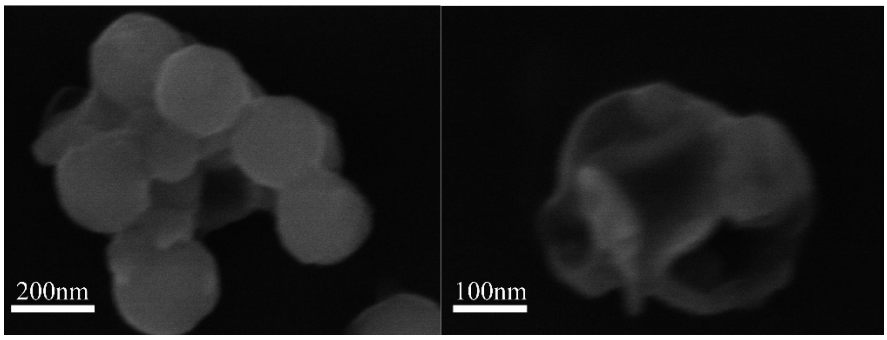

Figure. S3. SEM images of Co-N-C@mSiO_2-0.10 catalyst used for six consecutive times

Table S1. Oxidation of ethylbenzene to acetophenone catalyzed by different catalysts prepared with different usage of benzaldehyde and pyrrole

Entry	Benzaldehyde (g)	Pyrrole (mL)	$CoCl_2$ $6H_2O$ (g)	Con.[a] (%)	Sel. [b] (%)
1	0.50	0.35	0.10	86.1	94.7
2	0.73	0.50	0.10	93.1	98.0
3	1.00	0.70	0.10	83.9	96.0

Reaction condition: 15 mg catalysts, 1.0 mmol ethylbenzene, 3.5 mmol TBHP, 3.0 mL H_2O, 80°C, 12 h. [a] conversion of ethylbenzene; [b] selectivity of acetophenone

Table S2. The Co contents of the prepared catalysts measured by ICP-MS

Sample	Co (wt%)
Co-N-C@ mSiO_2-0.03	2.1
Co-N-C@ mSiO_2-0.10	3.9
Co-N-C@ mSiO_2-0.15	4.2
Co-N-C@ mSiO_2-0.20	5.2
Co-N-C@ mSiO_2-0.10-H	3.4
Co-N-C@ mSiO_2-0.10-R6	2.5

Table S3. Structure parameters of the prepared catalysts

Entry	Sample	S_{BET}[a] (m^2/g)	D_p[b] (nm)	V_p[c] (cm^3/g)
1	$mSiO_2$	1102.3	3.78	1.04
2	N-C@$mSiO_2$	40.4	5.75	0.06
3	Co-N-C@ $mSiO_2$-0.03	25.0	9.32	0.11
4	Co-N-C@ $mSiO_2$-0.10	33.8	11.9	0.10
5	Co-N-C@ $mSiO_2$-0.15	46.9	8.48	0.10
6	Co-N-C@ $mSiO_2$-0.10-R6	52.8	6.72	0.09

[a] S_{BET}: Specific surface area; [b] D_p: Average pore size; [c] V_p: Total pore volume

Table S4. The element content of the prepared catalysts measured by XPS

Sample	Co (at%)	N (at%)	Si (at%)	O (at%)	C (at%)
Co-N-C@ $mSiO_2$-0.03	0.69	4.61	9.47	21.47	63.76
Co-N-C@ $mSiO_2$-0.10	0.71	4.54	13.03	27.87	53.84
Co-N-C@ $mSiO_2$-0.1-R6	0.32	2.97	16.37	43.39	36.96