SUPPORTING INFORMATION

Catalytic Decomposition of Toxic Chemicals Over Metal-Promoted Carbon Nanotubes

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Table of Contents

Supporting information including description of pretreatment of carbon nanorturbs(CNTs); and 4 figures and 2 tables.

Pretreatment of CNTs

The chemical reagents used in the preparation of the catalysts were analytical grade and used as-received. The multi-walled CNTs prepared by the chemical vapor deposition process were purchased from Shenzhen Nanotech Co., Ltd., China. The CNTs were pretreated before the active components were impregnated. 10g purchased CNTs (BET surface area 175m^2/g) were first immersed in 500 ml 1:1 mixture of 98.3 wt% H_2SO_4 and 65 wt% HNO_3 and sonicated for 0.5 h, then the solution was refluxed for 6 h at 120°C under ambient pressure. After filtration and wash with deionized water, the oxidized CNTs were further sonicated for 0.5 h and refluxed for 2 h in 500ml 27wt% ammonia at 60°C under ambient pressure. After filtration, the CNTs were washed with deionized water and vacuum-dried at 60°C for 24h.

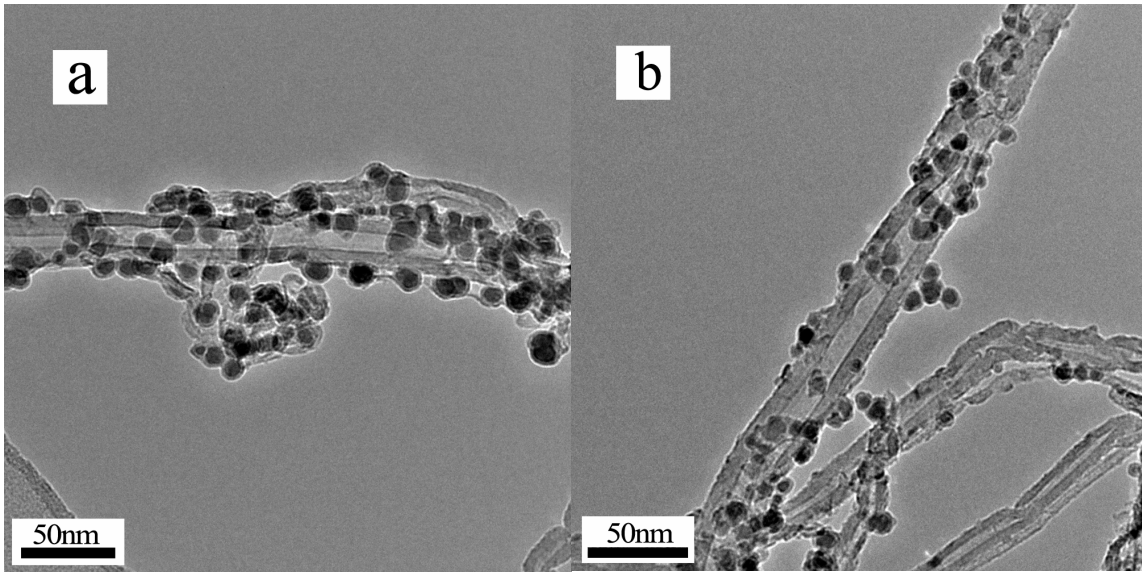

FIGURE S1. TEM images of (a) Co/CNTs, (b) CoCeBP/CNTs.

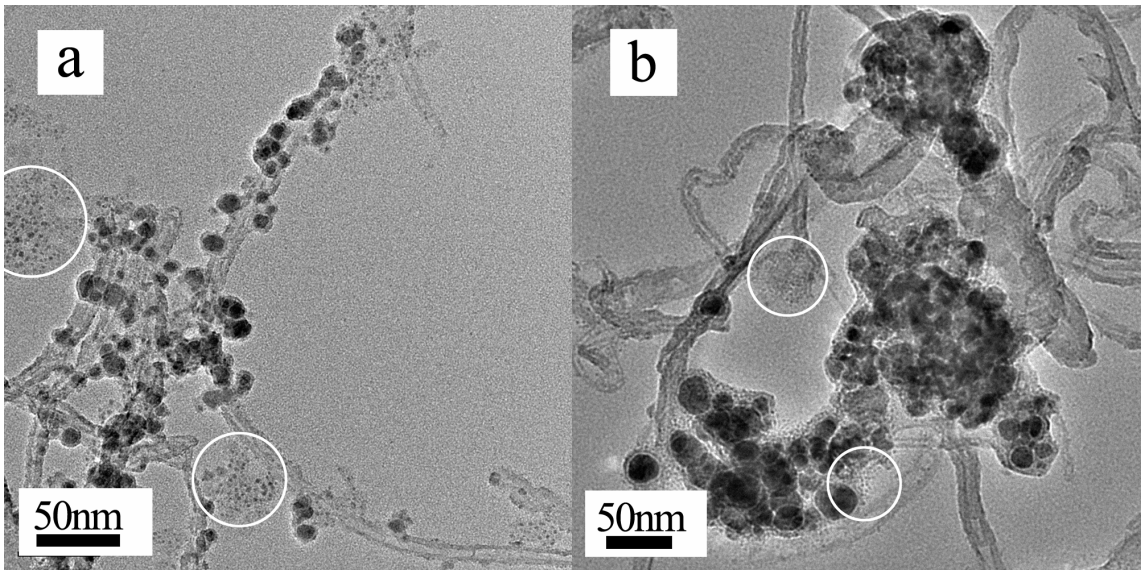

FIGURE S2. TEM images of spent catalysts tested at 300-460^{o}C (a) CoCe/CNTs, (b) CoCeB/CNTs

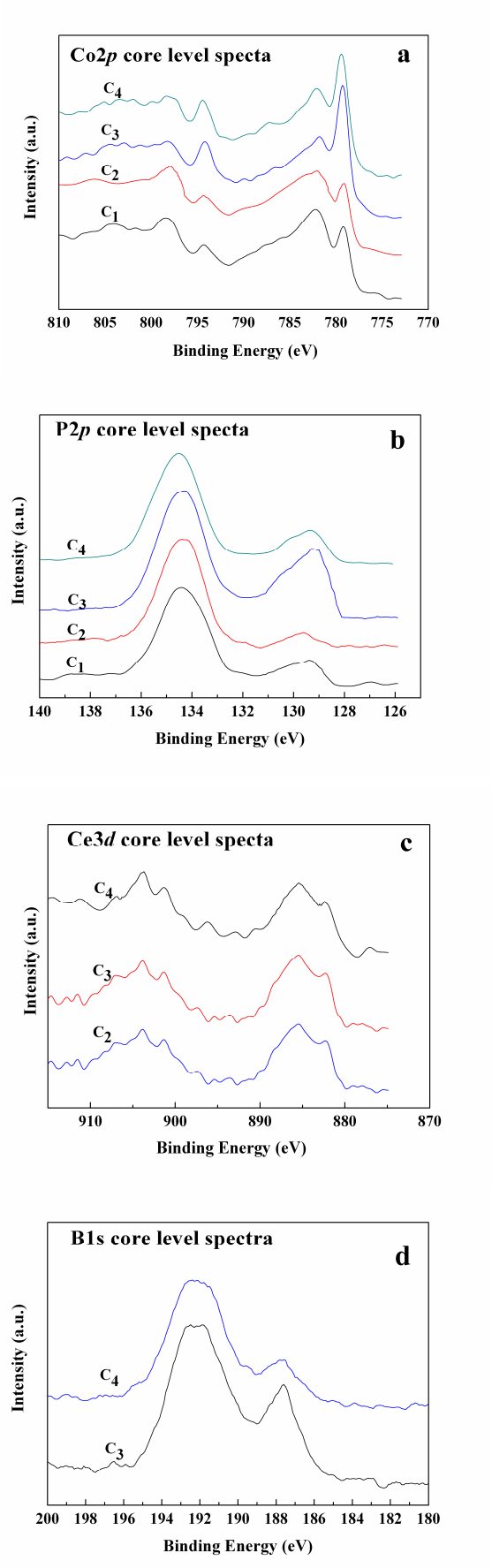

FIGURE S3. XPS spectra of spent catalysts in the energy levels of a: Co2p, b: P2p, c: Ce3d, d: B1s(C_1: Co/CNTs, C_2: CoCe/CNTs, C_3: CoCeB/CNTs, C_4: CoCeBP/CNTs).

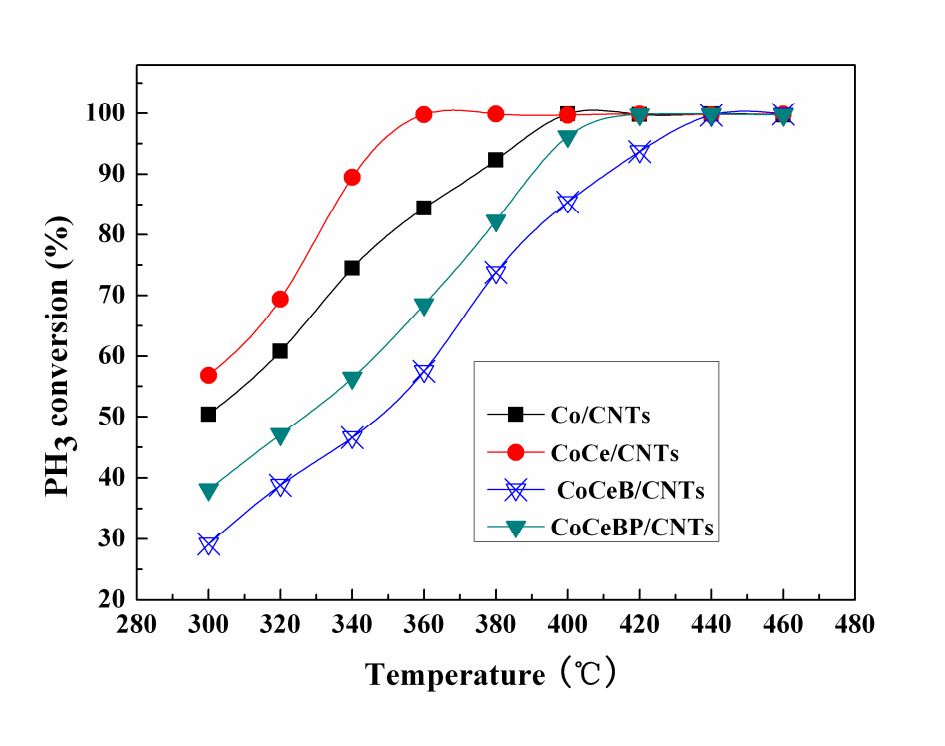

FIGURE S4. PH_3 decomposition under different temperatures($GHSV_{PH_3}$ =2520ml/h.g_{cat})

TABLE S1. Summary of XPS Spectra Parameters of Spent Ce-promoted Co/CNTs

catalyst	binding energy (eV)							
	Co $2p_{3/2}$		P $2p_{3/2}$		Ce $3d_{5/2}$		B 1s	
	Co^{2+}	CoP	PO_4^-	CoP	CeO_2	Ce_2O_3	B	BO_2^-
Co/CNTs	782.0	779.0	134.4	129.4	-	-	-	-
CoCe/CNTs	781.6	778.9	134.4	129.6	882.3	885.4	-	-
CoCeB/CNTs	781.8	779.1	134.3	129.3	882.3	885.3	187.5	192.4
CoCeBP/CNTs	781.9	779.2	134.5	129.4	882.4	885.5	187.7	192.5

TABLE S2. Phosphorus Yield Obtained from PH_3 Decomposition Reaction over Ce-Promoted Co/CNTs Catalysts[a]

catalyst	P actually collected(g)	P theoretical (g)[b]	P yield (%)[c]
Co/CNTs	21.1	24.68	85.53
CoCe/CNTs	26.55	29.88	88.86
CoCeB/CNTs	9.86	12.47	79.1
CoCeBP/CNTs	15.71	18.56	84.6

[a] $GHSV_{PH_3}$ =2520mL/h.g_{cat}, T=360 °C, reaction time=32h, catalyst mass=300mg; [b]calculated from PH_3 decomposition reaction: $2PH_3 \rightarrow 2P + 3H_2$; [c]the yield equals (P actually collected/P theoretical) x 100%.