Supporting Information

Pt-embedded-Co₃O₄ hollow structure as a highly efficient catalyst for toluene combustion

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1. Figure and Table captions.

Table S1 physical properties of different samples.

Sample	Pt contents (wt%)	S_{BET} (m^2/g)	V_{ads} (cm^3/g)	Pore Diameter (nm)
Co_3O_4	-	24.77	0.396	63.9
Pt@Co_3O_4	0.59	21.1	0.299	56.7
Pt/Co_3O_4	0.85	9.65	0.138	57.1

Table S2 XPS related results of different samples before reaction.

Sample	Surface Composition (at.%)			Fitted results		
	Pt	Co	O	Co^{3+}/Co^{2+}	Pt^0/Pt_{total}	O_{ads}/O_{total}
Co_3O_4	-	33.0	67.0	0.87	/	0.39
Pt@Co_3O_4	0.55	35.0	64.45	0.98	0.57	0.33
Pt/Co_3O_4	0.89	27.6	71.51	1.02	0.28	0.40

Table S3 XPS related results of different samples after one reaction.

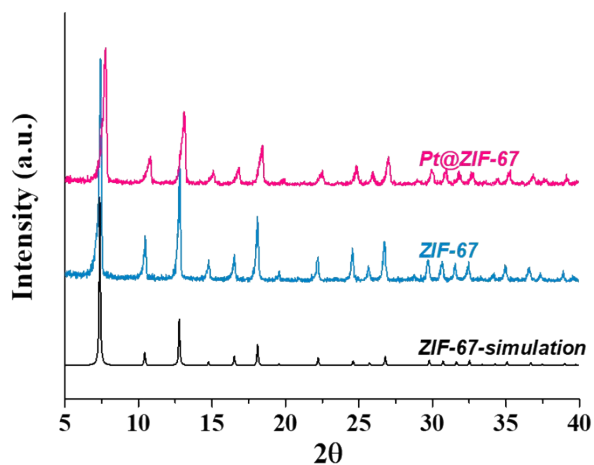| Sample	Surface Composition (at.%)			Fitted results		
	Pt	Co	O	Co^{3+}/Co^{2+}	Pt^0/Pt_{total}	O_{ads}/O_{total}
Co_3O_4	-	32.8	67.2	0.96	/	0.31
Pt@Co_3O_4	0.50	34.85	64.65	1.05	0.39	0.39
Pt/Co_3O_4	0.92	35.20	63.88	0.96	0.16	0.43

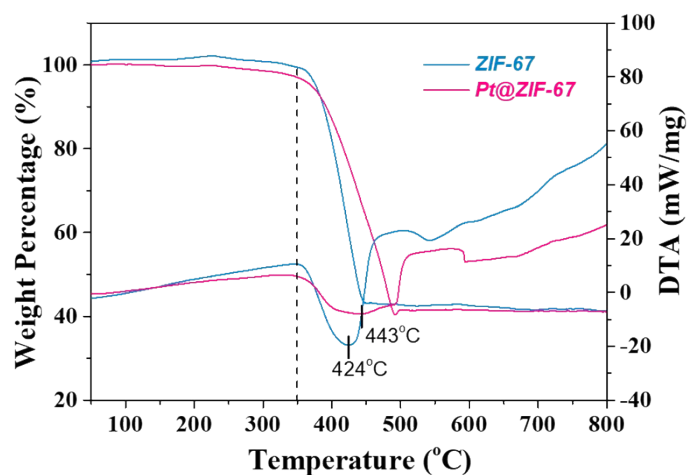**Fig. S1** XRD patterns of ZIF precursors.

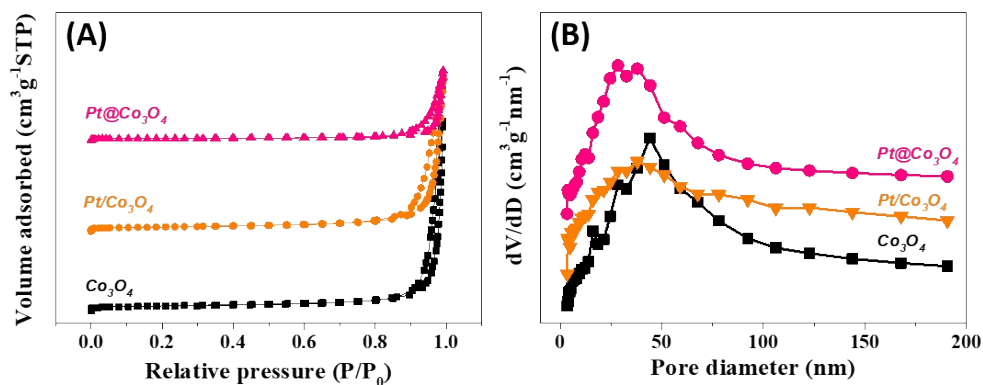**Fig. S2** TGA curves of ZIF-67 and Pt@ZIF-67 in air atmosphere.

Fig. S3 (A) N_2 sorption isotherms and (B) the pore-size distribution of different samples.
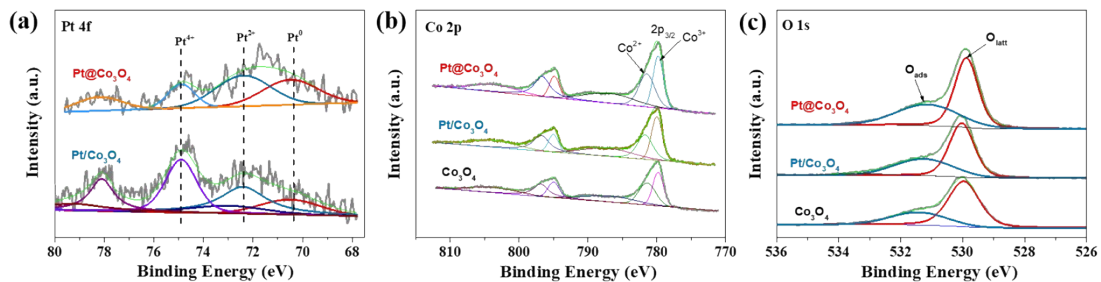
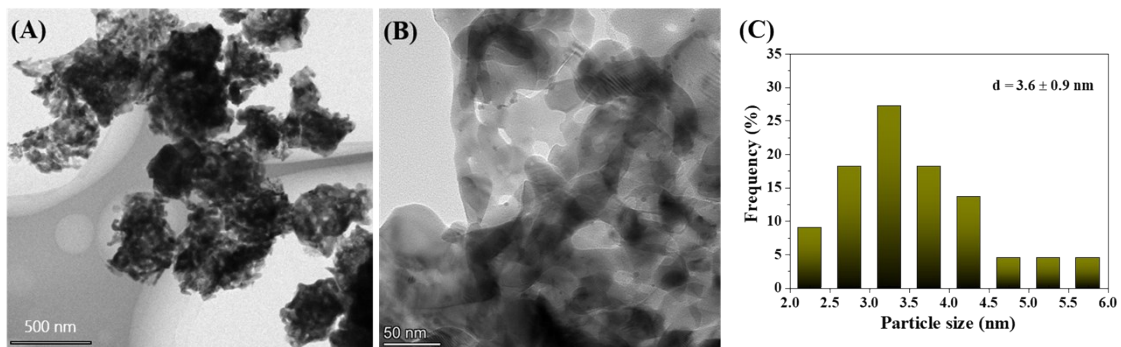**Fig. S4** (a) Pt 4f, (b) Co 2p and (c) O 1s XPS spectra of different samples after one reaction.

Fig. S5 TEM images and particle size distribution of the used Pt@Co$_3$O$_4$ catalyst after stability test.