

Supplementary Data

Zn-Co@N-Doped Carbon Derived from ZIFs for High-Efficiency Synthesis of Ethyl Methyl Carbonate: the Formation of ZnO and the Interaction between Co and Zn

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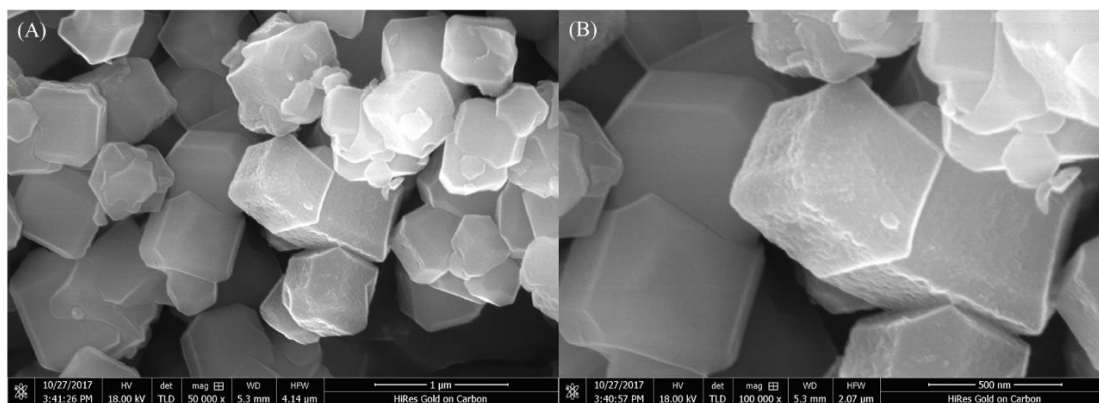


Figure 1. SEM images of Co/Zn-ZIF.

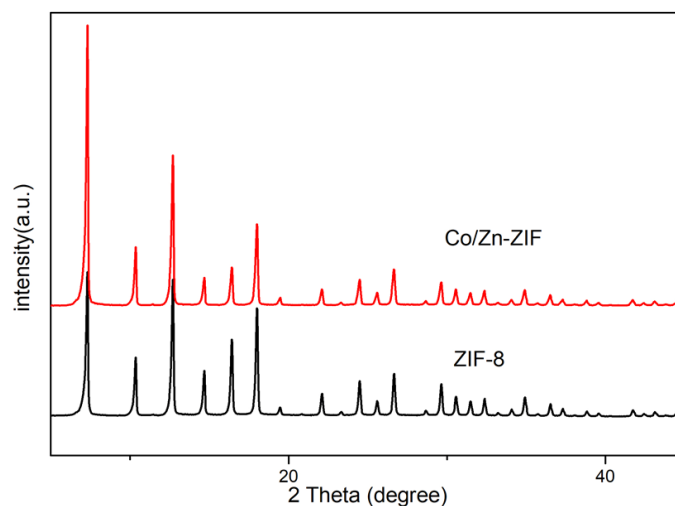


Figure S2. XRD patterns of different ZIF materials.

Table S1. Particle sizes calculated from XRD.

Entry	Catalyst	$d_M(\text{nm})$	
		d_{ZnO}	d_{Co}
1	Co/Zn-ZIF	--	--
2	ZnO/NC-600	27.38	--
3	ZnCo _{0.8} /NC-600	29.25	--
4	ZnCo/NC-600	29.97	21.63
5	ZnCo _{1.2} /NC-600	30.19	22.55

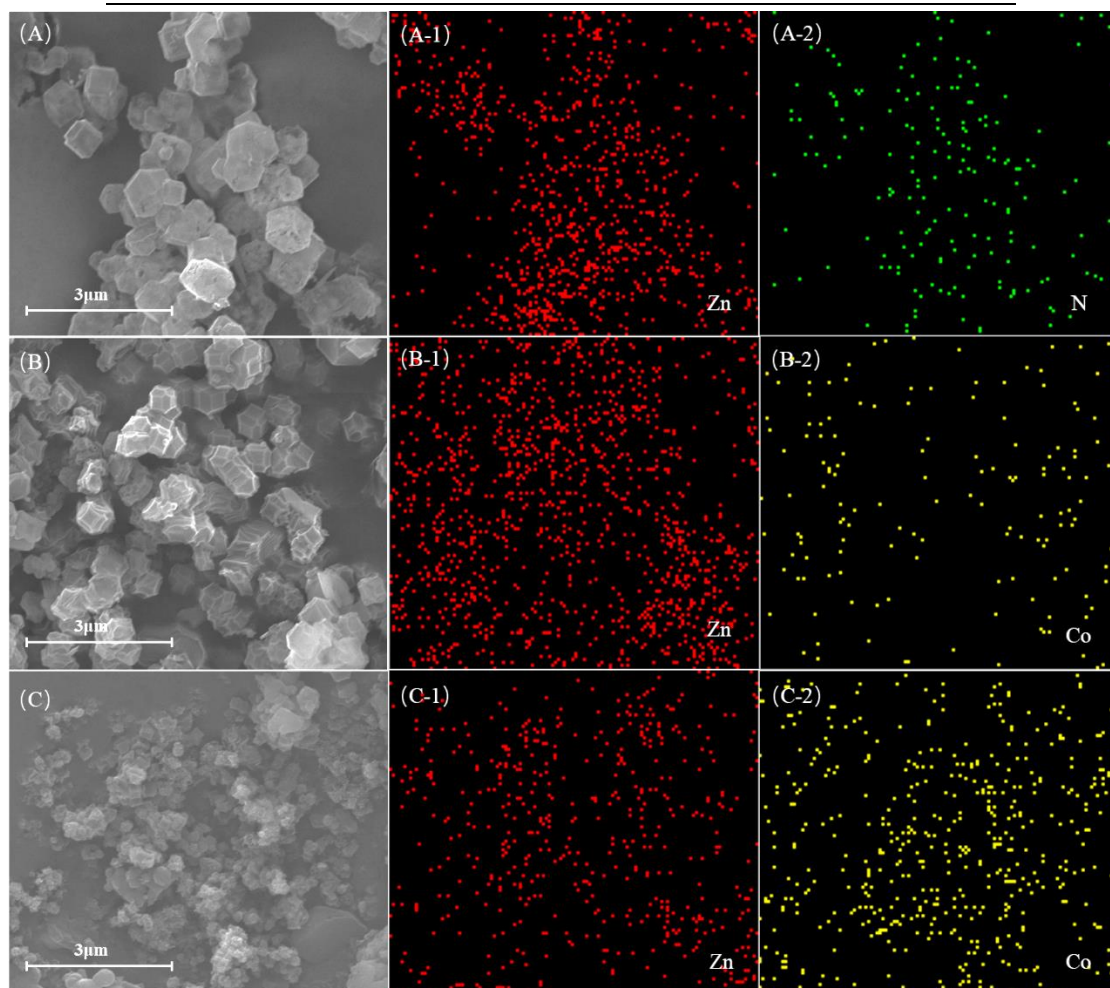


Figure S3. SEM/EDX mapping of: (A) ZnO/NC-600: (A-1) the dispersion of Zn; (A-2) the dispersion of N; (B) ZnCo/NC-600: (B-1) the dispersion of Zn; (B-2) the dispersion of Co; (C) samples calcined from mechanical mixture of ZIF-67 and ZIF-8: (C-1) the dispersion of Zn; (C-2) the dispersion of Co.

Table S2. ICP results of the materials.

Entry	Catalyst	Zn (wt%)	Co (wt%)	Other elements (wt%)
1	Co/Zn-ZIF	47.54	1.87	50.59
2	ZnCo/NC-600 ^a	44.92	1.72	53.56
3	ZnCo/NC-600 ^b	23.71	0.96	75.33

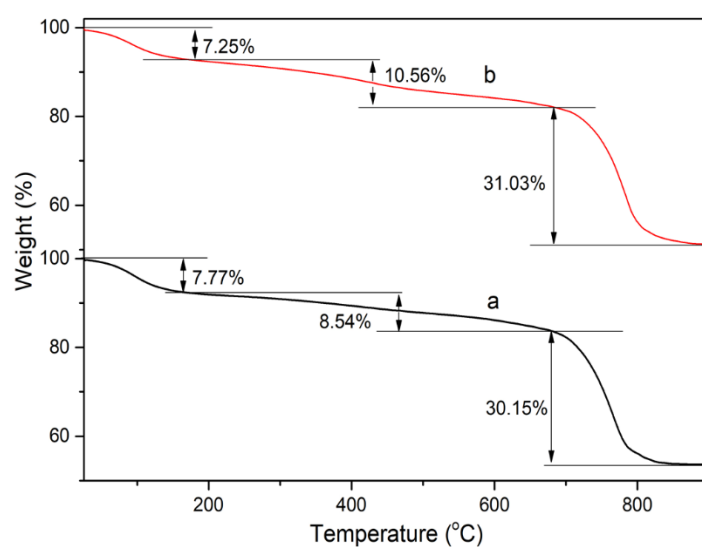
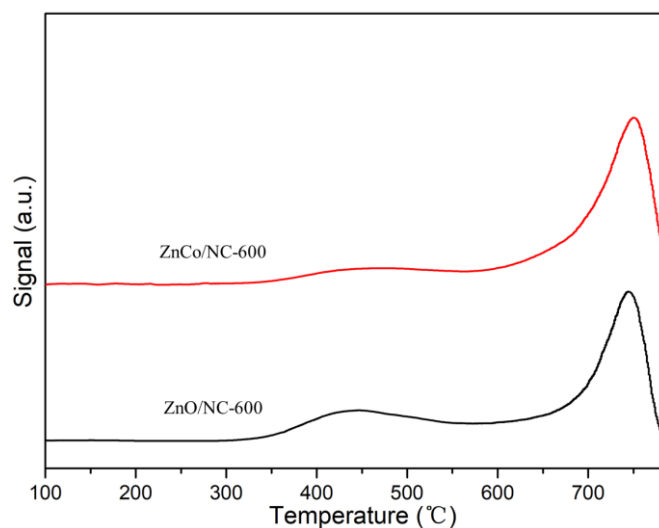
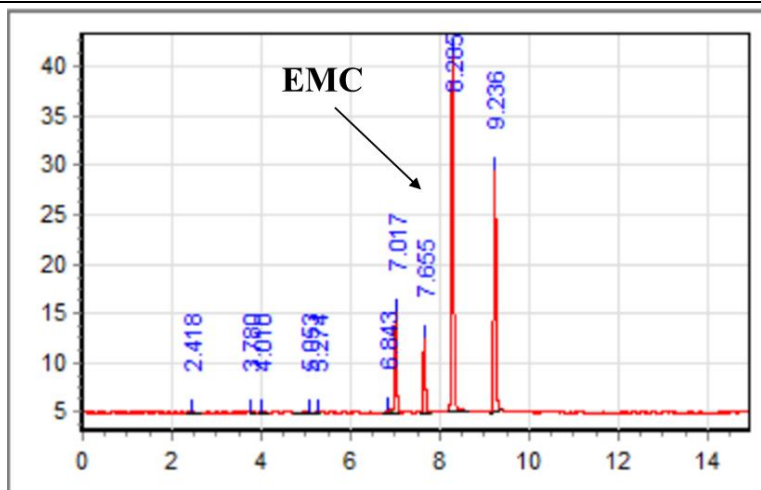
^aFresh catalyst.^bSpent catalyst after 5 cycles.**Figure S4.** The TG analysis of ZnCo/NC-600 catalysts: (a) fresh, (b) spent.**Figure S5.** NH₃-TPD profiles of ZnO/NC-600 and ZnCo/NC-600.

Table S3. Results of CO₂-TPD over catalysts.

Entry	Catalysts	Peak area of basic sites (a.u.)		
		Weak	Strong	Total
1	ZnO/NC-600	280.51		280.51
2	ZnCo _{0.8} /NC-600	245.78	134.60	380.38
3	ZnCo/NC-600	345.29	140.56	485.85
4	ZnCo _{1.2} /NC-600	328.62	137.46	466.08

**Figure S6.** The GC analysis of liquid products.

The reaction conditions: n(DMC):n(DEC)=1:1, 100 °C, 7 h, 1 wt% catalyst amount.

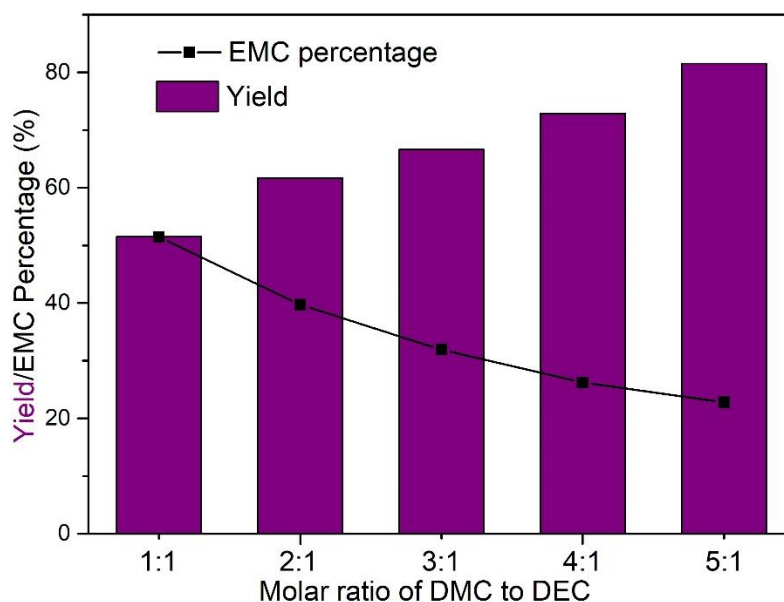


Figure S7. Effect of molar ratio of DMC to DEC: EMC yield; EMC molar percentage after reaction.