Electronic Supplementary Material (ESI) for Catalysis Science & Technology.

Transformation of γ-valerolactone to 1,4-pentanediol and 2-methyltetrahydrofuran over Zn-promoted Cu/Al_2O_3 catalyst

(Supporting information)

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Table S1. Amounts of Cu and Zn species loaded in the Al_2O_3-supported catalysts measured by ICP

Entry	Catalyst [a]	Loading		
		Cu (wt.%) [b]	Zn (wt.%) [b]	Zn/Cu (-) [c]
1	Cu/Al_2O_3	9.9	/	/
2	$Zn_{0.5}Cu/Al_2O_3$	9.5	4.5	0.4
3	$Zn_{1.0}Cu/Al_2O_3$	8.4	7.9	0.8
4	$Zn_{1.5}Cu/Al_2O_3$	7.9	10.7	1.3
5	$Zn_{2.0}Cu/Al_2O_3$	6.6	13.2	1.9

a. The nominal Cu loading is 10% (Cu/Al_2O_3 in weight).

b. Cu/Al_2O_3, Zn/Al_2O_3 in weight measured by ICP.

c. Molar ratio

Table S2. The amounts of Cu and Al species in the fresh Cu/Al_2O_3 and used Cu/Al_2O_3 catalysts measured by ICP

Entry	Catalyst	Amount	
		Cu (wt.%)[a]	Al (wt.%)[b]
1	Cu/Al_2O_3-fresh	9.9	47.8
2	Cu/Al_2O_3-used	9.4	47.9

a. The nominal Cu loading is 10% (Cu/Al_2O_3 in weight).

b. The amount of Al of 10%Cu/Al_2O_3 in weight measured by ICP.

Reaction conditions: 0.1 g catalyst, 10.0 mL 1,4-dioxane, 2.0 mmol GVL, 200℃, 4 MPa H_2, 3 h.

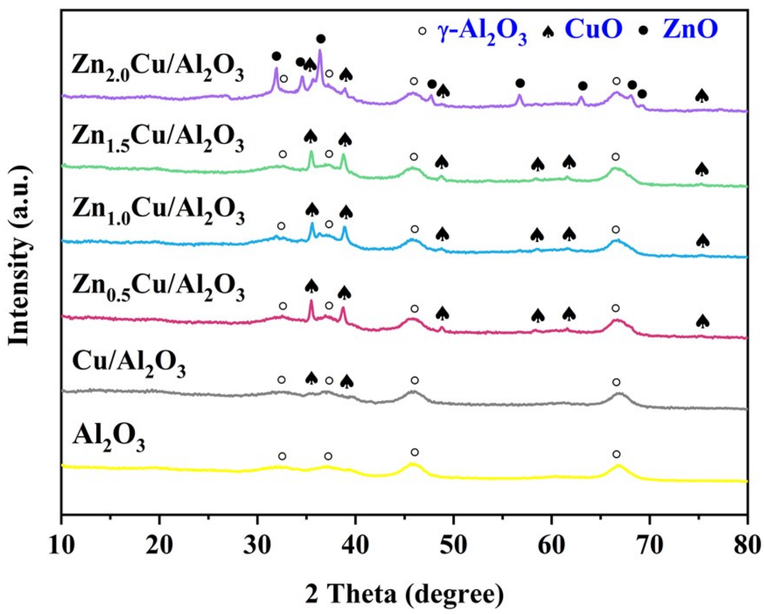

Figure S1. XRD patterns of the calcined γ-Al_2O_3 support and Cu/Al_2O_3 and Zn_xCu/Al_2O_3 with Zn/Cu molar ratios of 0.5, 1.0, 1.5, and 2.0, respectively.

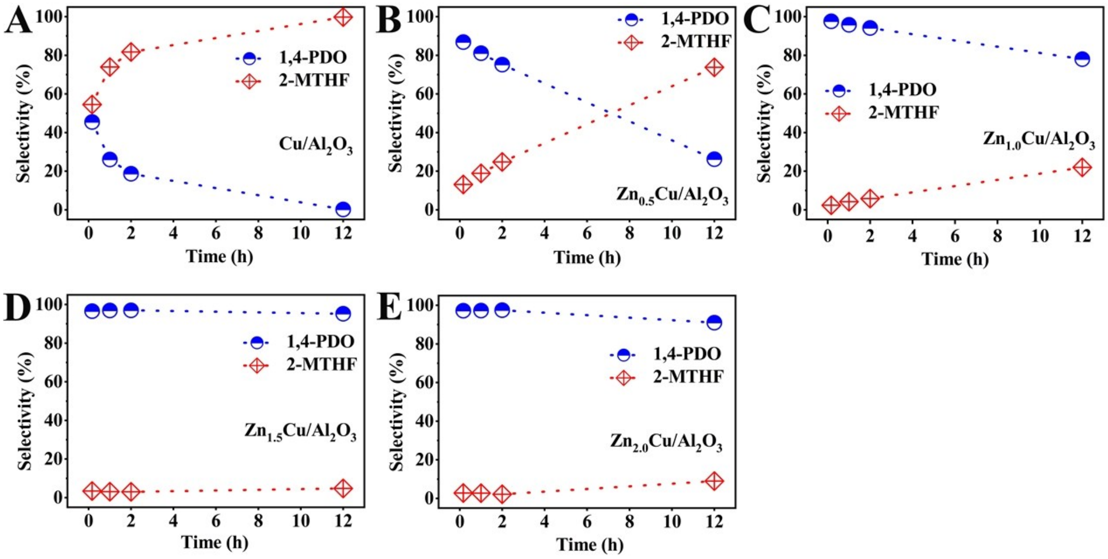

Figure S2. The change of the product selectivity with time for the (A) Cu/Al_2O_3, (B) $Zn_{0.5}Cu/Al_2O_3$, (C) $Zn_{1.0}Cu/Al_2O_3$, (D) $Zn_{1.5}Cu/Al_2O_3$, and (E) $Zn_{2.0}Cu/Al_2O_3$ catalysts. The data were collected at reaction time of 1/6, 1, 2, and 12 h, respectively. Reaction conditions: 0.1 g catalyst, 10.0 mL 1,4-dioxane, 2.0 mmol GVL, 200℃, 4 MPa H_2.

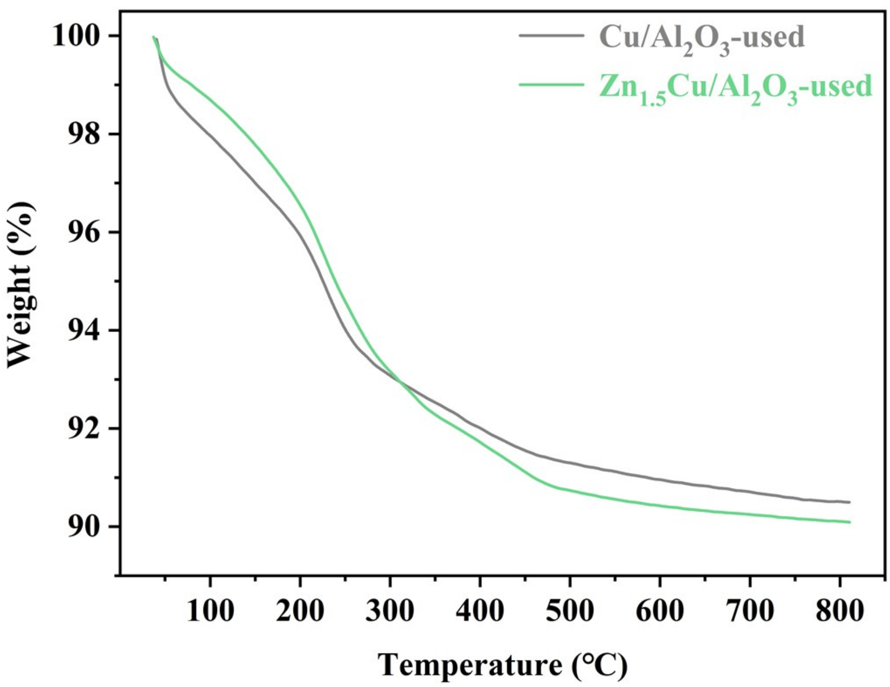

Figure S3. TGA of the used Cu/Al_2O_3 and $Zn_{1.5}Cu/Al_2O_3$ catalysts.

Reaction conditions: 0.1 g catalyst, 10.0 mL 1,4-dioxane, 2.0 mmol GVL, 200℃, 4 MPa H_2, 3 h.

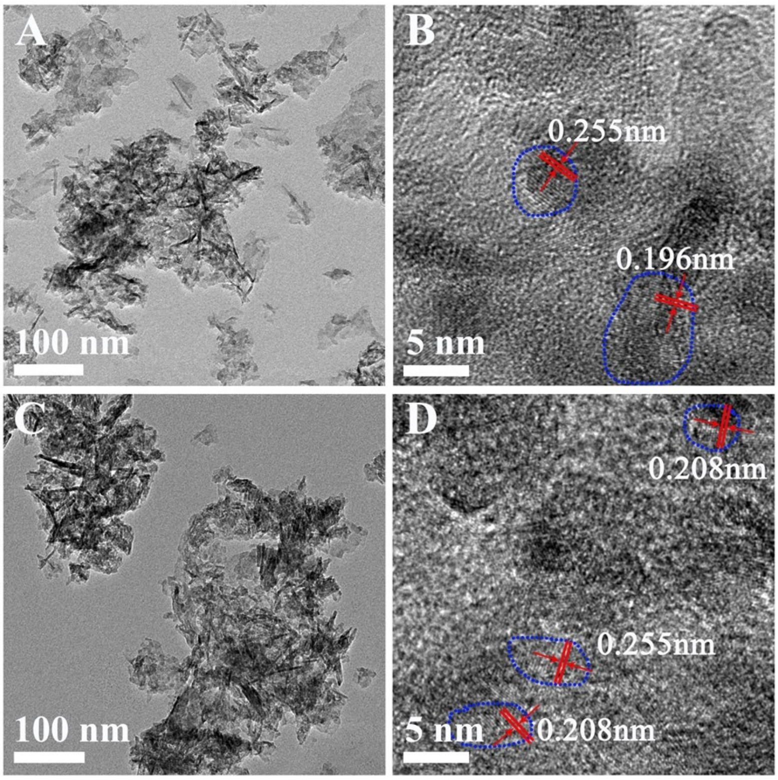

Figure S4. TEM images of the used Cu/Al_2O_3 (A, B) and $Zn_{1.5}Cu/Al_2O_3$ (C, D) catalysts. The blue rings and red parallel lines showed the lattice of the nanoparticles.