

Supporting Information

Surface gallium oxide hydroxide species adsorbing carbon dioxide to enhance the photocatalytic activity of a silver-loaded calcium titanate for carbon dioxide reduction with water

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Table S1. Actual amounts in the prepared samples determined by XRF analysis.

Entry	Sample	Loading amount of Ag (wt %)	Loading amount of Ga (wt%)
1	Ag(1.0)/CTO	0.84	-
2	GaOOH(1.0)/CTO	-	0.92
3	Ag(1.0)/GaOOH(1.0)/CTO	0.85	0.91

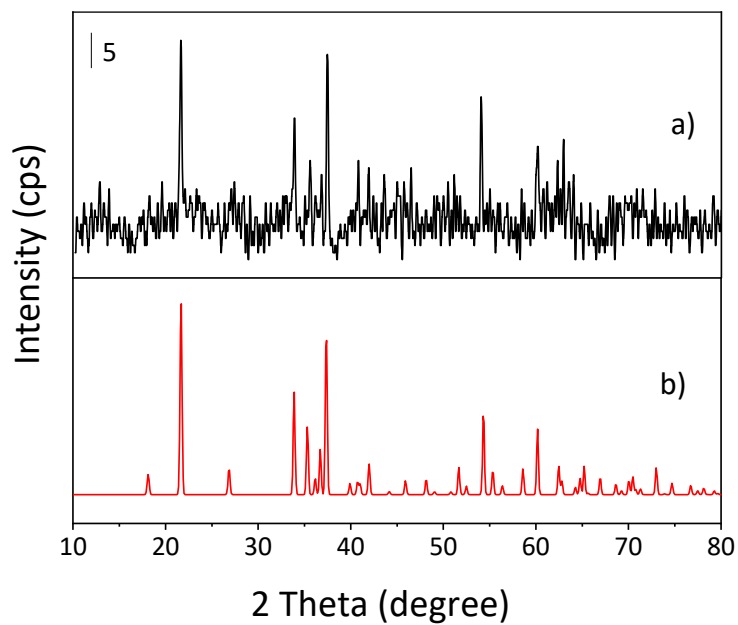


Figure S1. XRD patterns of (a) the homemade GaOOH, and (b) standard database of GaOOH (ICSD# 409671).

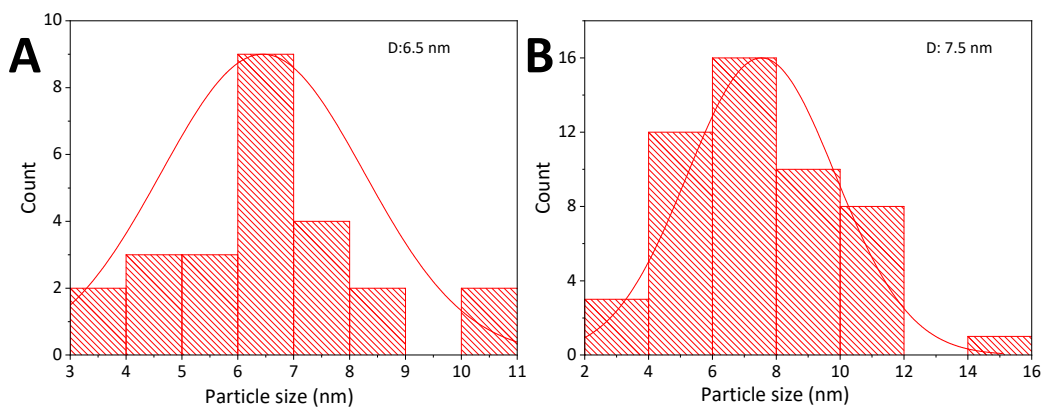


Figure S2. The Ag particle size of [A] Figure 3 B and [B] Figure 3 D.

Table S2 SSA of the bare CTO and GaOOH(1.0)/CTO samples.

Entry	Sample	Specific surface area ^a / m ² g ⁻¹
1	Bare CTO	2.2
2	GaOOH(1.0)/CTO	2.4

^a Estimated by a BET method from N₂ adsorption experiment at 77 K.

Table S3. Results of water splitting over bare CTO and GaOOH(1.0)/CTO samples.

Entry	Sample	Production rate (μmol h ⁻¹) ^a	
		H ₂	O ₂
1	Bare CTO	0.3	0.1
2	GaOOH(1.0)/CTO	0.9	0.4
3	Ag(1.0)/GaOOH(1.0)/CTO	0.5	0.2

^a The production rates were measured after 3.5 h of photoirradiation.

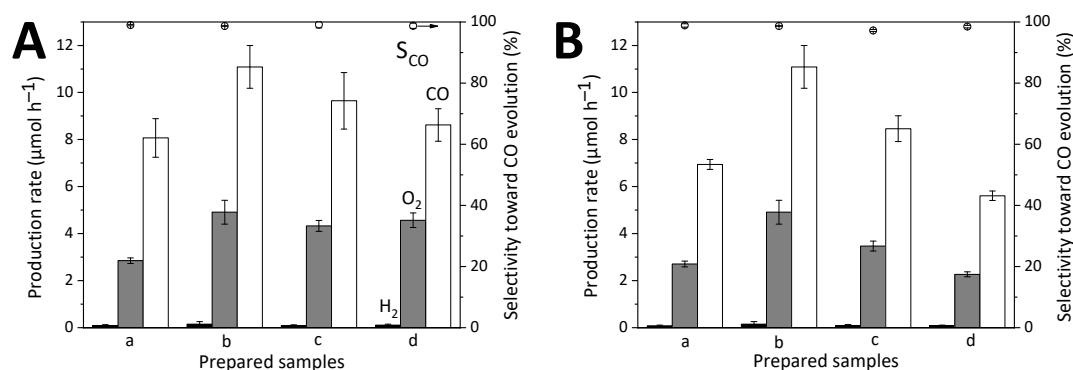


Figure S3. Results of the photocatalytic reaction tests of CO₂ reduction with H₂O over [A] Ag(1.0)/GaOOH(y)/CTO samples, where the y wt% was (a) 0.5, (b) 1.0, (c) 3.0, and (d) 5.0; [B] Ag(x)/GaOOH(1.0)/CTO samples, where the x wt% was (a) 0.5, (b) 1.0, (c) 3.0, and (d) 5.0.

Table S4. Results of the first and second runs in the photocatalytic CO₂ reduction with the Ag(1.0)/GaOOH(1.0)/CTO sample.

Run	Sample weight (g)	Production rate (μmol h ⁻¹) ^a			S _{CO} (%)
		H ₂	O ₂	CO	
1 st	0.3	0.2	4.9	11.1	98.7
2 nd	0.28	0.1	3.6	8.2	98.7

^a The production rates were measured after 3.5 h of photoirradiation.

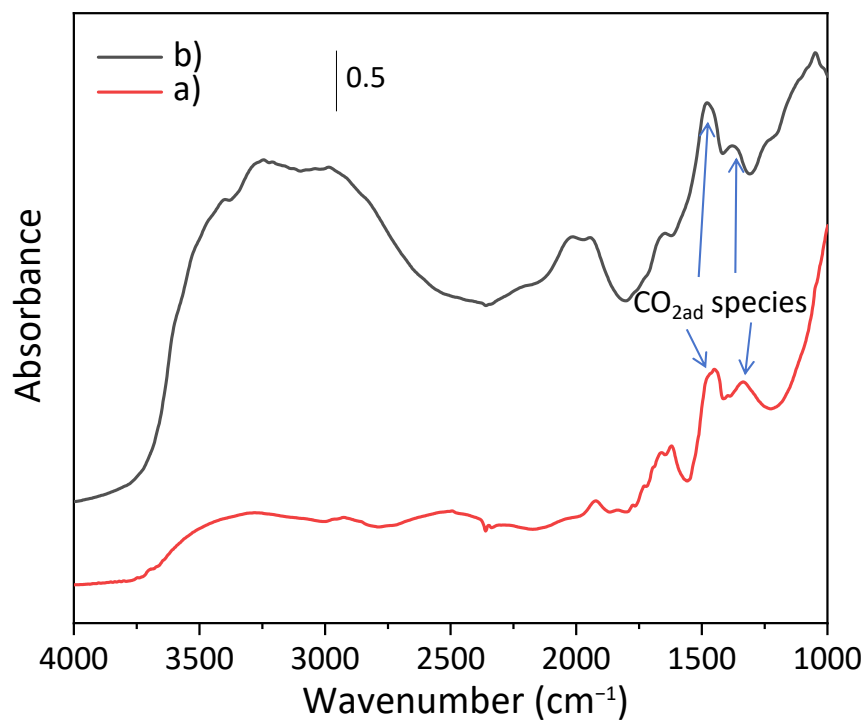


Figure S4. FT-IR spectra of the treated samples, (a) GaOOH(0.5)/CTO and (b) GaOOH(1.0)/CTO, which were photoirradiated in a 1.0 M NaHCO_3 solution with a bubbling CO_2 flow, followed by filtering, and drying at room temperature.

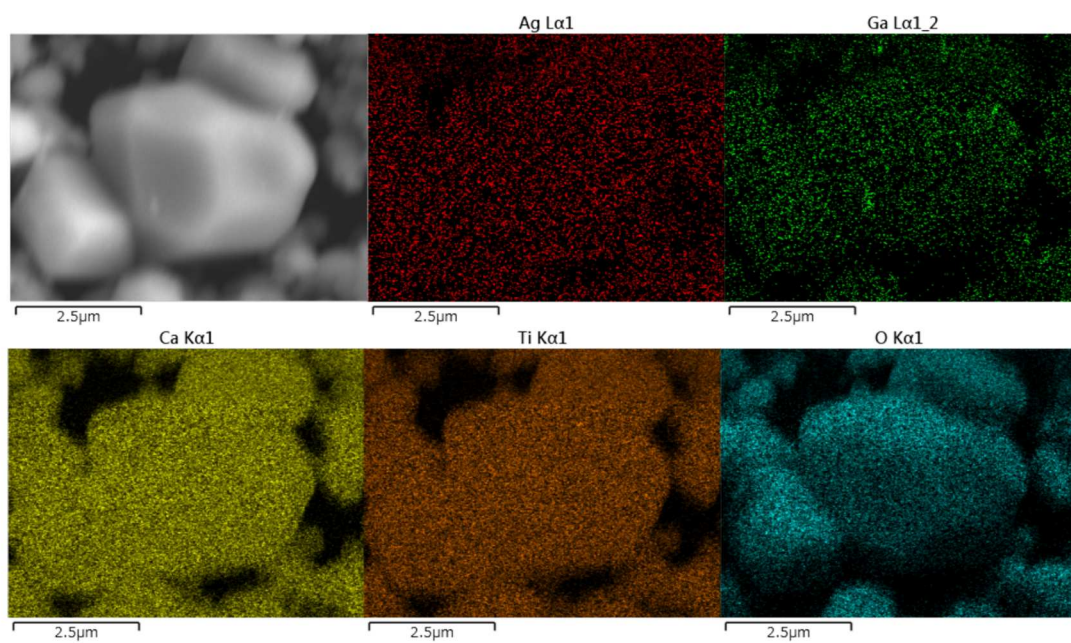


Figure S5. SEM-EDS of the Ag(1.0)/GaOOH(1.0)/CTO sample used for the photocatalytic reaction test for 3.5 h.