Supporting Information

for

In situ Hydrothermal Etching Fabrication of $CaTiO_3$ on TiO_2 Nanosheets for Heterojunction Effect to Enhance CO_2 Adsorption and Photocatalytic Reduction

Jinjin Lin, Jiangshan Hu, Chengwei Qiu, Huijuan Huang, Lu Chen, Yanyu Xie, Zizhong Zhang*, Huaxiang Lin and Xuxu Wang*

State Key Laboratory of Photocatalysis on Energy and Environment, Research Institute of Photocatalysis, College of Chemistry, Fuzhou University, P. R. China

E-Mail: z.zhang@fzu.edu.cn; xwang@fzu.edu.cn

Tel: +86-591-22865859

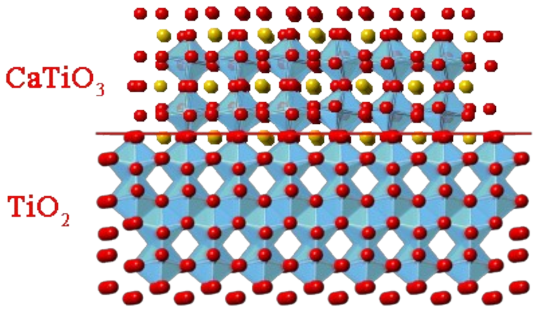

Fig. S1 The possible structure of $CaTiO_3/TiO_2$ composite.

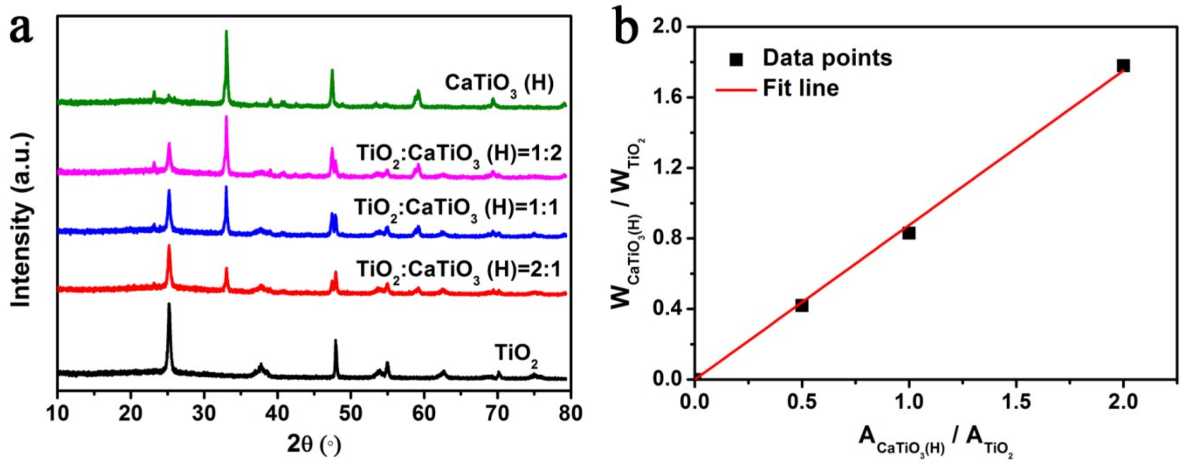

Fig. S2 (a) XRD spectra of mechanical mixture with 1:2, 1:1 and 2:1 ratio of $CaTiO_3$ (H) to TiO_2. (b) Plot of area ratios of the 2θ at 33.06° for $CaTiO_3$ (H) (112) to the 2θ at 25.28° for TiO_2 (101) ($A_{CaTiO_3(H)}/ A_{TiO_2}$) versus weight ratios of $CaTiO_3$ (H) to TiO_2 ($W_{CaTiO_3(H)}/W_{TiO_2}$).

Table S1. The $CaTiO_3$ (H) content of the $CaTiO_3/TiO_2$ samples.

	$CaTiO_3/TiO_2$-0.4g	$CaTiO_3/TiO_2$-0.3g	$CaTiO_3/TiO_2$-0.2g	$CaTiO_3/TiO_2$-0.1g
$A_{CaTiO_3(H)}/ A_{TiO_2}$	0.098	0.153	0.276	0.762
$W_{CaTiO_3(H)}/W_{TiO_2}$	8.6 %	13.4 %	24.2 %	66.7 %

The weight fraction of $CaTiO_3$ (H), $W_{CaTiO_3(H)}$, can be estimated by semiquantitative analysis of the phase composition of the samples by XRD spectroscopy (shown in Fig. S1). And the weight fraction of $CaTiO_3$ (H) of the $CaTiO_3/TiO_2$ samples could be worked out from the XRD peak intensities using the following formula:

$$W_{CaTiO_3(H)}/W_{TiO_2} = 0.87619 * (A_{CaTiO_3(H)}/ A_{TiO_2})$$

Where $A_{CaTiO_3(H)}$ and A_{TiO_2} represent the X-ray integrated intensities of $CaTiO_3$ (H) (112) and TiO_2 (101) diffraction peaks, respectively. To estimate the weight fraction of the $CaTiO_3$ (H) in the samples by XRD spectroscopy, pure $CaTiO_3$ (H) and TiO_2 were mixed mechanically at the given weight ratios and ground carefully to mix sufficiently. Fig. S1a displays the XRD spectra of the mechanical mixture with 1:2, 1:1 and 2:1 ratio of $CaTiO_3$ (H) to TiO_2. The relationship between the area ratios of the 2θ at 33.06˚ for $CaTiO_3$ (H) (112) to the 2θ at 25.28° for TiO_2 (101) ($A_{CaTiO_3(H)}/ A_{TiO_2}$) and the weight ratios of $CaTiO_3$ (H) to TiO_2 ($W_{CaTiO_3(H)}/W_{TiO_2}$) is plotted in Fig. S1b. It could be seen that a linear relationship between the band area ratios and the weight ratios of $CaTiO_3$ (H) to TiO_2 in the mixture is obtained. The anatase content in these samples (shown in details in Table S1) was ca. 13.4 % by calculation.

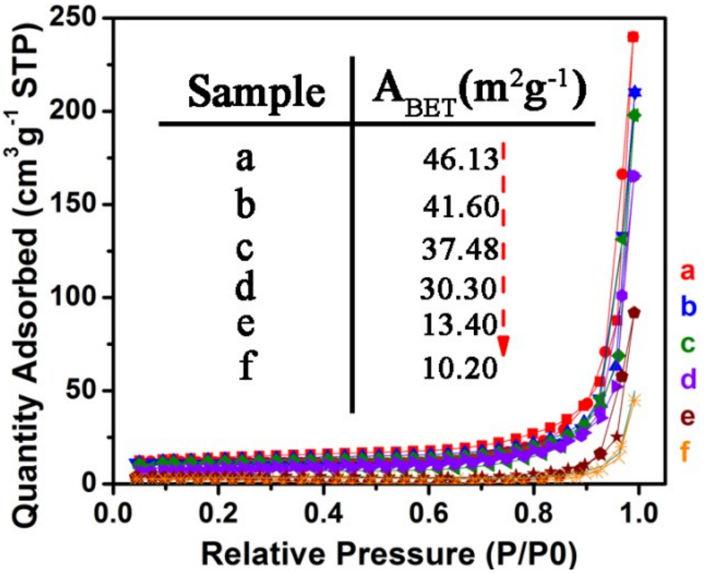

Fig. S3 The N_2 adsorption-desorption isotherms of TiO_2 (a), 8.6%$CaTiO_3/TiO_2$ (b), 13.4%$CaTiO_3/TiO_2$ (c), 24.2%$CaTiO_3/TiO_2$ (d), 66.7%$CaTiO_3/TiO_2$ (e) and $CaTiO_3$ (H) (f) samples.

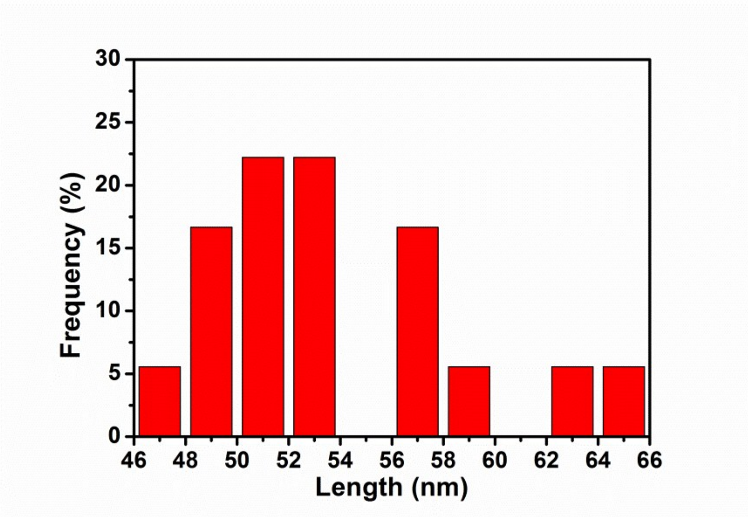

Fig. S4 The statistics of the side length of TiO_2.

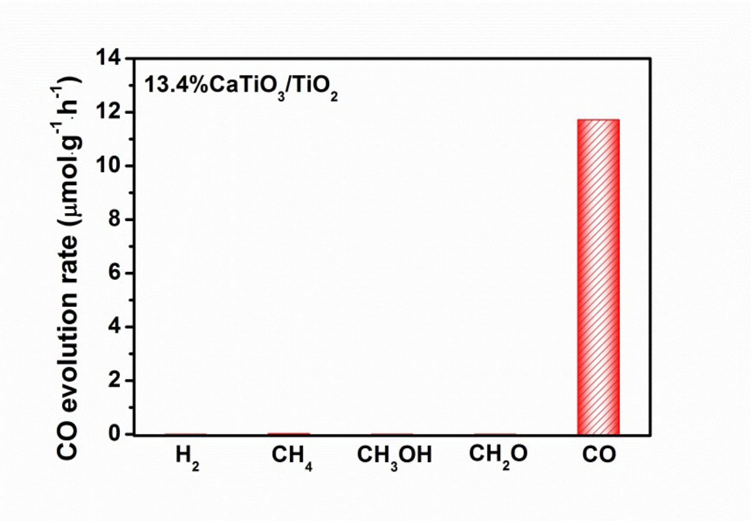

Fig. S5 The products of 13.4%$CaTiO_3/TiO_2$ sample on the photocatalytic CO_2 reduction.

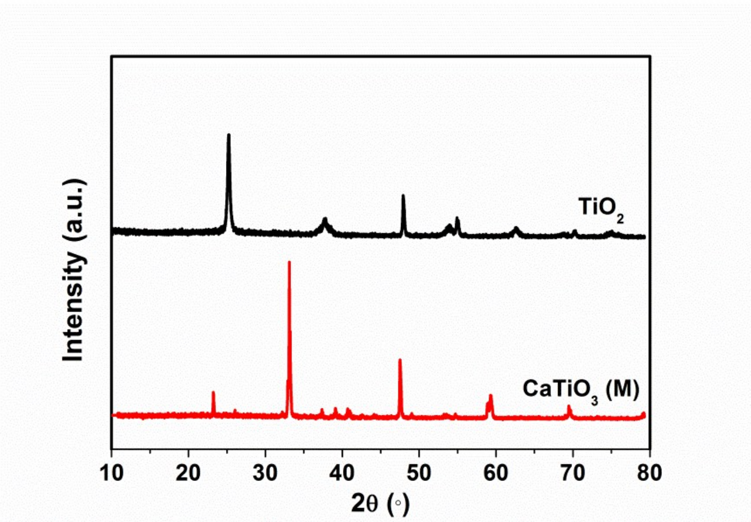

Fig. S6 The XRD spectra of TiO_2 and $CaTiO_3$ (M).

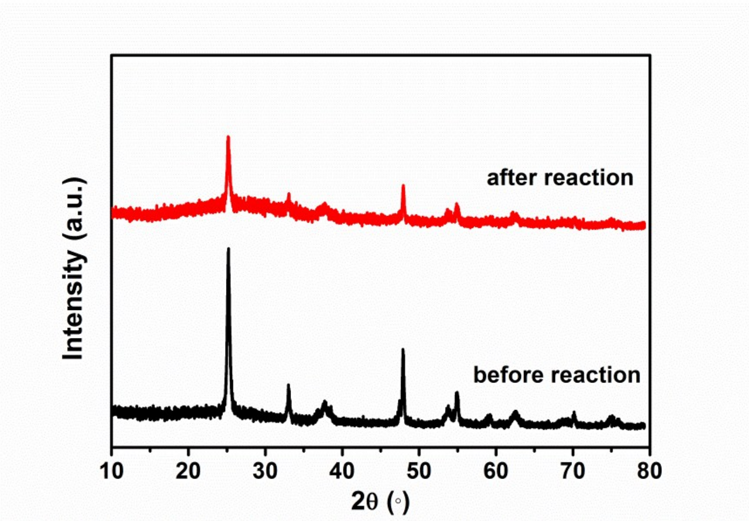

Fig. S7 The XRD spectra of 13.4%$CaTiO_3/TiO_2$ before and after reaction.

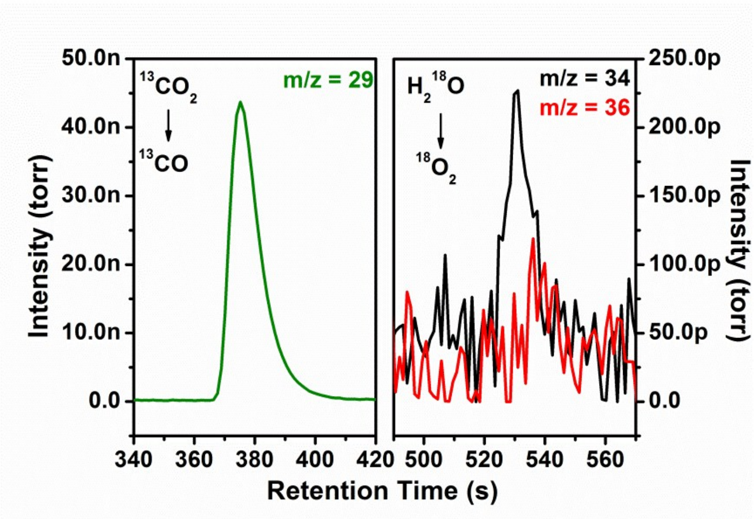

Fig. S8 The isotopic experiments of 13.4%$CaTiO_3/TiO_2$.

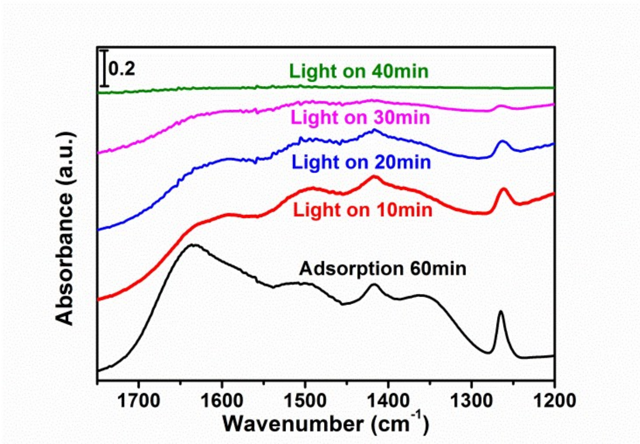

Fig. S9 The function of time of 13.4%$CaTiO_3/TiO_2$ irradiated by UV-visible light.

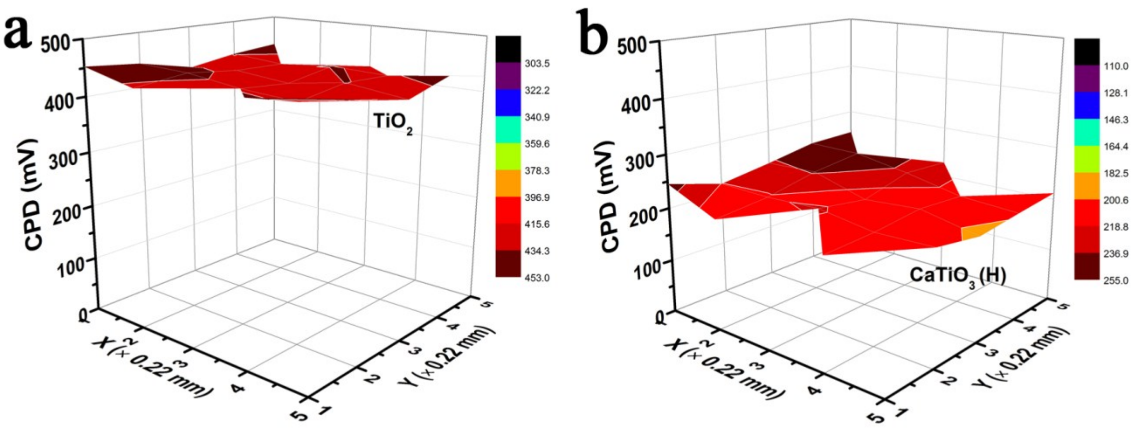

Fig. S10 CPDs of TiO_2 (a) and $CaTiO_3$ (H) (b) surface at scan measurement over 1.21 mm^2 area.