Journal Name

ARTICLE

Electronic Supplementary Information

Visible light-driven methanol dehydrogenation and convert into 1, 1-dimethoxymethane over non-noble metal photocatalyst under acid condition

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Experimental section

1. The preparation of 1wt% CdS@MoS_2

Just like the procedure of the preparation of CdS@NiMoS, the prepared CdS NRs sample (0.6 g), $Na_2MoO_4 \cdot 2H_2O$ (3 mg) and L-cystiene (4 mg) were dispersed into 30 mL distilled water by sonication for 10 min. After stirring for another 30 min, the obtained mixture was transferred to a 50 mL Teflon-lined stainless steel autoclave, and reacted at 200 °C for 24 hours. The as-prepared products were separated by centrifugation, followed by washing with distilled water and ethanol several times. After being dried at 60 °C overnight in a vacuum, the yellow green CdS@MoS_2 products were obtained.

2. The preparation of 1wt% CdS@NiS

To keep the same prepared conditions of all samples, the synthesis of 1wt% CdS@NiS like the ways above. The pure as-prepared CdS nanorods (0.6g), $NiCl_2 \cdot 6H_2O$ (5 mg) and L-cystiene (4 mg) were dispersed into 30 mL distilled water by sonication for 10 min. After stirring for another 30 min, the obtained mixture was transferred to a 50 mL Teflon-lined stainless steel autoclave, and reacted at 200 °C for 24 hours. The as-prepared products were separated by centrifugation, followed by washing with distilled water and ethanol several times. The products were obtained after being dried at 60 °C overnight in a vacuum.

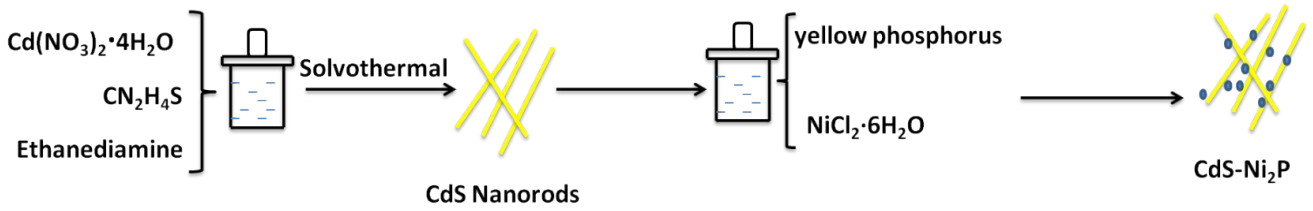

Fig. S1 Schematic illustration of the synthetic process of the CdS/Ni_2P hybrid photocatalyst.

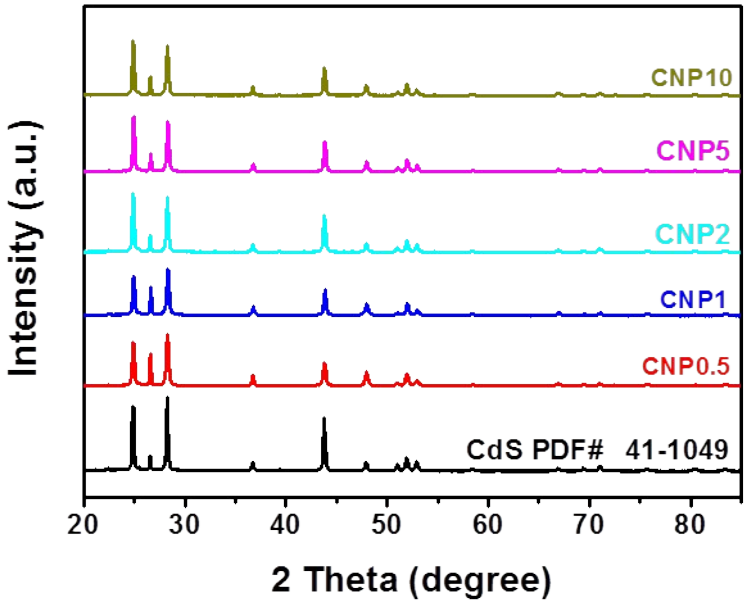

Fig. S2 X-ray diffraction patterns for CdS NRs and CdS/Ni_2P samples loading with various amounts of Ni_2P.

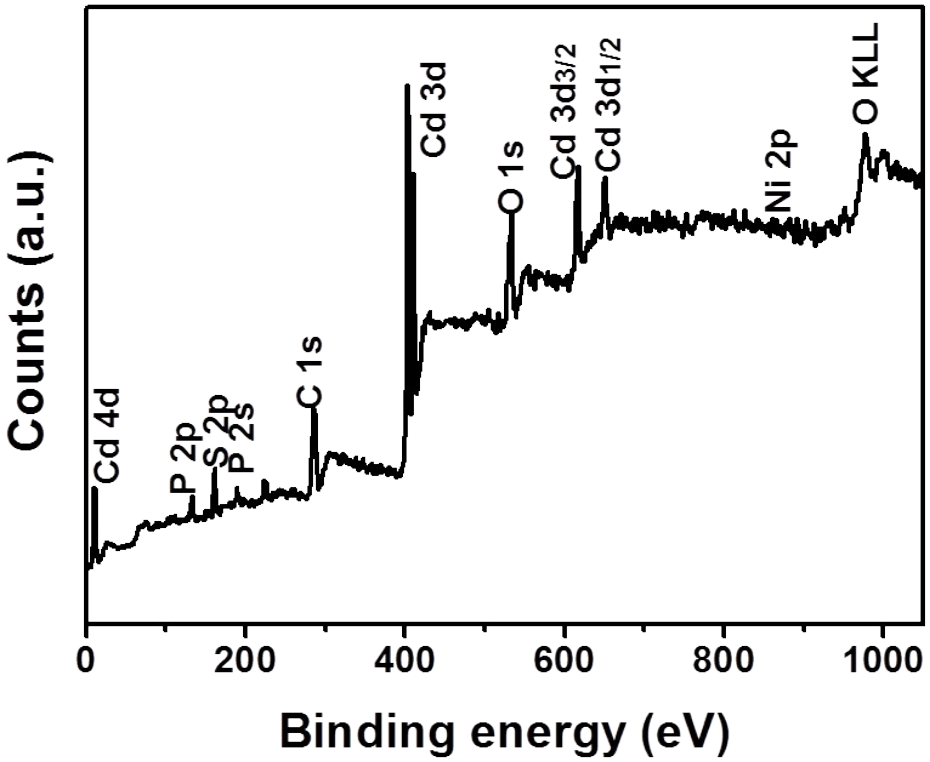

Fig. S3 XPS survey scan of CdS/Ni_2P-1wt% sample.

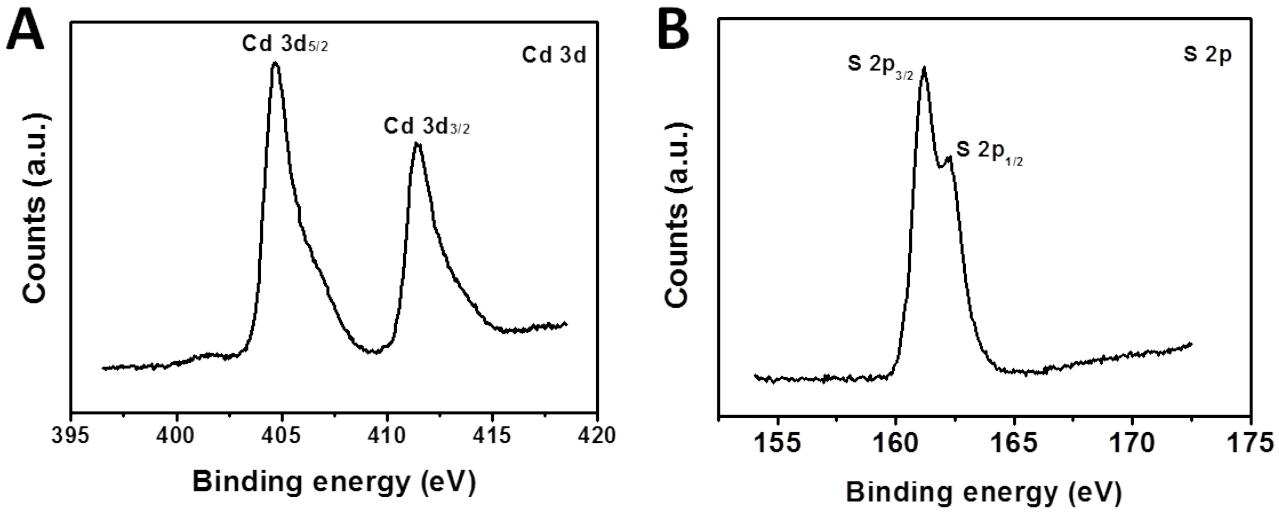

Fig. S4 XPS spectrums of Cd 3d (a), S 2p (b) in the samples of CdS/Ni_2P.

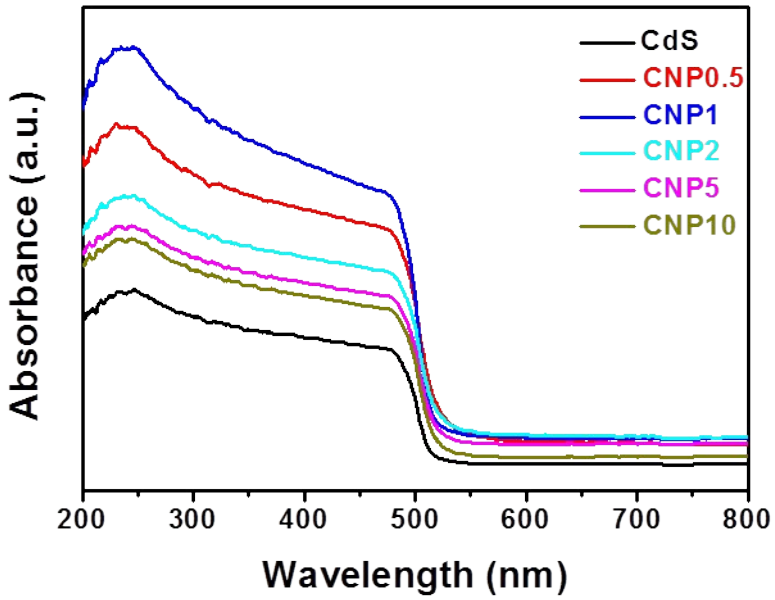

Fig. S5 UV-vis diffuse reflectance spectra (DRS) of CdS NRs and CdS/Ni_2P (CNP) loading with various amounts of Ni_2P.

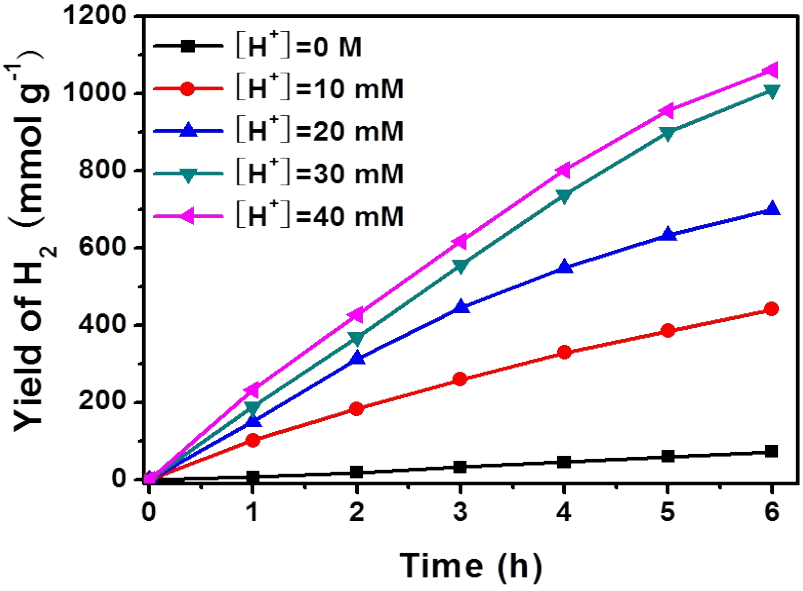

Fig. S6 Yield of H_2 production over CdS/Ni_2P-1wt% photocatalyst with different H^+ concentration.

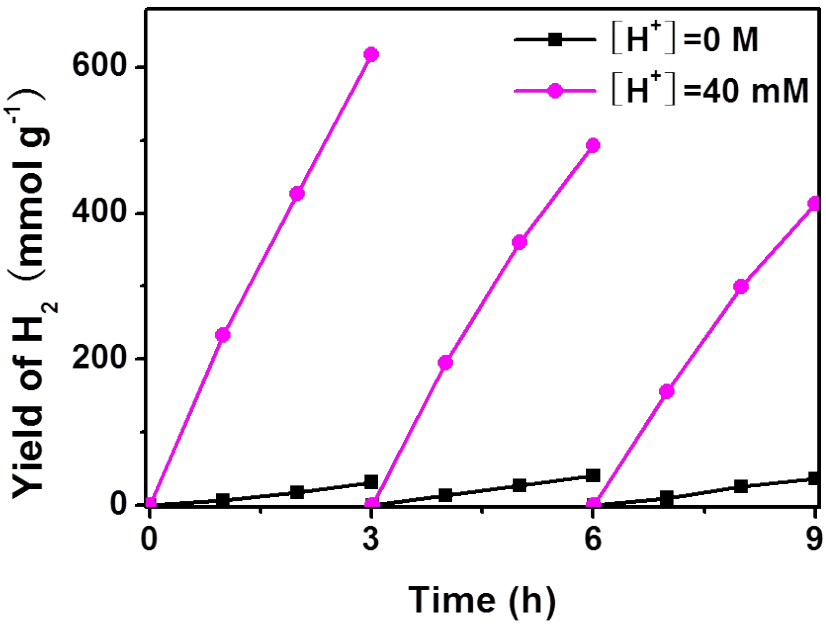

Fig. S7 The photocatalytic activity cycles of CdS/Ni_2P-1wt% with or without H^+ in the reaction system.

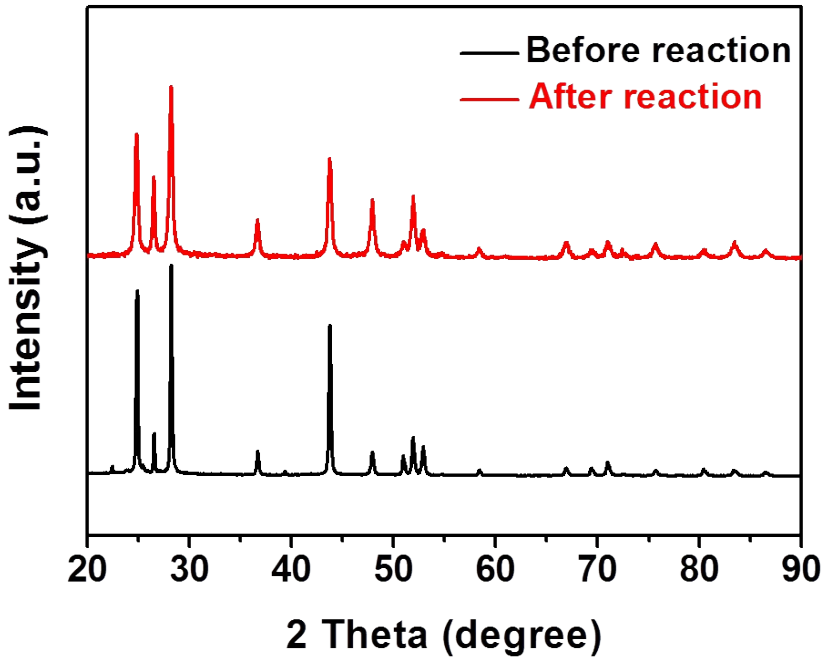

Fig. S8 The XRD spectra comparison of CdS/Ni_2P sample before and after photocatalytic reaction.

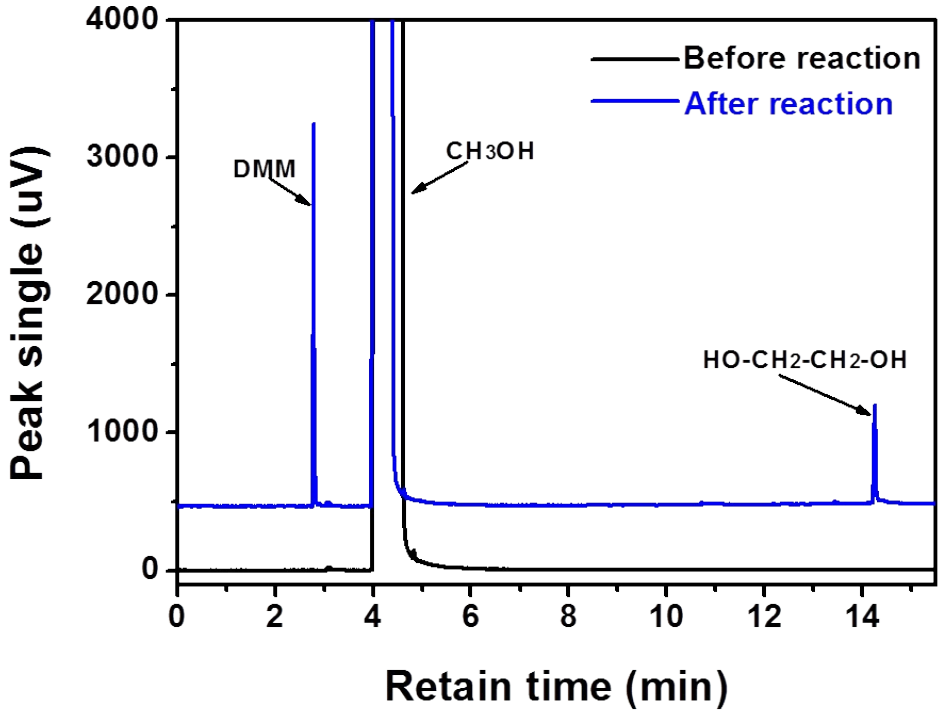

Fig. S9 Gas chromatogram of the liquid sample before and after photocatalytic reaction.

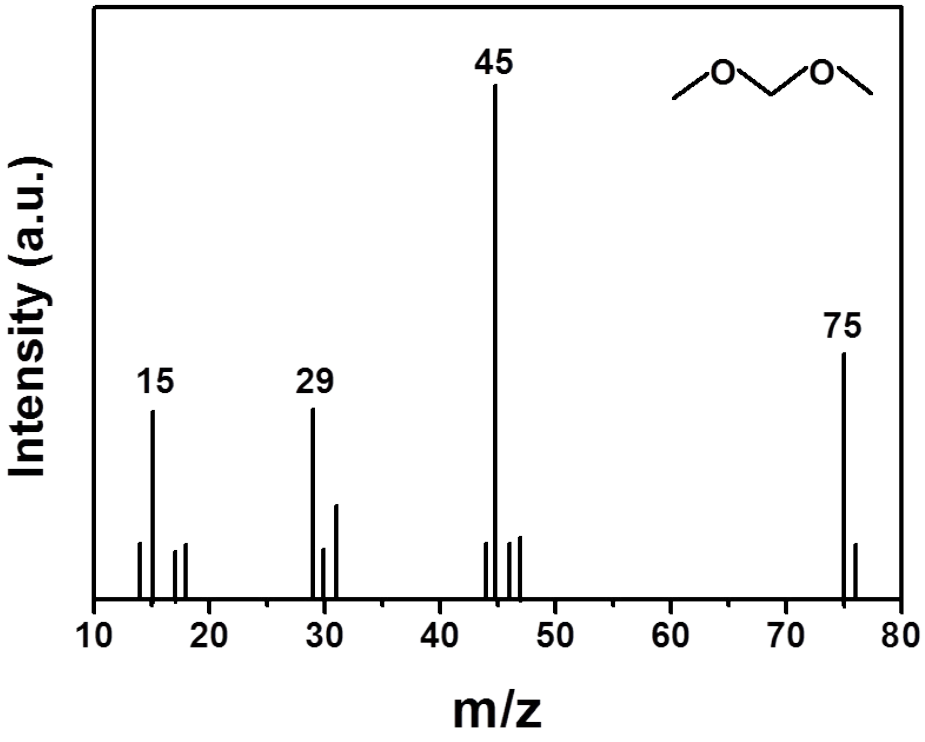

Fig. S10 Mass spectrum of the produced DMM.

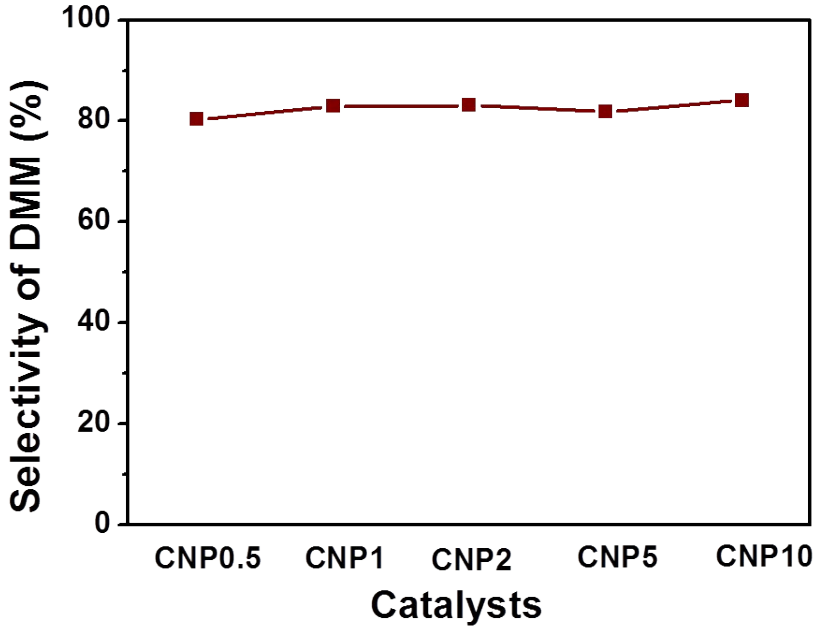

Fig. S11 The selectivity of DMM over different photocatalyst samples.