Supplementary Information

Enhanced Photocatalytic Activity of Novel CdS/Pt/Mo$_2$C Heterostructure for Visible-Light-Driven Hydrogen Evolution

Fig. S1 XRD patterns of CdS/Pt/Mo$_2$C-0.5 samples.

Fig. S2 EIS Nyquist plots of CdS, Mo$_2$C, CdS/Mo$_2$C, CdS/Pt/Mo$_2$C-0.5, CdS/Pt/Mo$_2$C-1 and CdS/Pt/Mo$_2$C-3 samples coated on ITO measured at 0.5 V vs. SCE in a 0.5 M Na$_2$SO$_4$ aqueous solution
Figure S3 XPS survey spectrum (a), high-resolution spectra of the S 2p (b), Pt 4f7 (c), C 1s (d) and Cd 3d (e) for the CdS/Pt/Mo2C-0.5 heterostructure system.

Table S1. The chemical composition of different samples measured by XPS
**Fig. S4** (a) Tauc plot curves of the different samples. (b) valence band spectra of CdS, CdS/Mo$_2$C, CdS/Pt/Mo$_2$C-0.5, CdS/Pt/Mo$_2$C-1 and CdS/Pt/Mo$_2$C-3.

**Fig. S5** EDS of CdS/Pt/Mo$_2$C-0.5 sample.
Fig. S6 TEM of CdS/Pt/Mo$_2$C-0.5 sample.

Fig. S7 H$_2$ evolution rates on the CdS/Pt photocatalysts with different Pt content.
Fig. S8. Comparison on the XRD patterns of the fresh and used CdS/Pt/Mo$_2$C-0.5 after 4 runs of cycling test.

Fig. S9. Comparison on SEM images of the fresh (a and b), and used CdS/Pt/Mo$_2$C-0.5 after 4 (c and d) runs of cycling tests