Supporting Information

Promoting Photocatalytic Hydrogen Evolution of CdS under Visible Light Using Earth-Abundant Cocatalysts CoP

Dan Zhao, [ab] *Bing Sun,* [b] *Xiangqing Li,* [a] *Lixia Qin,* [a] *Shizhao Kang,* *[a] *Dong Wang* *[b]

[a] School of Chemical and Environmental Engineering, Shanghai Institute of Technology, 100 Haiquan Road, Shanghai 201418, China.

[b] Beijing National Laboratory for Molecular Sciences, Key Laboratory of Molecular Nanostructure and Nanotechnology, Institute of Chemistry, Chinese Academy of Science, 2 North 1st Street, Zhongguancun, Beijing 100190, China.

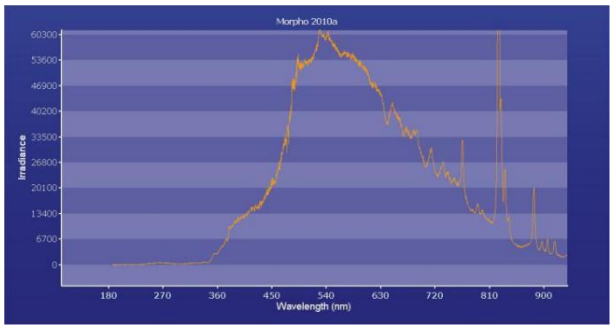

Figure S1. The emission spectra of Xe lamp without the cut-off filter.

Figure S2. The hydrogen plant of photocatalytic experiment.

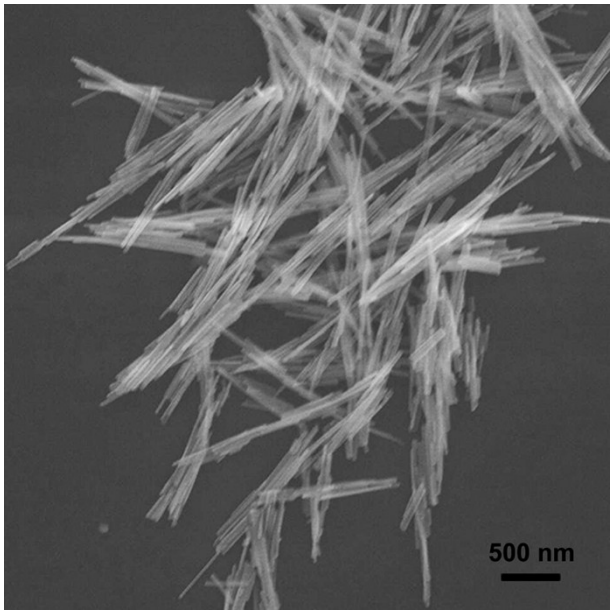

Figure S3. FESEM image of CdS nanorods.

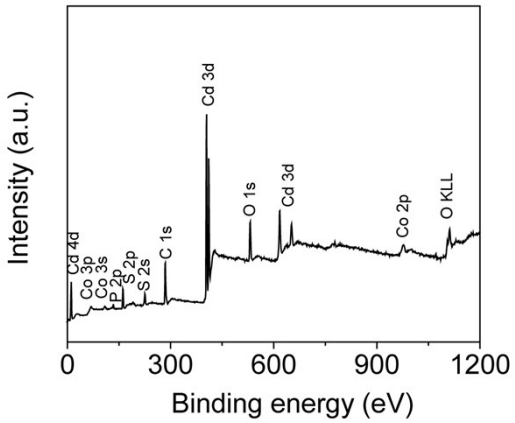

Figure S4. The XPS data of CoP/CdS-3%.

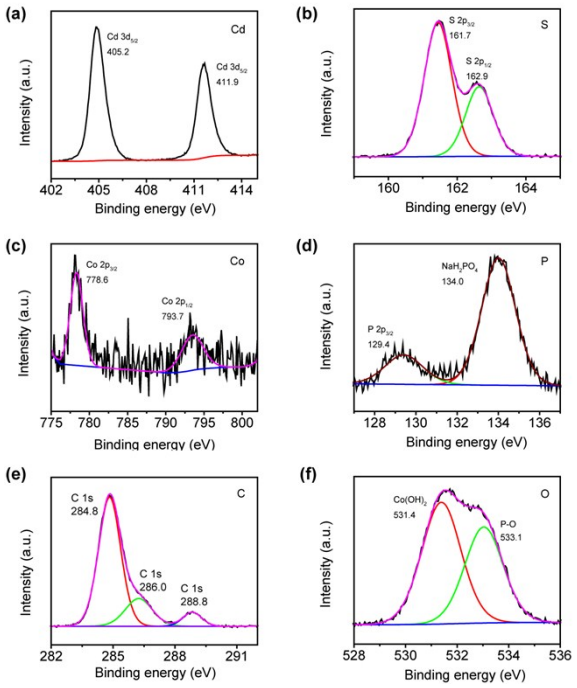

Figure S5. The high resolution XPS spectrum of Cd3d, S2p, Co2p, P2p, C1s and O1s.

Figure S5a, b suggest the existence of Cd^{2+} and S^{2-}. Fig S5c shows the high resolution XPS of Co 2p core level, and there are two main peaks at 778.6 eV in the Co $2p_{3/2}$ region and 793.7 eV in the Co $2p_{1/2}$ region. Fig S5d exhibits two peaks at 129.4 eV corresponding to P $2p_{3/2}$ region and one broad peak at 134.0 eV. The peaks at 778.6 eV and 129.4 eV are close to the binding energies of Co and P in CoP nanocrystal, while the peaks at 793.7 eV and 134.0 eV are assigned to the oxidized Co and P species. Figure S5e shows high resolution XPS of C, and the peaks of C at 286.0 eV and 288.8 eV come from the CO_2 or impurity adsorbed on the surface of photocatalyst or instrument. Figure S5f indicates that the presence of $Co(OH)_2$ and unreacted PO^{3-}.

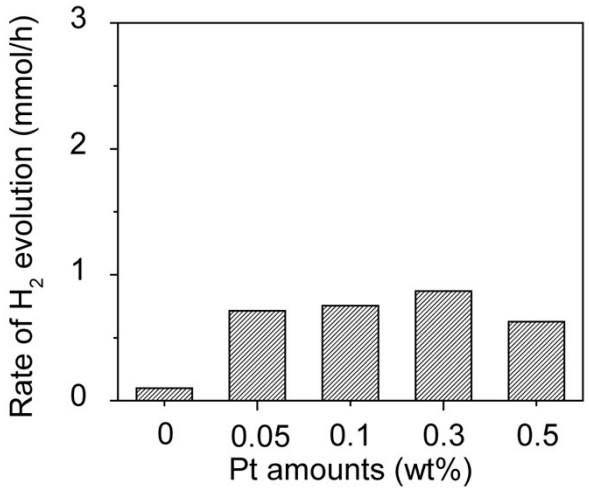

Figure S6. The hydrogen evolution rate of CdS with different amounts of Pt (loading by photo-deposition method).