Electronic Supporting Information (ESI)

Highly Efficient Colloidal $Mn_xCd_{1-x}S$ Solid Solution Nanorods for Photocatalytic Hydrogen Generation

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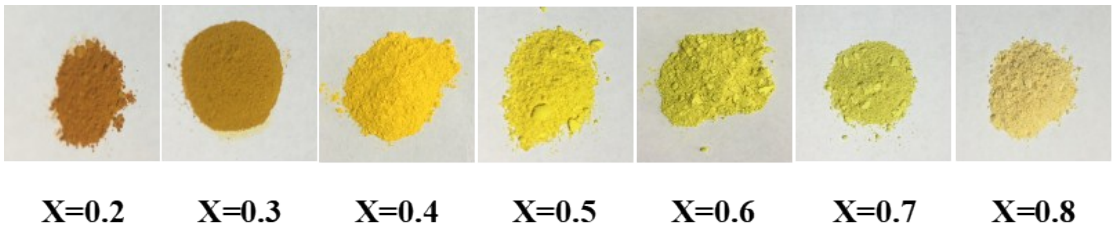

Fig. S1 Digital photographs of synthesized $Mn_xCd_{1-x}S$ samples.

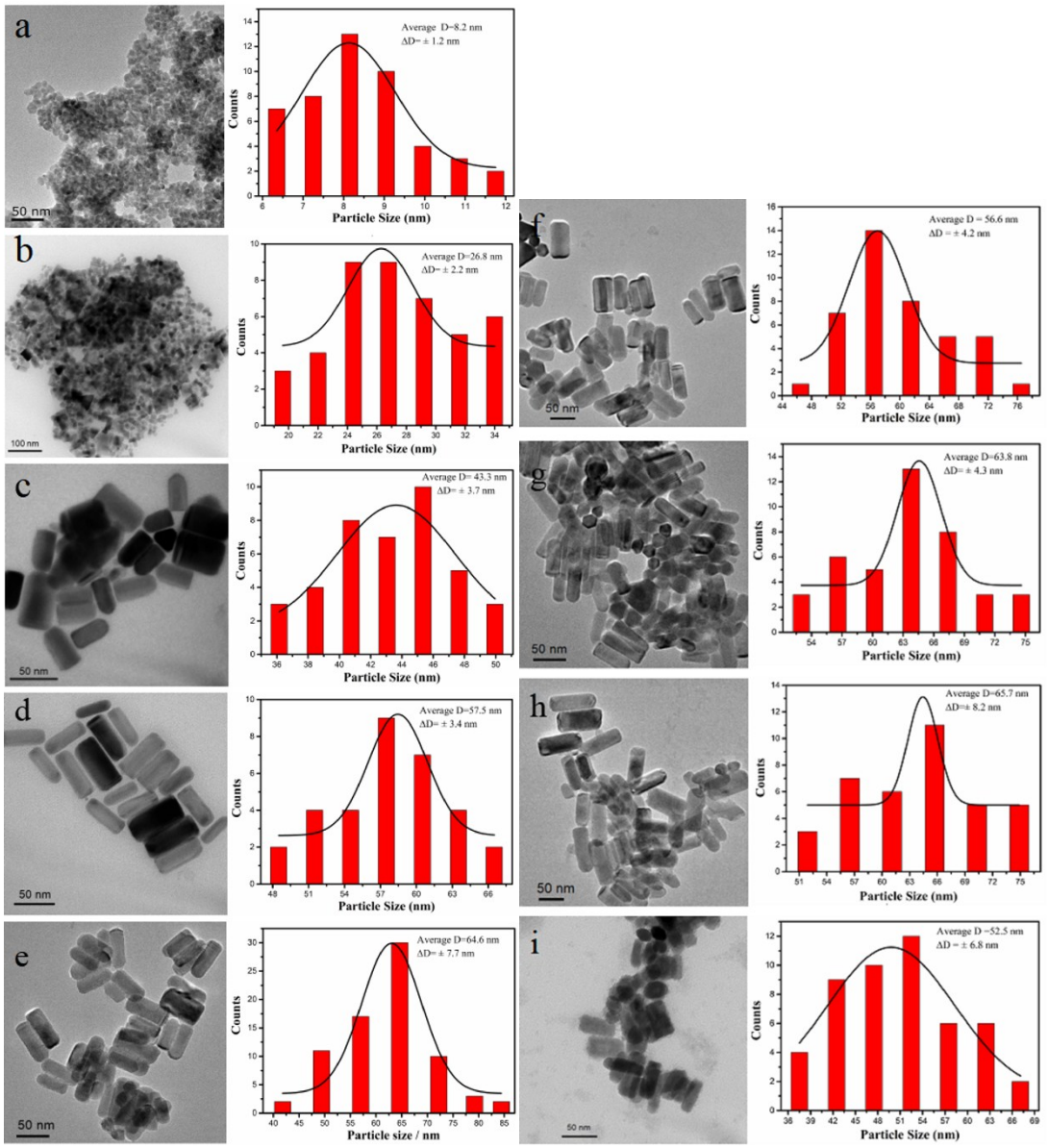

Fig. S2 TEM and Size distribution histogram of $Mn_xCd_{1-x}S$ solid solutions. (a. x=0; b. x=0.2; c. x=0.3; d. x=0.4; e. x=0.5; f. x=0.6; g. x=0.7; h. x=0.8; i. x=1.0)

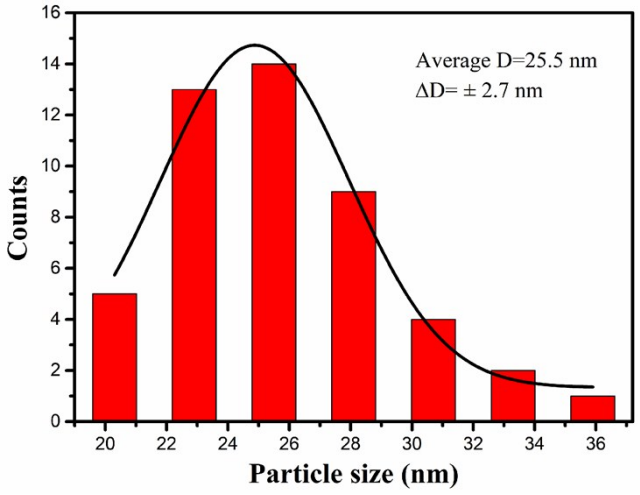

Fig. S3 Size distribution histogram of $Mn_{0.5}Cd_{0.5}S$ nanorods (top of view).

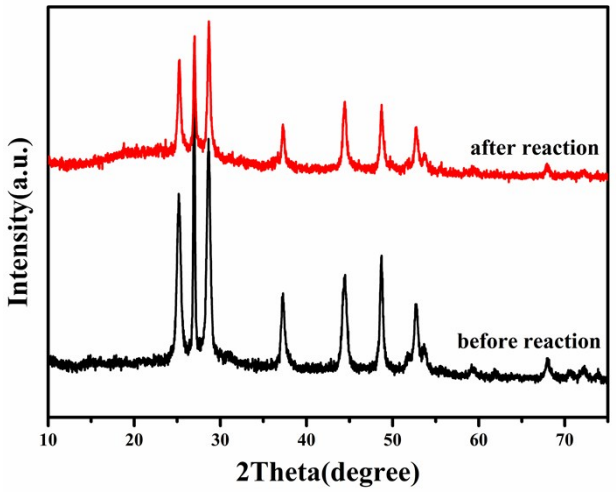

Fig. S4 XRD patterns of the $Mn_{0.5}Cd_{0.5}S$ solid solution photocatalyst before and after the photocatalytic reactions.

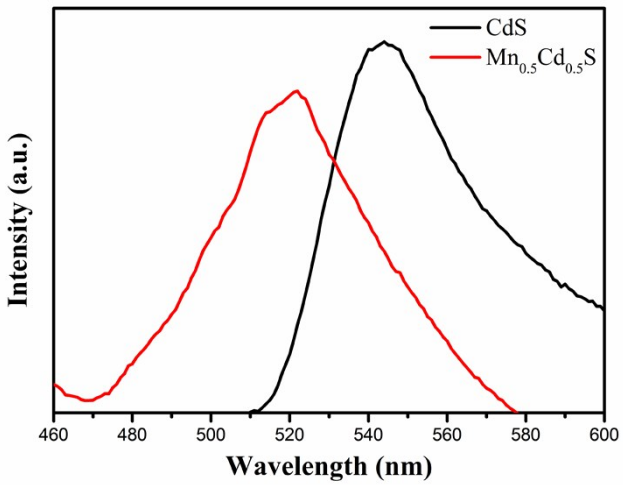

Fig. S5 Photoluminescence spectra of CdS (black) and $Mn_{0.5}Cd_{0.5}S$ (red) in solution.

Table. S1 Comparison of H_2 evolution rate with other Mn-Cd-S solid solutions.

No.	Photocatalyst	Rate of H_2 Evolution	Method	Reference
1	$Mn_{0.2}Cd_{0.8}S/CoP_3$	29530 $\mu molg^{-1}h^{-1}$	Hydrothermal method	1
2	$Mn_xCd_{1-x}S$	355 $\mu molg^{-1}h^{-1}$		2
3	$Mn_xCd_{1-x}S$	10900 $\mu molg^{-1}h^{-1}$		3
4	$Mn_{0.25}Cd_{0.75}S/MoS_2$	12470 $\mu molh^{-1}g^{-1}$		4
5	$Mn_{0.8}Cd_{0.2}S/g\text{-}C_3N_4$	4000 $\mu molg^{-1}h^{-1}$		5
6	$Mn_xCd_{1-x}S/NiS$	8386 $\mu molh^{-1}g^{-1}$		6
7	$Cu_{2-x}S/Mn_{0.5}Cd_{0.5}S/MoS_2$	13752 $\mu molg^{-1}h^{-1}$		7
8	Ni doped Mn-Cd-S	1020 $\mu molg^{-1}h^{-1}$		8
9	Ag doped Mn-Cd-S	4400 $\mu molg^{-1}h^{-1}$		9
10	$Zn_{1-x}Cd_xS$ solid solutions	7420 $\mu molg^{-1}h^{-1}$	thermolysis method	10
11	ZnCdS dodecahedral cages	5680 $\mu molg^{-1}h^{-1}$	Sulfurization and ion exchange	11
12	$NiS/ Zn_xCd_{1-x}S/RGO$	7514 $\mu molg^{-1}h^{-1}$	Hydrothermal method	12
13	Cu^{2+} doped $In_{2x}Zn_{3(1-x)}S_3$	790 $\mu molg^{-1}h^{-1}$		13
14	MnS/In_2S_3	8360 $\mu molh^{-1}g^{-1}$ (from H_2S)	Solvothermal method	14
15	**$Mn_xCd_{1-x}S$**	**26000 $\mu molg^{-1}h^{-1}$**	**Colloidal method**	**This study**

Table. S2 PL lifetime fitting results for CdS and $Mn_{0.5}Cd_{0.5}S$

sample	T1 / ns	T2 / ns
CdS	**6.31**	**123.44**
$Mn_{0.5}Cd_{0.5}S$	**7.60**	**162.38**

The PL kinetic curves were fitted with bi-exponential decay function, thus providing two lifetimes, one fast decay component and one slow decay component. Fast decay components were usually associated with non-radiative recombination, while slow decay components were due to the radiative lifetime of free excitons.[15]

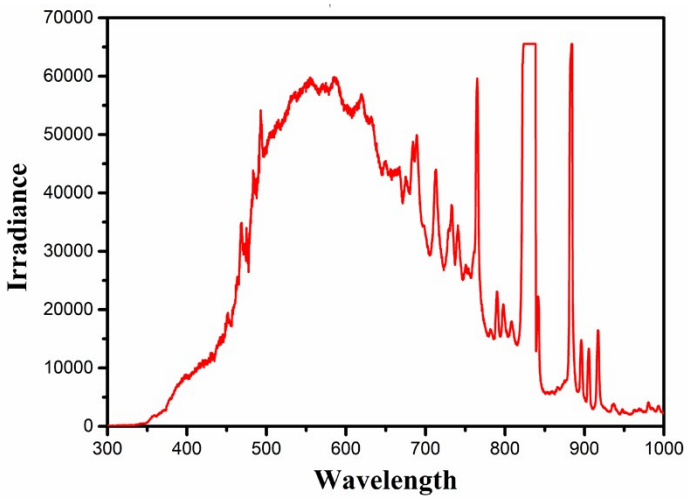

Fig. S6 Emission spectra of Xenon light source. (PLS-SXE300/300UV; PerfectLight, China.)

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