Supporting information

Rational design of g-C_3N_4/CdS/MIL-125-derived TiO_2 ternary heterojunction as highly efficient photocatalyst for wastewater treatment under visible-light irradiation

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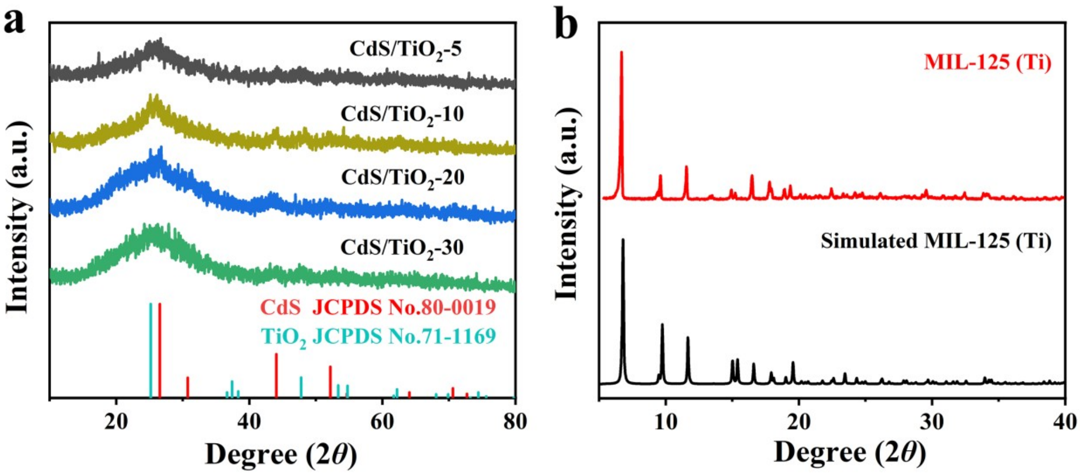


Fig. S1. XRD patterns of (a) CdS/TiO_2-x and (b) MIL-125 (Ti).

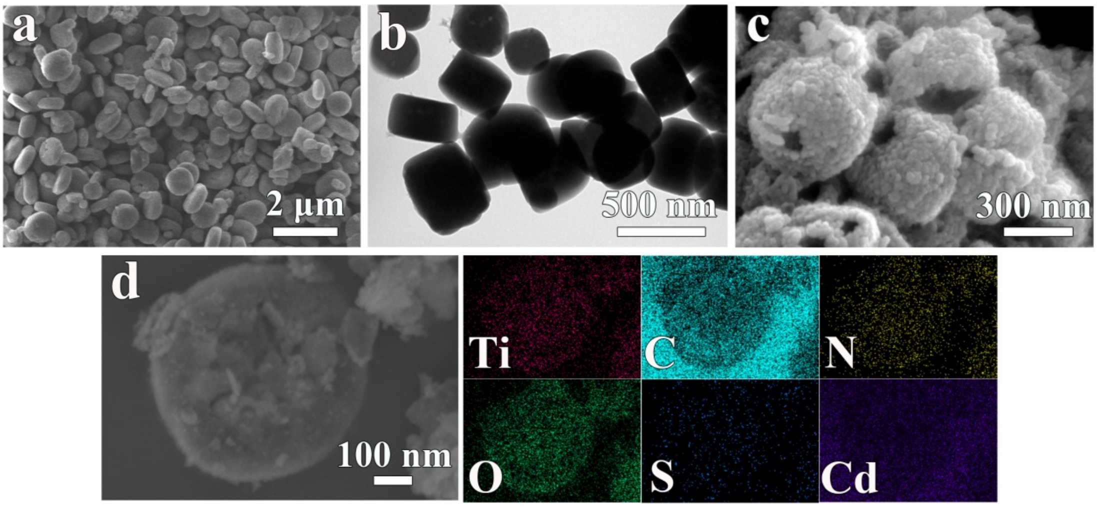


Fig. S2. (a) SEM and (b) TEM image of MIL-125 (Ti), (c) SEM image of CdS/TiO_2-10, and (d) SEM-mapping images of 20-g-C_3N_4/CdS/TiO_2-10.

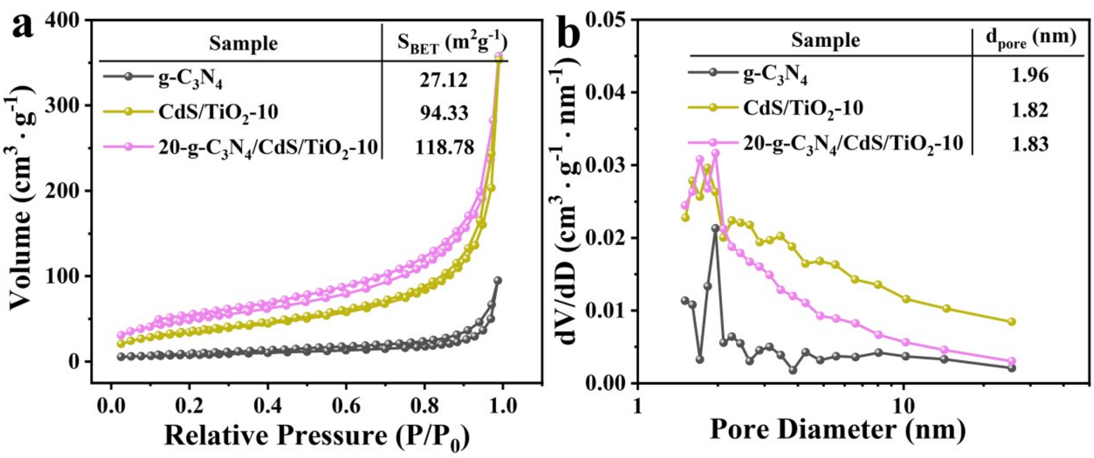


Fig. S3. (a) N_2 sorption isotherms curves, and (b) the corresponding curves of pore size distribution of g-C_3N_4, CdS/TiO_2-10 and 20-g-C_3N_4/CdS/TiO_2-10.

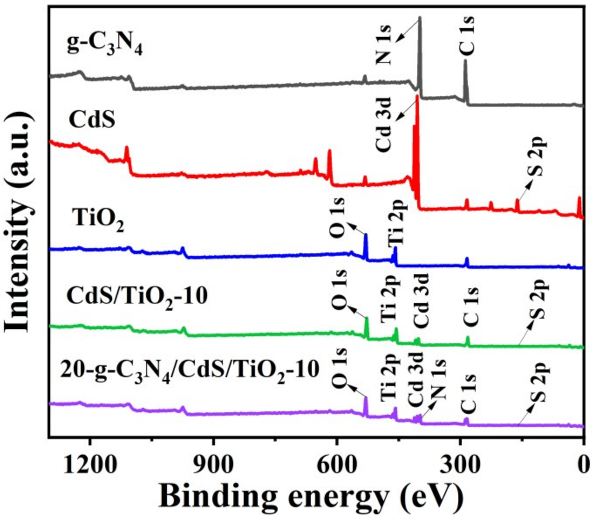


Fig. S4. XPS survey spectrum of of g-C_3N_4, CdS, TiO_2, CdS/TiO_2-10 and 20-g-C_3N_4/CdS/TiO_2-10.

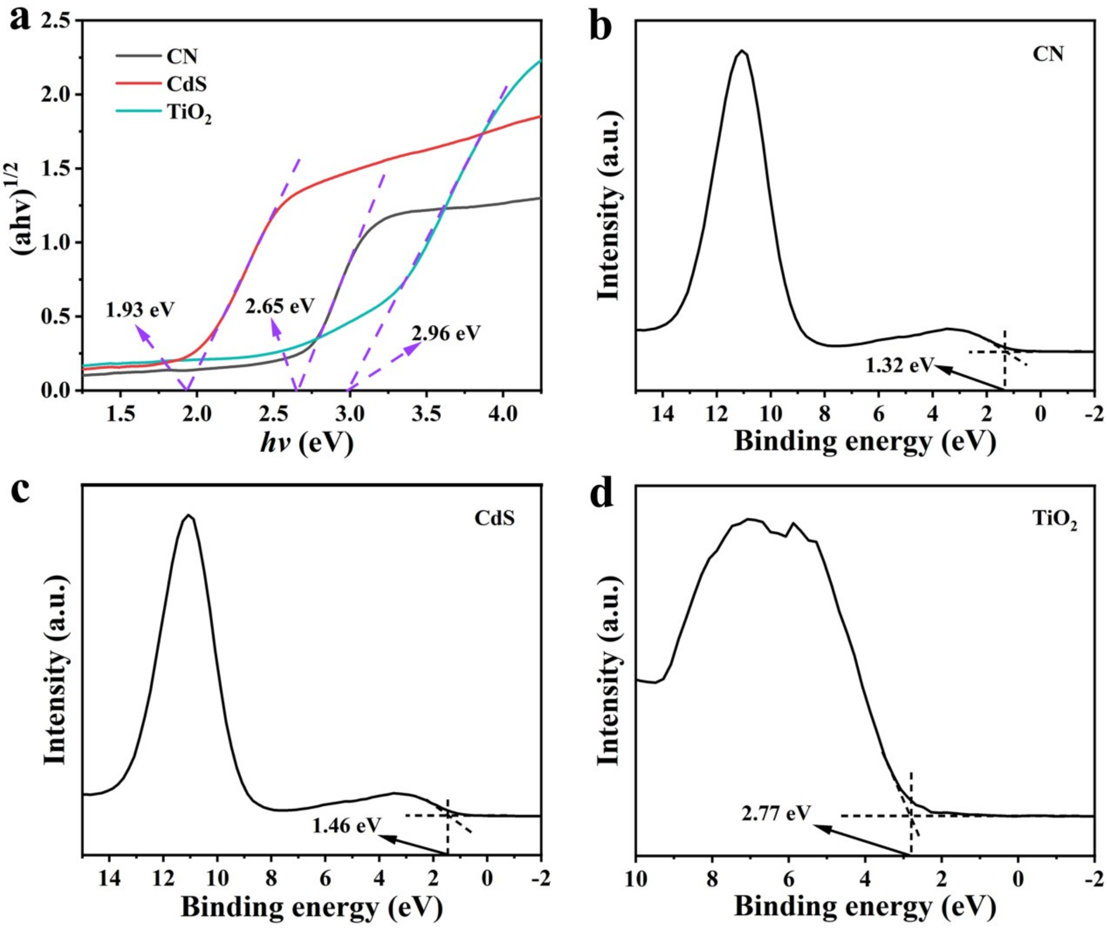


Fig. S5. (a) Kubelka-Munk plots of g-C_3N_4, CdS and TiO_2, (b-d) VB-XPS plots of g-C_3N_4, CdS and TiO_2.

Table S1. E_{CB} and E_{VB} of g-C_3N_4, CdS, and TiO_2

Samples	g-C_3N_4		CdS		TiO_2	
	E_{CB}(eV)	E_{VB}(eV)	E_{CB}(eV)	E_{VB}(eV)	E_{CB}(eV)	E_{VB}(eV)
Mot-Schottky test	-1.29	1.36	-0.43	1.50	-0.15	2.81

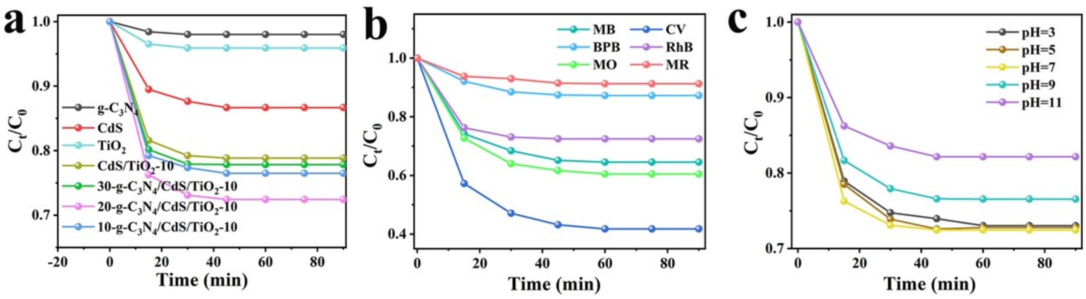


Fig. S6 (a) The adsorption curve of the synthesized photocatalyst for RhB under dark conditions; (b) The adsorption curve of other dyes; (c) The adsorption curve of dye solutions with different pH.

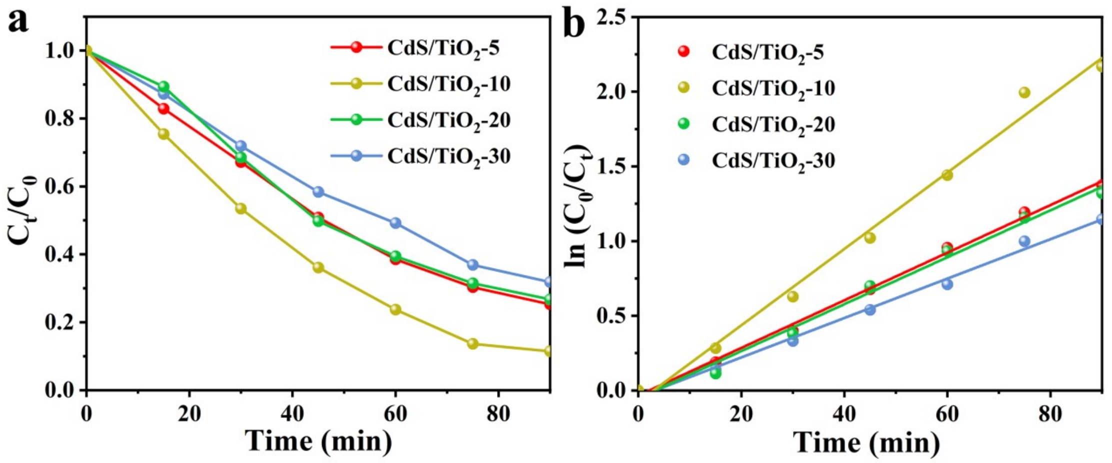


Fig. S7. (a) Photocatalytic degradation of RhB by CdS/TiO_2-x and (b) the corresponding pseudo-first-order kinetic curves.

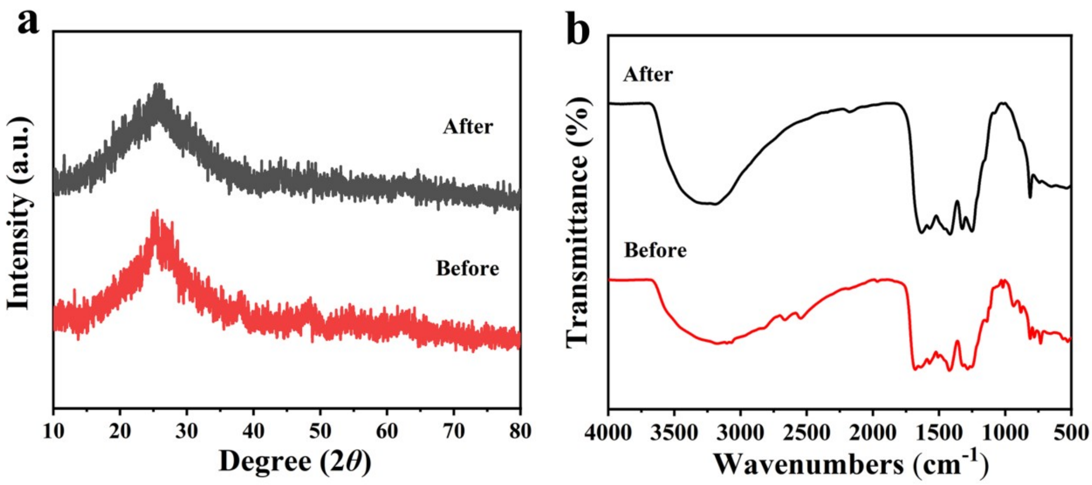


Fig. S8. (a) XRD patterns and (b) FTIR spectra of 20-g-C_3N_4/CdS/TiO_2-10 before and after photocatalytic degradation reaction.

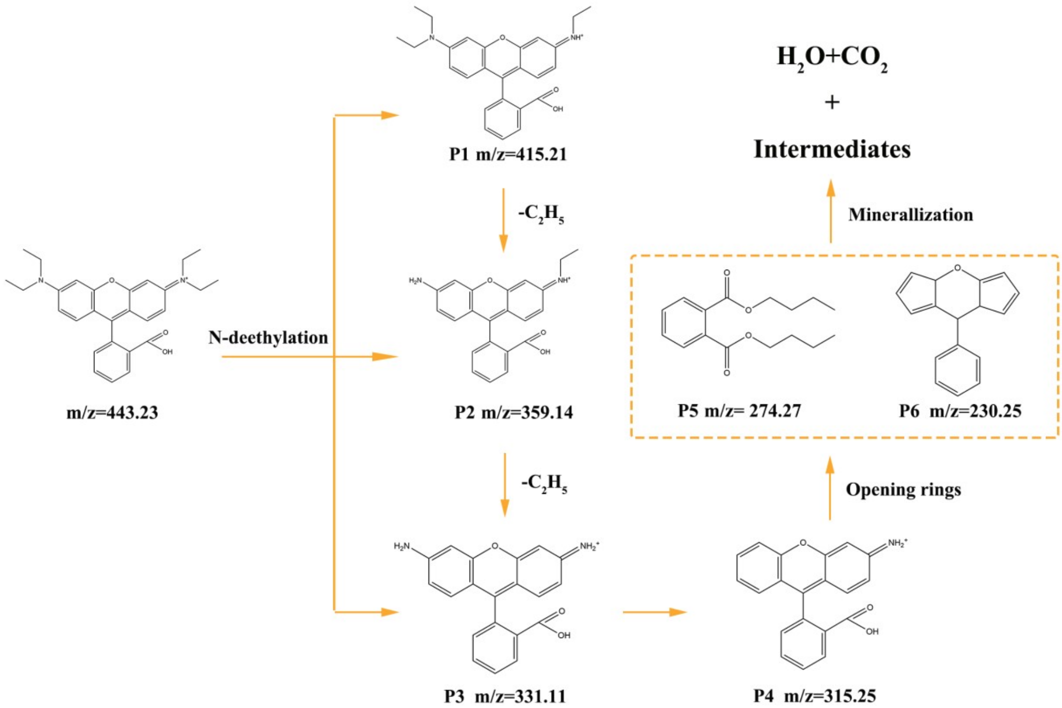
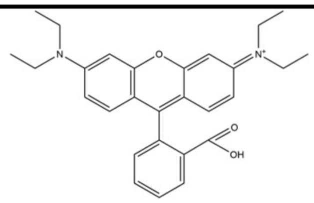
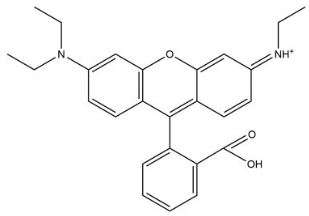
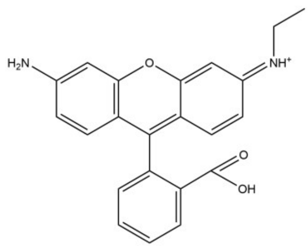
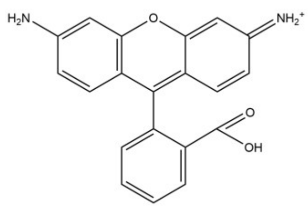
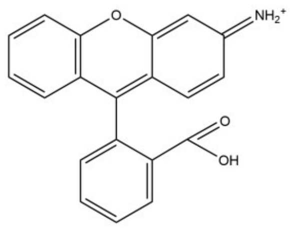
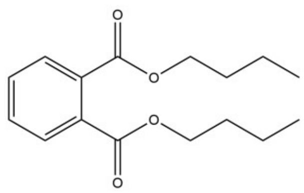
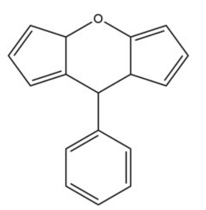


Fig. S9. The proposed pathway for photodegradation RhB by 20-g-C_3N_4/CdS/TiO_2-10.

Table S2. The photodegradation efficiency of RhB for MOF-derived TiO_2 photocatalysts.

Sample	$C_{catalyst}$ ($g\cdot L^{-1}$)	$C_{pollutant}$ ($mg\cdot L^{-1}$)	Light	Time (min)	Degradation efficeincy (%)	k (min^{-1})	Ref
20-g-C_3N_4/CdS/TiO_2-10	2.5	10 (RhB)	500 W Xe (λ > 420 nm)	90	98.9	0.0494	This work
$CdIn_2S_4$@A/R-TiO_2	1.0	20 (MG)	1000 W Xe	180	82.1	0.0492	[1]
Ag-TiO_2@carbon	2.0	15 (RhB)	500 W Hg	25	98.8	0.049	[2]
g-C_3N_4/TiO_2	3.0	10 (MB)	(λ > 420 nm)	150	97.7	—	[3]
YCQDs/NH_2BDC_{10}-TiO_2	2.0	80 (RhB)	300 W Xe (λ > 420 nm)	120	87.1	—	[4]
TiO_2/carbon	2.0	20 (MB)	300 W Xe (λ > 420 nm)	120	91.4	-	[5]
N-TiO_2-2	8.0	10 (RhB)	—	240	90.0	0.01014	[6]
BiOBr/$Bi_{24}O_{31}Br_{10}$/TiO_2	5.0	10 (RhB)	500 W Xe	80	78.0	0.04484	[7]
10AgC-TiO_2/$Cd_{0.5}Zn_{0.5}S$	5.0	7 (RhB)	500 W Xe	90	97.6	—	[8]

Table S3. Mass spectra of the possible intermediate products.

No.	Formula	(m/z)	Molecular structure
Rh B	$C_{28}H_{31}N_2O_3$	443.23	
P1	$C_{26}H_{27}N_2O_3$	415.21	
P2	$C_{22}H_{19}N_2O_3$	359.14	
P3	$C_{20}H_{15}N_2O_3$	331.11	
P4	$C_{20}H_{14}N_2O_3$	315.25	
P5	$C_{16}H_{22}O_4$	274.27	
P6	$C_{17}H_{12}O$	230.25	

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