Electronic Supplementary Material (ESI) for Catalysis Science & Technology.

Supporting Information

Photocatalytic conversion of 5-hydroxymethylfurfural to 2,5-diformylfuran by S-scheme Black Phosphorus/ $CdIn_2S_4$ heterojunction

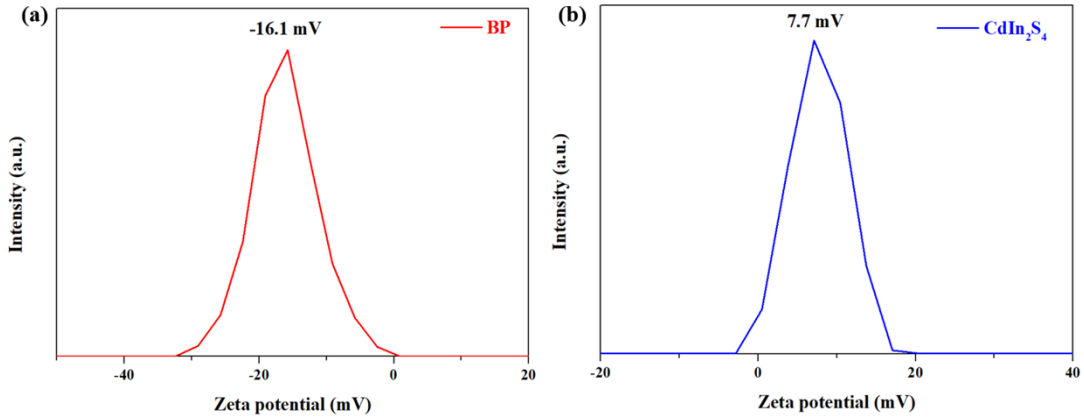

Fig. S1. Zeta potential of BP (a) and $CdIn_2S_4$ (b)

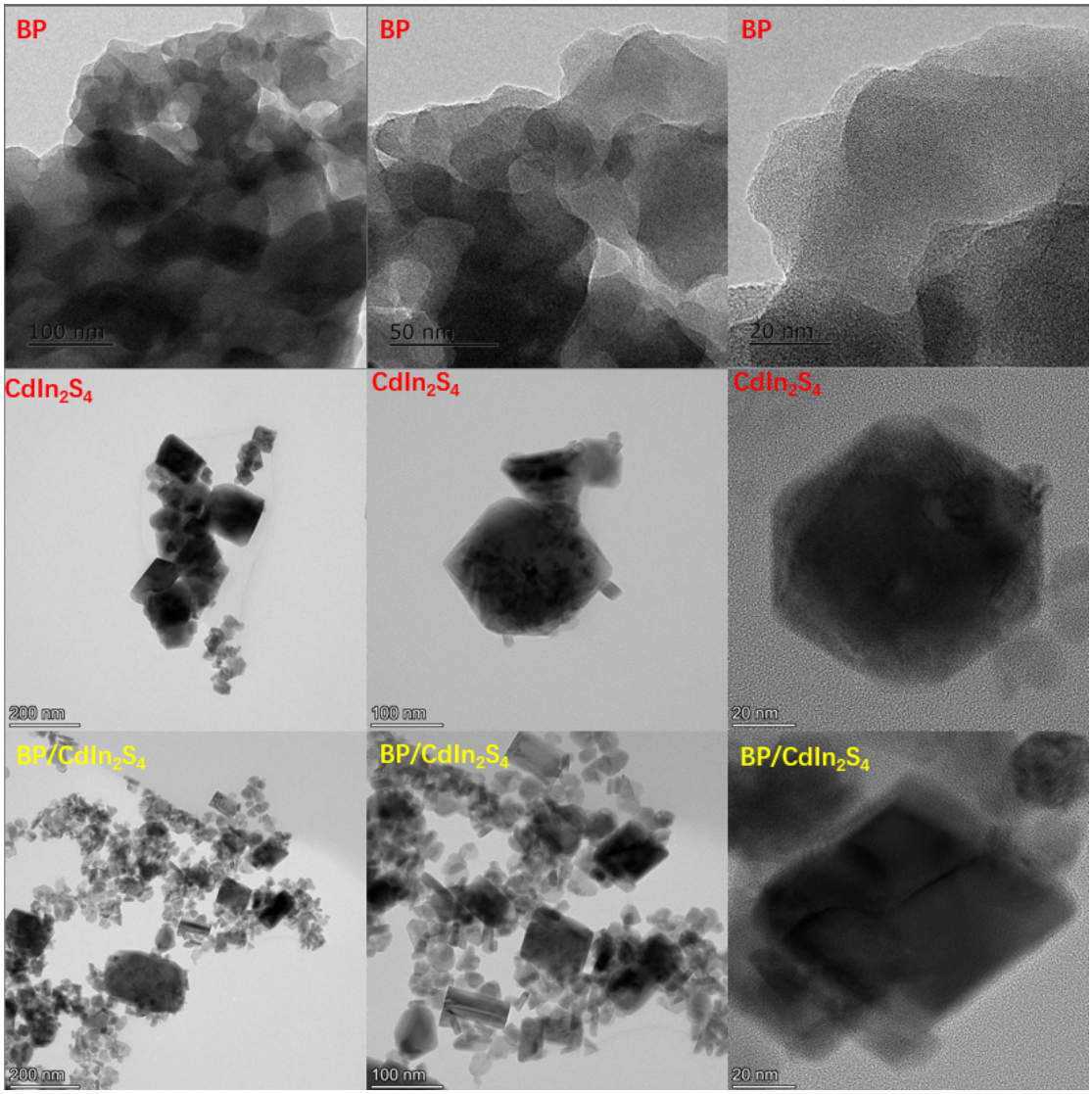

Fig. S2. TEM image of BP, $CdIn_2S_4$ and BP/ $CdIn_2S_4$

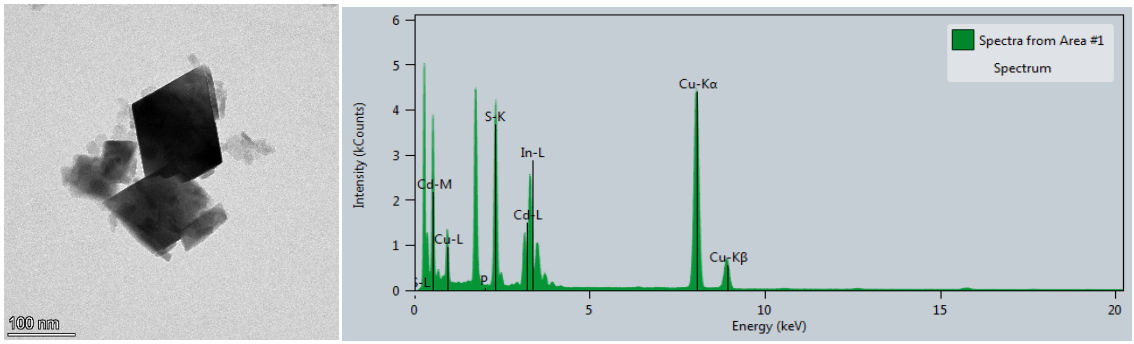

Fig. S3. EDS spectra of BP/ $CdIn_2S_4$ heterojunction

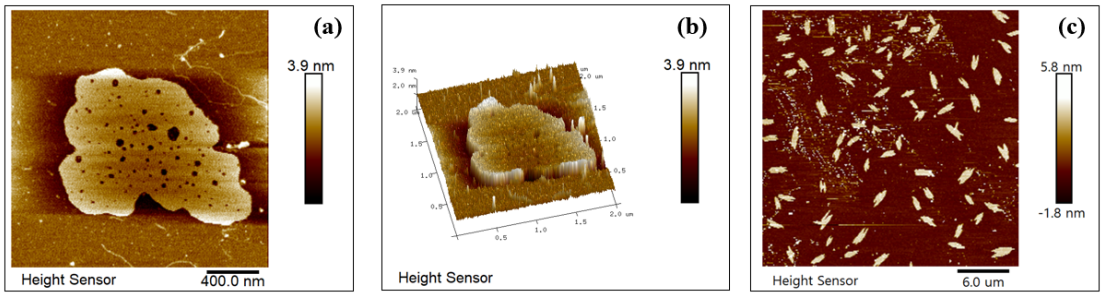

Fig. S4. AFM image of BP (a), (b) and BP/$CdIn_2S_4$ (c)

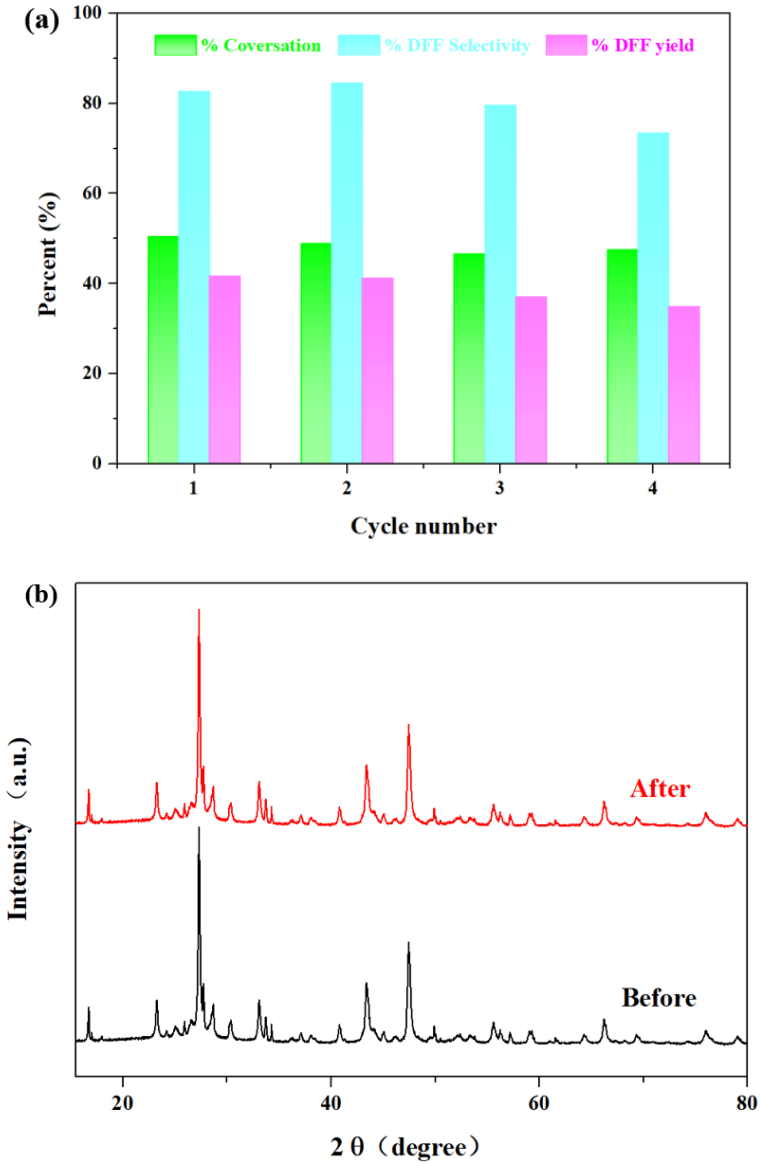

Fig. S5. Cycling runs in the photocatalytic oxidation of 5-HMF on the 1.5% BP/$CdIn_2S_4$ catalyst under visible light irradiation (a), XRD spectrum of 1.5% BP/$CdIn_2S_4$ sample before and after photocatalytic reaction.

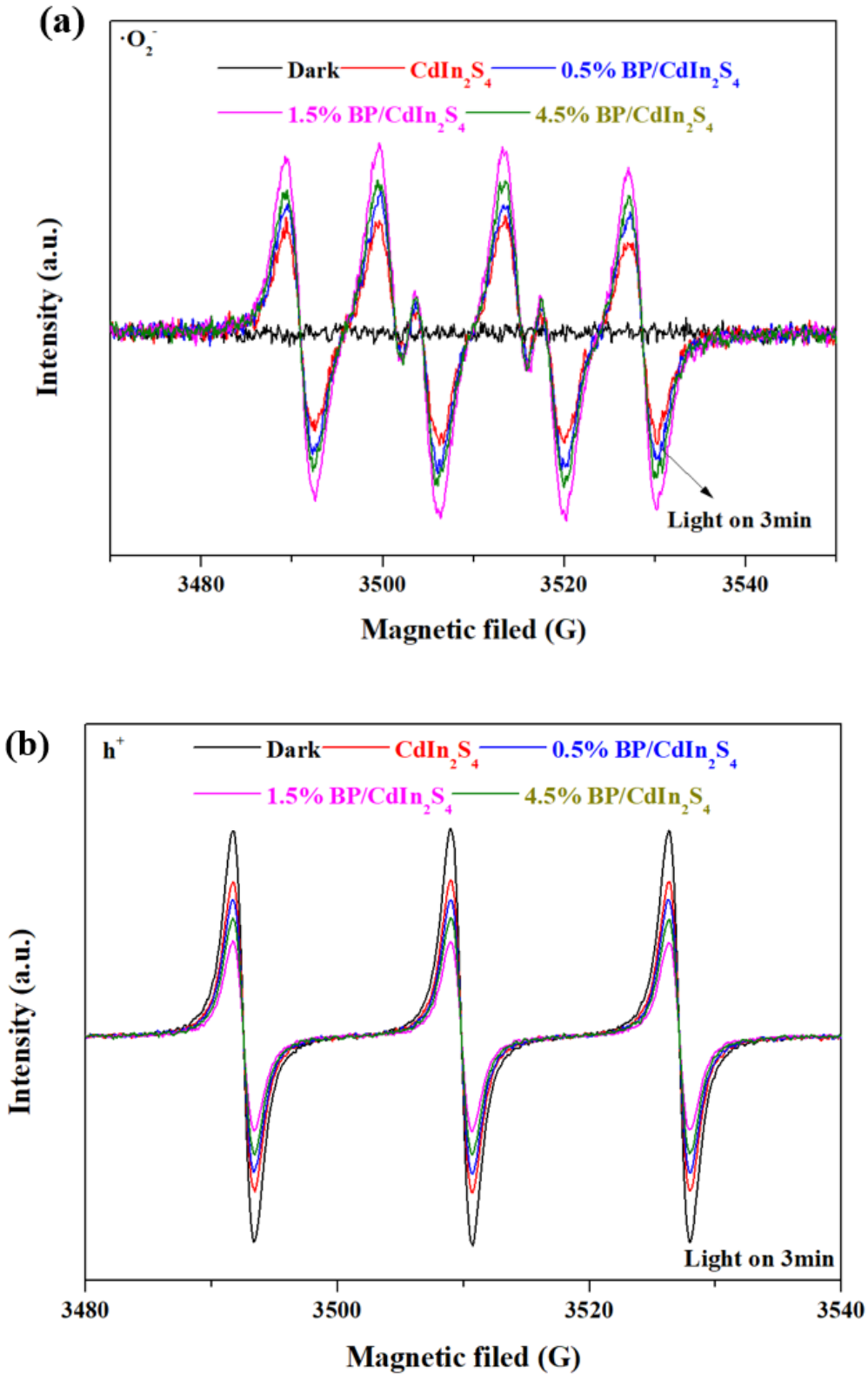

Fig. S6. EPR spectra: $\cdot O_2^-$ (a), h^+ (b).

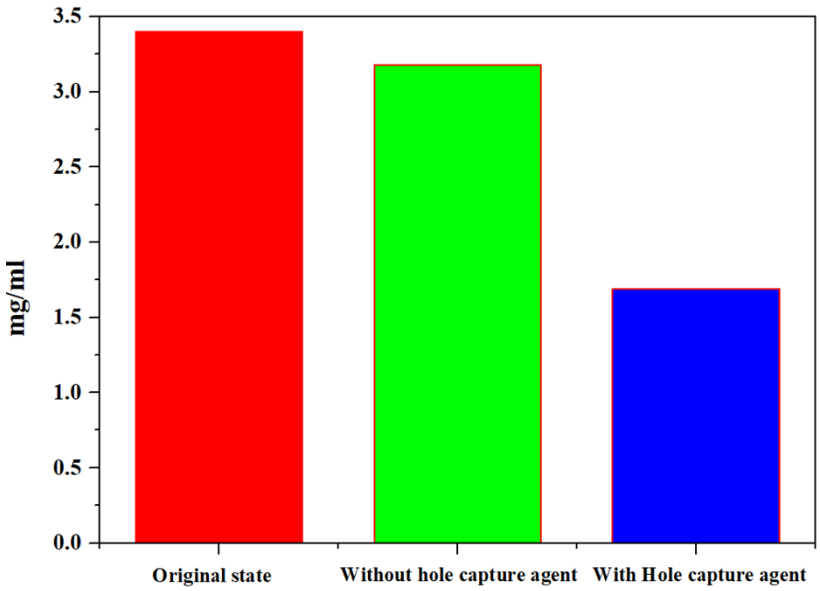

Fig. S7. The total organic carbon content of the system without and with a hole capture agent.

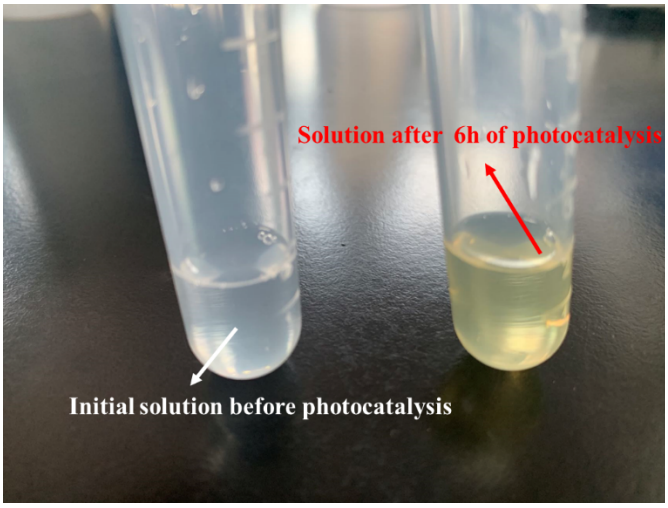

Fig. S8. Color reaction of H_2O_2.

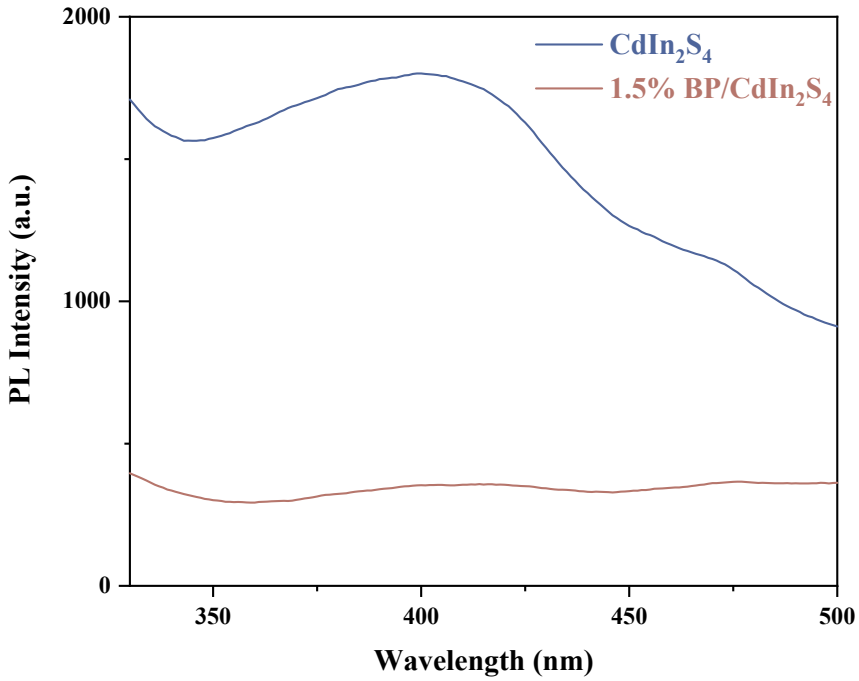

Fig. S9. Photoluminescence spectra of the $CdIn_2S_4$ and 1.5% BP/ $CdIn_2S_4$.

Table S1

Comparison of herein reported HMF oxidation to DFF results with other photocatalysts with atmospheric oxygen as the oxidant

Catalyst	Solvent	Reaction conditions	Conv. (%)	Select. (%)	Yield (%)	Ref.
BP/$CdIn_2S_4$	Water	500 W Xe lamp (λ>420 nm), 20 ℃, under air	50.4	82.5	41.6	This work
$Cd_{1.5}In_2S_{4.5}$	Water	500 W Xe lamp (λ>420 nm), 20 ℃, under air	68.8	62.7	43.2	[1]
N-TiO_2	Water	500 W lamp (λ=365 nm), 20 ℃, under air	-	30.0-40.0	-	[2]
g-C_3N_4	Water	Sunlight, 25 ℃, under air	40.0	50.0	20.0	[2, 3]
g-C_3N_4-H_2O_2	Water	Sunlight, 20 ℃, under air	20.0	88.0	17.6	[4]
WO_3/g-C_3N_4	ACN+$PhCF_3$	Xe lamp (λ>400 nm), 30 ℃, O_2 purging	27.4	87.2	23.9	[5]
$Zn_xCd_{1-x}S$-P	Water	Visible light	40.0	65.0	26.0	[6]
Fe(III)/Bi_2MoO_6	Water	500 W Xe lamp (λ>400 nm)	32.6	95.3	31.1	[7]

References:

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