Supporting information:

Synergistic multi-selective photocatalysis and real-time optical thermometry of $CsPbBr_3/BiOI/TiO_2$@PAN flexible nanofibers

Yanyan Li [a], Lifan Shen [a, b, *], Edwin Yue Bun Pun [c], Hai Lin [a, c, *]

[a] School of Textile and Material Engineering, Dalian Polytechnic University, Dalian, 116034, P.R. China

[b] College of Microelectronics and Key Laboratory of Optoelectronics Technology, Faculty of Information Technology, Beijing University of Technology, Beijing, 100124, P.R. China

[c] Department of Electrical Engineering and State Key Laboratory of Terahertz and Millimeter Waves, City University of Hong Kong, Hong Kong Special Administrative Region, P.R. China

Corresponding Authors

* E-mail: shenlifan@bjut.edu.cn (Lifan Shen)

* E-mail: linhaidlpu@163.com (Hai Lin)

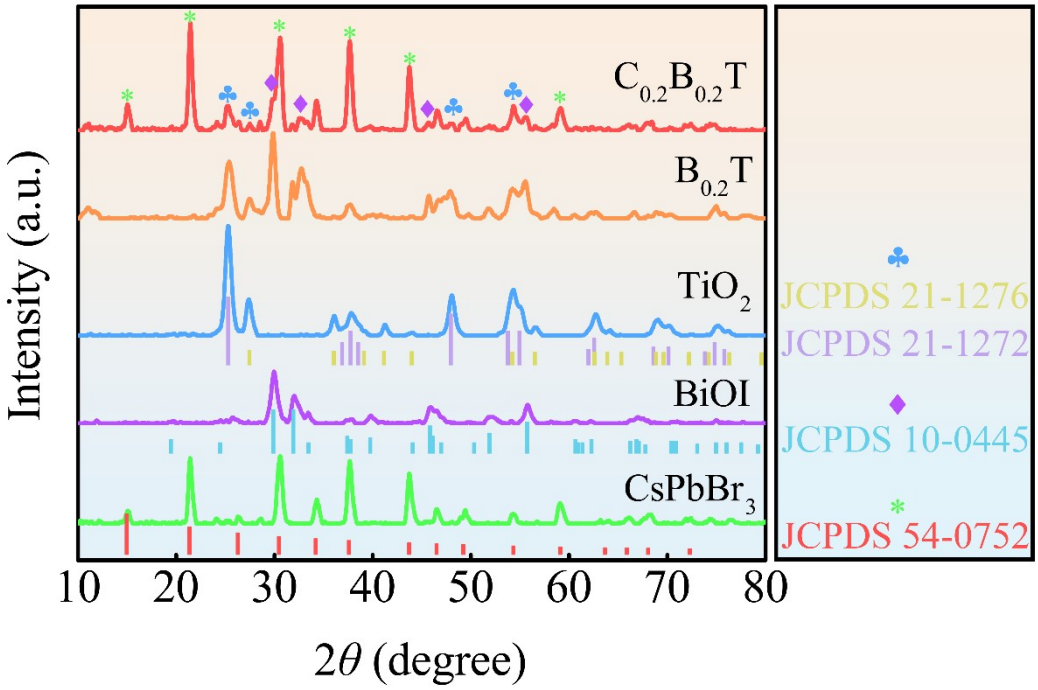

Figure S1. XRD patterns of pristine TiO_2, bare BiOI, initial $CsPbBr_3$, $B_{0.2}T$ and $C_{0.2}B_{0.2}T$ NCs.

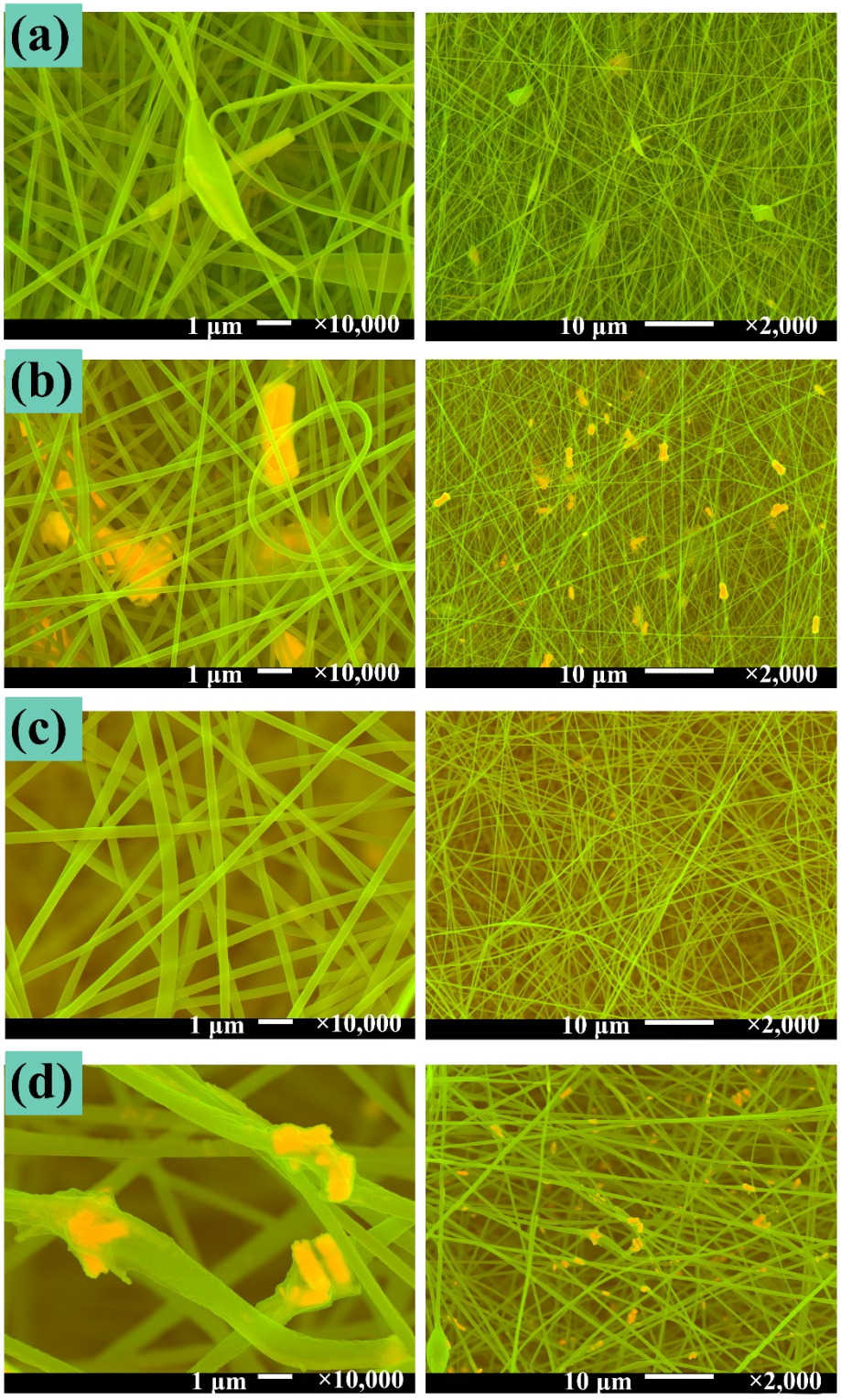

Figure S2. SEM images of TiO_2@PAN (a), BiOI@PAN (b), $CsPbBr_3$@PAN (c) and $B_{0.2}T$@PAN (d) nanofibers, at different magnifications.

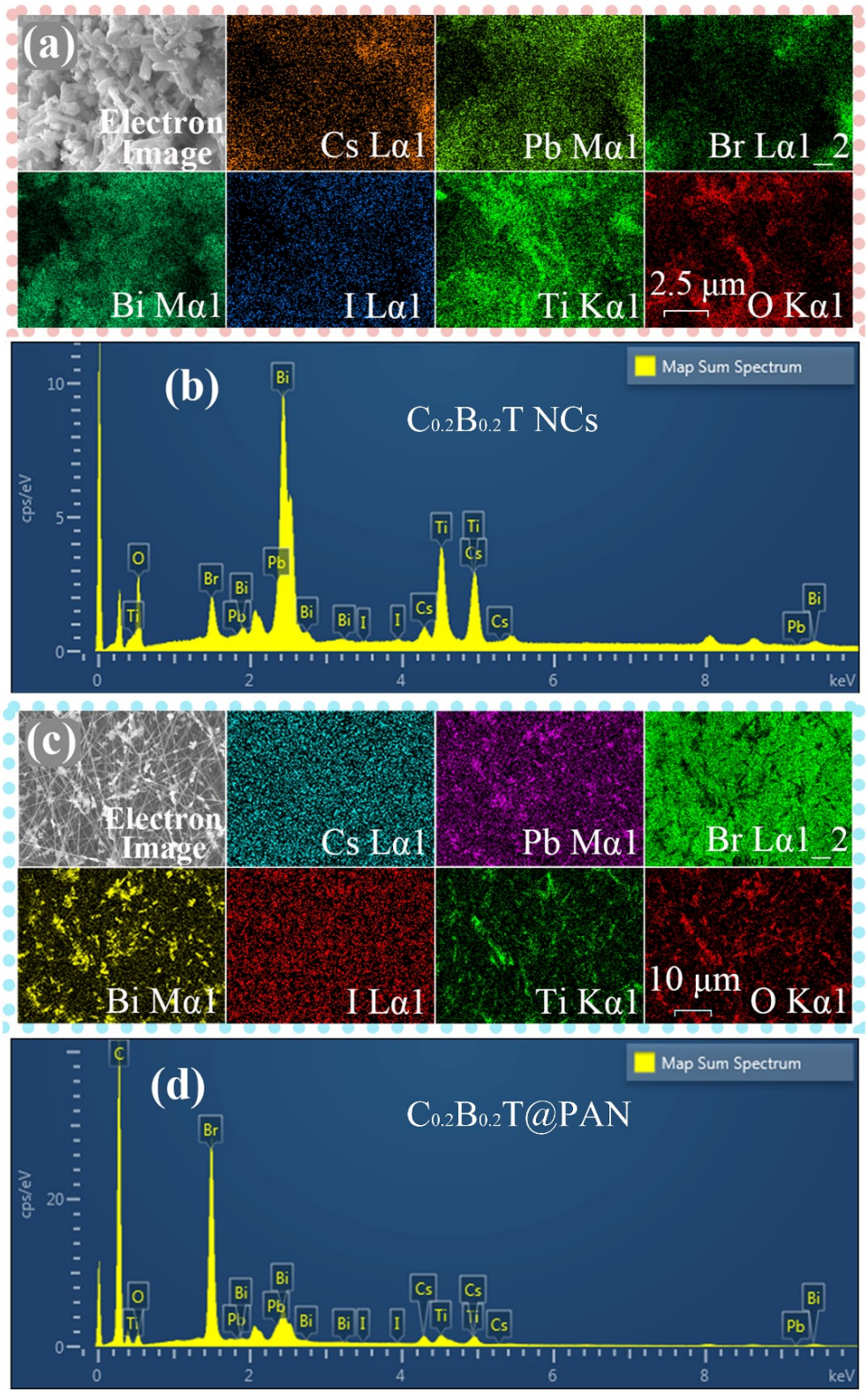

Figure S3. Elemental mapping and EDS spectrum of $C_{0.2}B_{0.2}T$ NCs (a, b) and $C_{0.2}B_{0.2}T$@PAN nanofibers (c, d).

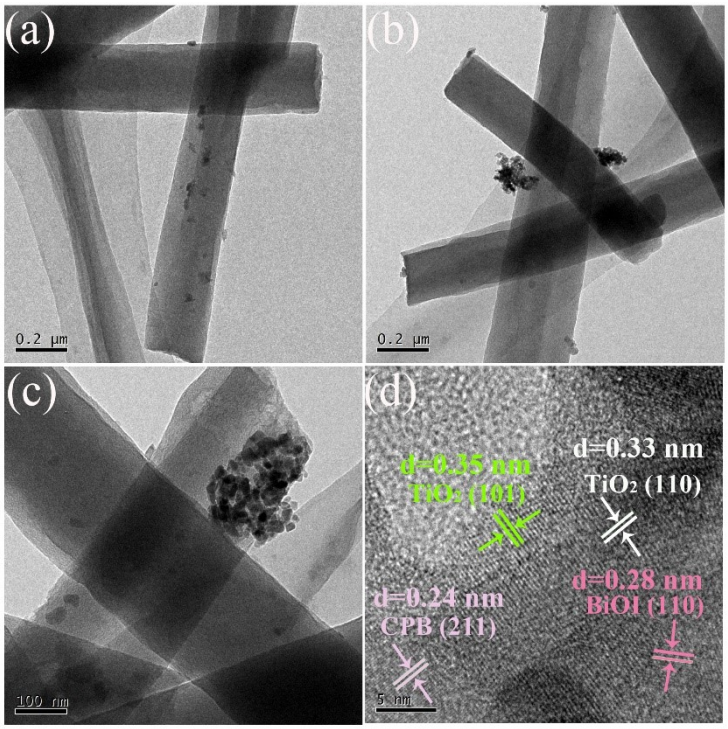

Figure S4. TEM images (a-c) and HRTEM image (d) of $C_{0.2}B_{0.2}T$@PAN nanofibers.

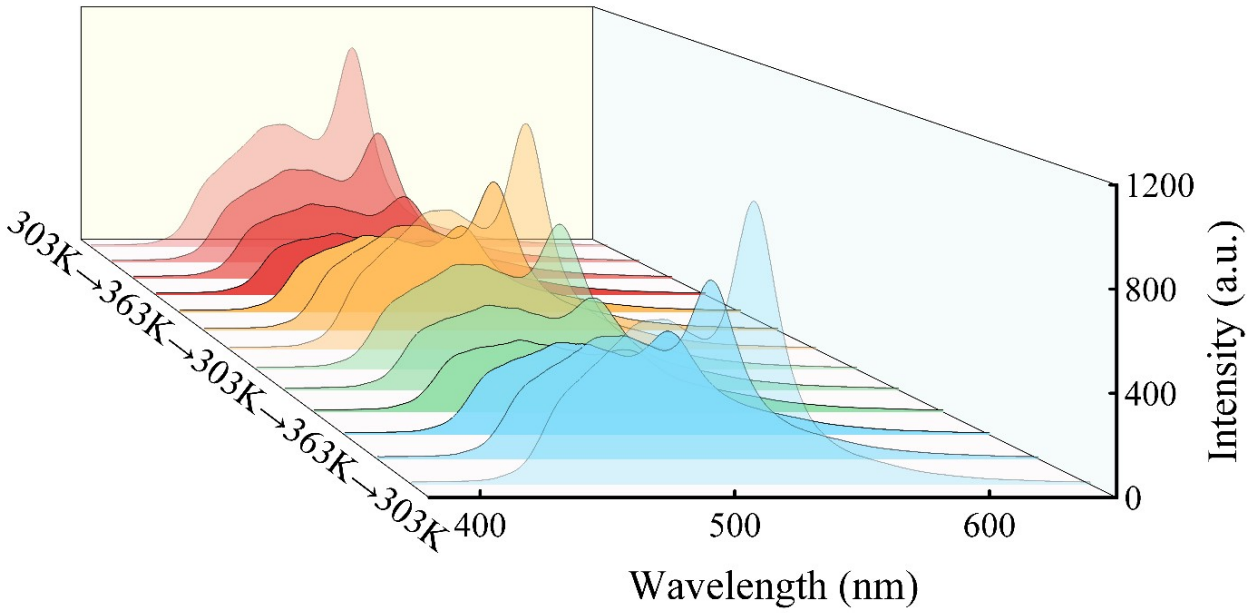

Figure S5. Temperature-dependent spectra of $C_{0.2}B_{0.2}T$@PAN nanofibers from 303 K to 363 K under 365 nm excitation.

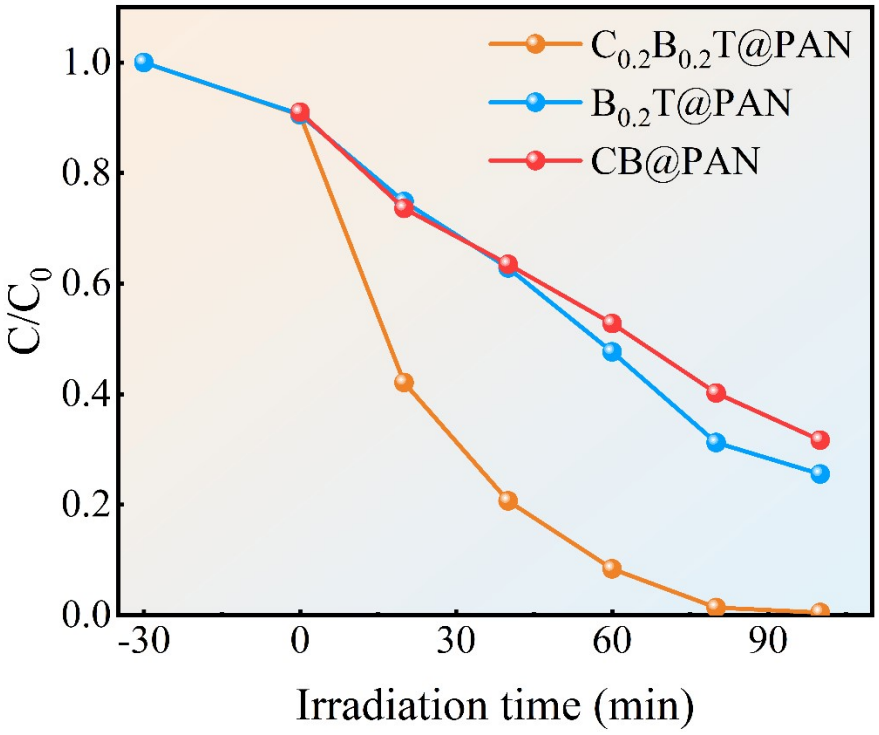

Figure S6. Photocatalytic degradation curves over as-prepared different catalysts for degradation of RhB utilizing simulated sunlight irradiation.

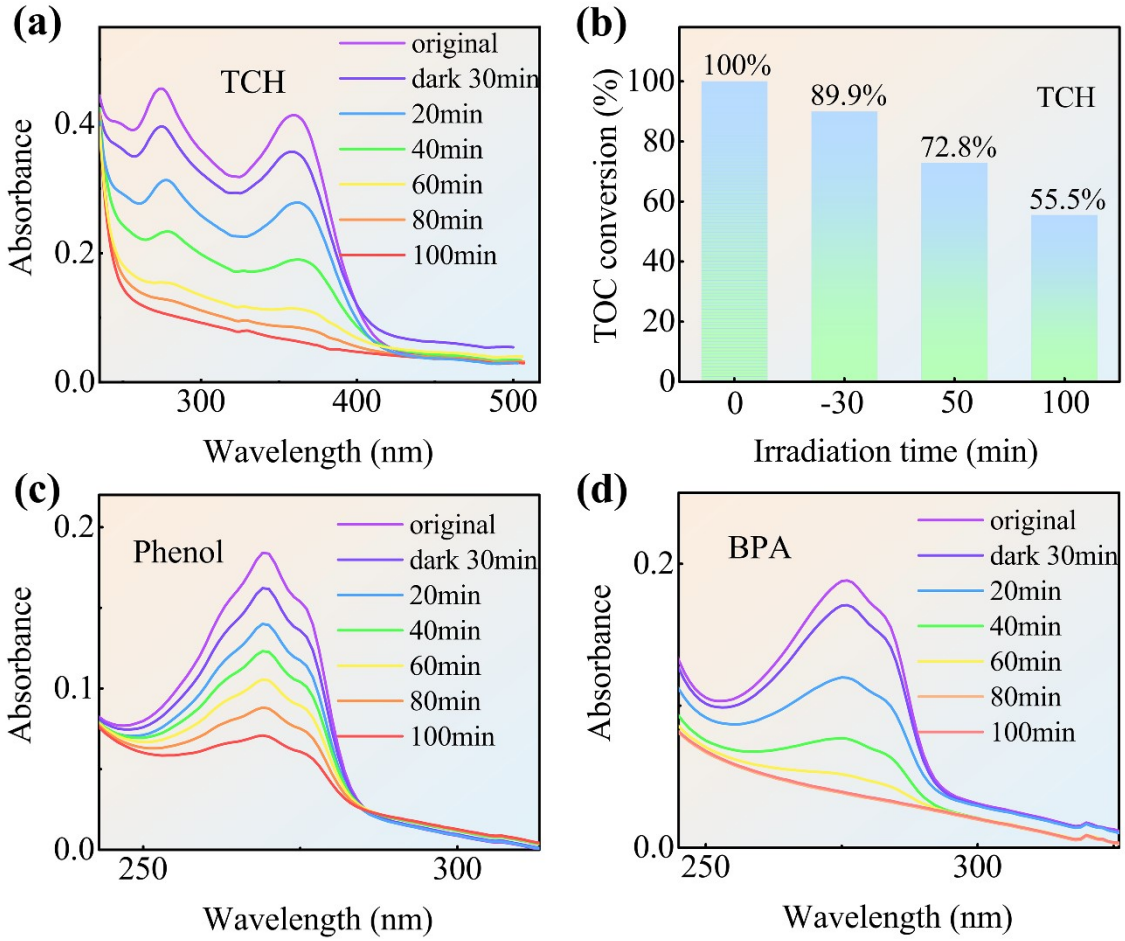

Figure S7. UV-vis spectral change of TCH (a), phenol (c) and BPA (d) over $C_{0.2}B_{0.2}T$@PAN nanofibers with different irradiation time. (b) The TOC contents of TCH solutions during the elimination reaction over the $C_{0.2}B_{0.2}T$@PAN nanofibers photocatalyst.

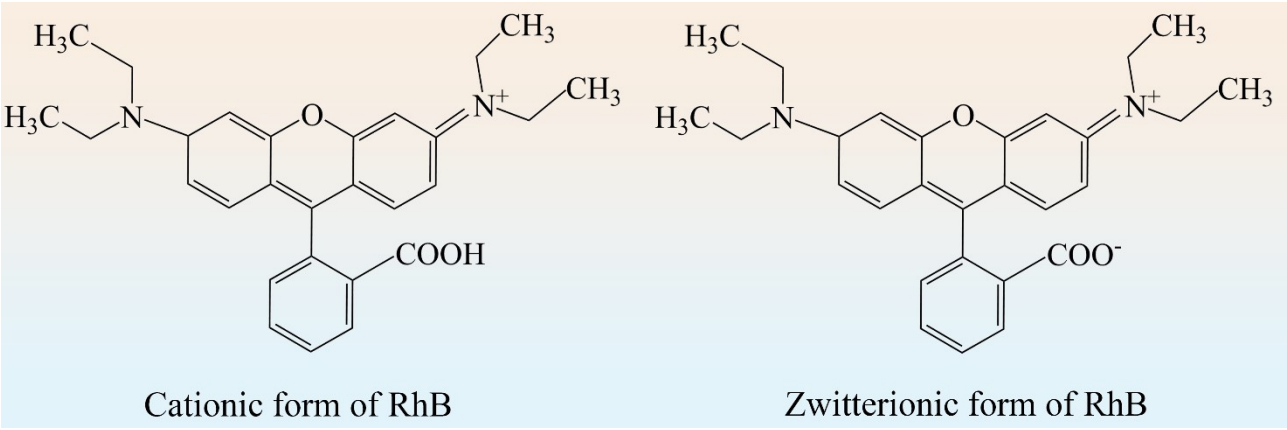

Figure S8. Chemical structure of different forms of RhB.

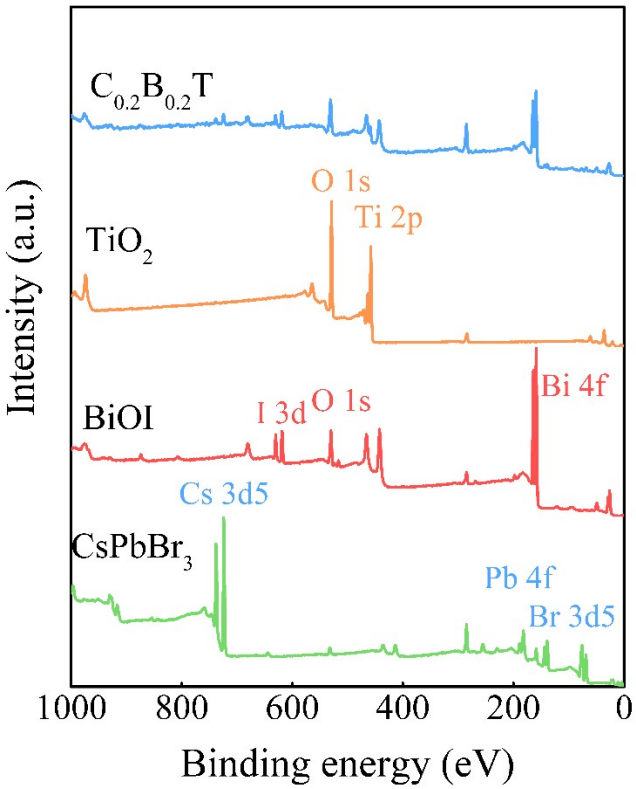

Figure S9. XPS full spectra of BiOI, $CsPbBr_3$, TiO_2 and $C_{0.2}B_{0.2}T$.

Table S1. Lattice constant of the prepared samples.

Sample	Lattice constant		
	a/Å	b/Å	c/Å
$CsPbBr_3$	5.83864	5.83864	5.83864
TiO_2	4.59035	4.59035	2.95504
BiOI	3.994	3.994	9.149

Table S2. Atomic percentage content table of $C_{0.2}B_{0.2}T$ NCs by XPS.

Element	Atomic %
C	48.13
O	26.8
Ti	14.88
Bi	5.02
I	1.35
Cs	0.76
Pb	0.40
Br	2.67

Table S3. The BET analysis results of the $C_{0.2}B_{0.2}T$ NCs and $C_{0.2}B_{0.2}T$@PAN nanofibers.

Sample	Specific surface area (m^2/g)	BJH desorption pore volume (cm^3/g)
$C_{0.2}B_{0.2}T$ NCs	6.88	0.12
$C_{0.2}B_{0.2}T$@PAN nanofibers	11.19	0.13

Table S4. The absorbance of samples with adsorption time of 10, 20, 30, 40 and 50 min under dark condition.

	10 min	20 min	30 min	40 min	50 min
PAN	0.984	0.951	0.908	0.909	0.908
TiO_2	0.993	0.968	0.927	0.928	0.927
BiOI	0.982	0.946	0.905	0.905	0.906
$CsPbBr_3$	0.986	0.954	0.915	0.916	0.915
$B_{0.05}T$	0.990	0.958	0.917	0.917	0.918
$B_{0.1}T$	0.981	0.950	0.907	0.907	0.906
$B_{0.2}T$	0.979	0.948	0.906	0.905	0.905
$B_{0.4}T$	0.989	0.959	0.916	0.915	0.914
$C_{0.05}B_{0.2}T$	0.983	0.951	0.908	0.907	0.907
$C_{0.1}B_{0.2}T$	0.976	0.946	0.902	0.903	0.903
$C_{0.2}B_{0.2}T$	0.972	0.943	0.905	0.905	0.906
$C_{0.4}B_{0.2}T$	0.982	0.952	0.906	0.905	0.904

Table S5. Goodness of fit (R^2) and apparent rate constant (k) of RhB degradation.

photocatalyst	R^2	k (min^{-1})
TiO_2	0.93375	0.00031
BiOI	0.99915	0.00502
$CsPbBr_3$	0.99556	0.00118
$B_{0.05}T$	0.94163	0.01156
$B_{0.1}T$	0.94669	0.01192
$B_{0.2}T$	0.96221	0.01277
$B_{0.4}T$	0.93868	0.01149
$C_{0.05}B_{0.2}T$	0.97941	0.02702
$C_{0.1}B_{0.2}T$	0.97516	0.03909
$C_{0.2}B_{0.2}T$	0.95682	0.05181
$C_{0.4}B_{0.2}T$	0.97672	0.03271

Table S6. Comparison of photocatalytic degradation for pollutants of the $C_{0.2}B_{0.2}T$@PAN nanofibers with the reported materials.

Photocatalyst	C_0 of pollutant [$mg \cdot L^{-1}$]	Irradiation light	Time [min]	Catalyst amount [$mg \cdot mL^{-1}$]	Removal efficiency [%]	Degradation rate constant k [min^{-1}]	References
$CsPbBr_3/BiOI/TiO_2$ nanofibers	RhB, 5	Vis	100	0.5	99.5	0.0518	This work
$CsPbBr_3/BiOI/TiO_2$ nanofibers	TCH, 10	Vis	100	0.5	97.7	/	This work
ZnO@AC@FeO	BPA, 30	UVC	60	0.4	95.6	0.0400	[17]
$CsPbBr_3/BiOI/TiO_2$ nanofibers	BPA, 10	Vis	100	0.5	95.2	/	This work
$g\text{-}C_3N_4/Ag_2CO_3/GO$	TC, 20	Vis	100	0.6	97.6	0.0268	[19]
NH_4F/Bi_2WO_6	RhB, 4.8	Vis	110	1	90.0	0.0158	[14]
biochar/$2Zn_3In_2S_6$/WO_3	RhB, 30	Vis	120	0.1	80.5	0.0120	[66]
$WO_3@TiO_2\text{-}SiO_2$	PHE, 500	Vis	180	0.5	58.8	0.0047	[11]
$g\text{-}C_3N_4/TiO_2$ films	MB, 10	Vis	180	/	68.0	/	[10]
$TiO_2/BiOI/Ag$	MO, 15	Solar	180	/	93.3	/	[23]