Synthesis and Property Detection of the $Ho_2BiNbO_7/ZnBiTmO_4$ Composite Catalyst for Photocatalytic Degradation of Brilliant Green

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Table S1. The concentration variation of the brilliant green by the adsorption effect of the HZ under dark conditions.

Dark adsorption time (min)	-63	-54	-45	-36	-27	-18	-9	0
Brilliant green concentration (mM)	0.03200	0.03152	0.03098	0.03041	0.02994	0.02957	0.02954	0.02952

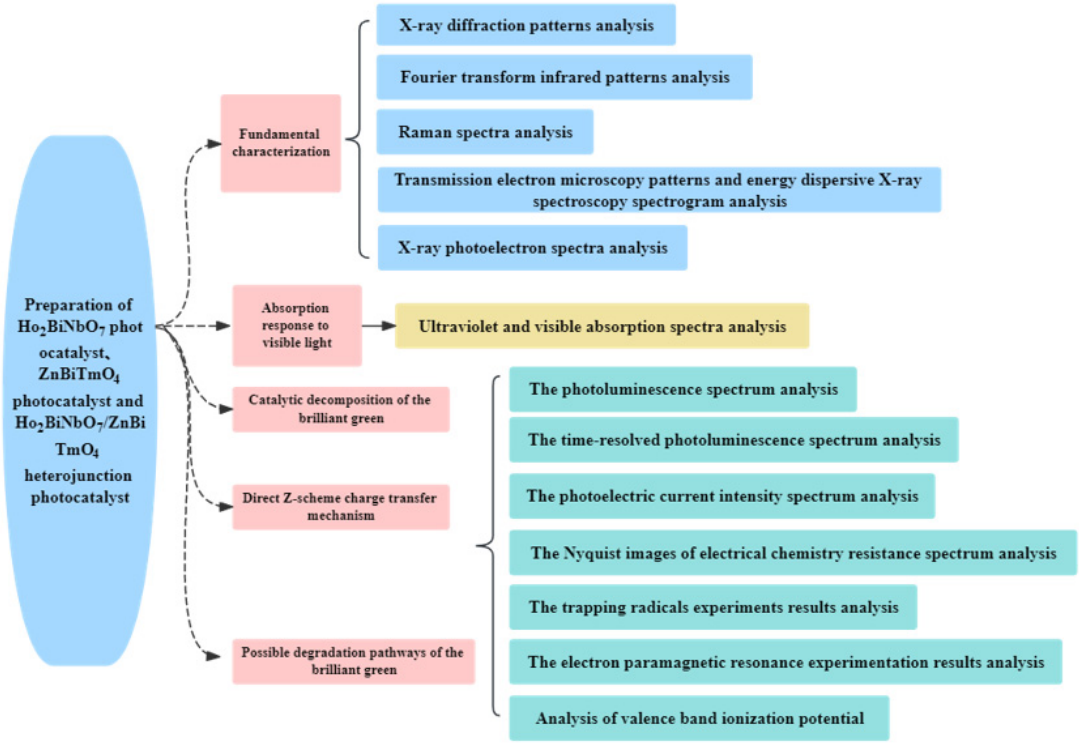


Figure S1. The research process flowchart for each stage of this study.

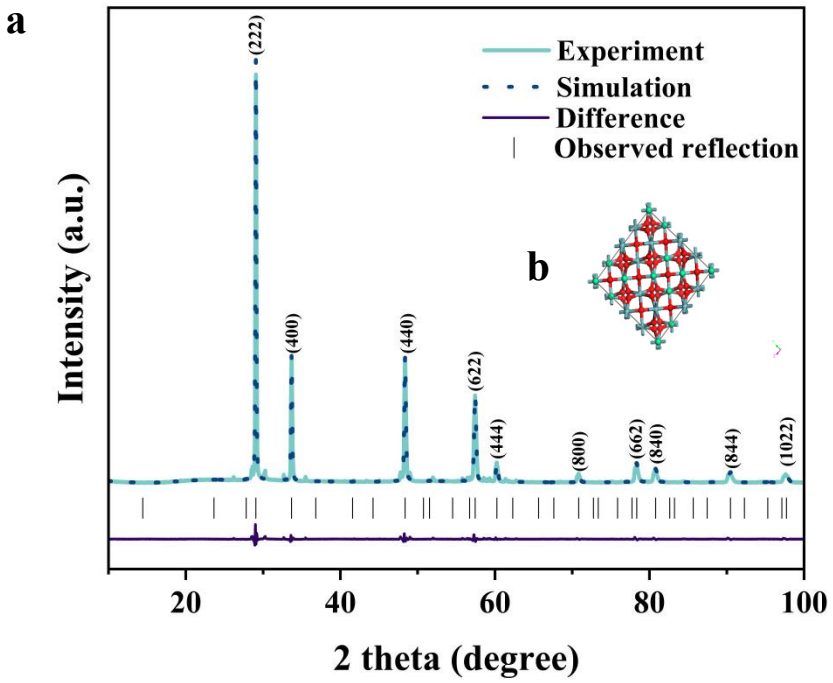


Figure S2. (a) The XRD pattern and the Pawley refinement result, and **(b)** the atomic architecture of Ho_2BiNbO_7.

Table S2. Structural properties of Ho_2BiNbO_7 fabricated with the rapid microwave-assisted high temperature treatment method.

Atom	x	y	z	**Occupation Factor**
Ho	0	0	0	1
Bi	0.5	0.5	0.5	0.5
Nb	0.5	0.5	0.5	0.5
O(1)	-0.125	0.125	0.125	1
O(2)	0.125	0.125	0.125	1

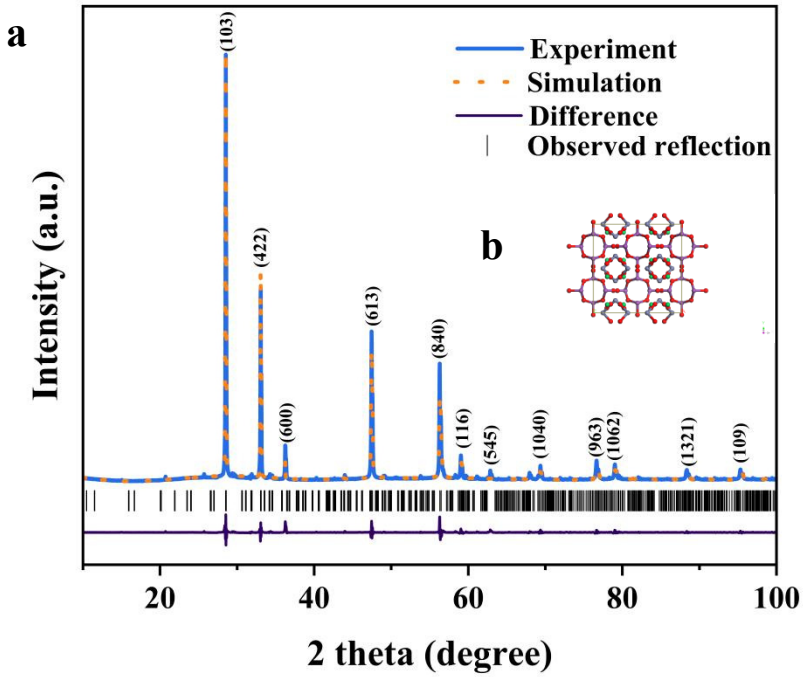


Figure S3. (a) The XRD pattern and the Pawley refinement result, and **(b)** the atomic architecture of $ZnBiTmO_4$.

Table S3. Structural properties of $ZnBiTmO_4$ fabricated with the homogeneous precipitation assisted heat treatment method.

Atom	x	y	z	**Occupation Factor**
Zn	0.39003	0.00000	0.00000	1
Bi	0.00000	0.11132	0.22252	1
Tm	0.15752	0.09252	0.87500	1
O(1)	0.00000	0.97728	0.30179	1
O(2)	0.15267	0.05286	0.12528	1
O(3)	0.39217	0.14216	0.12500	1

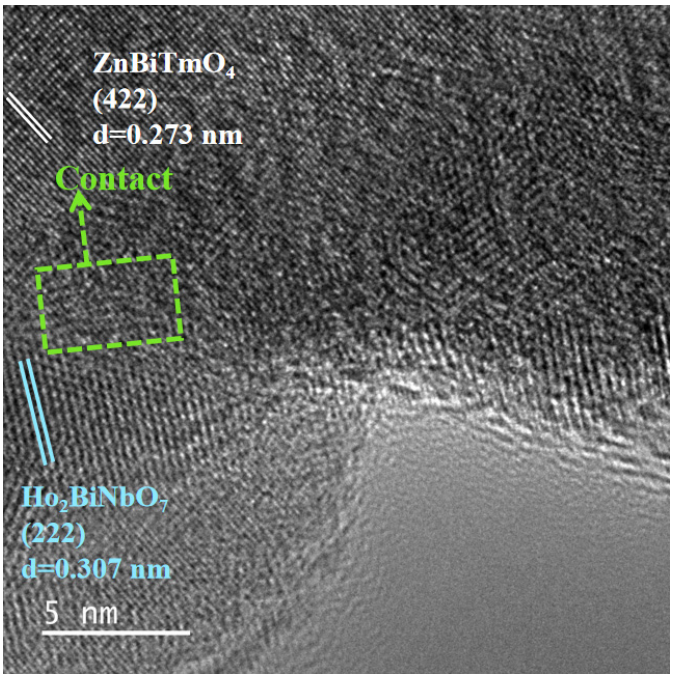
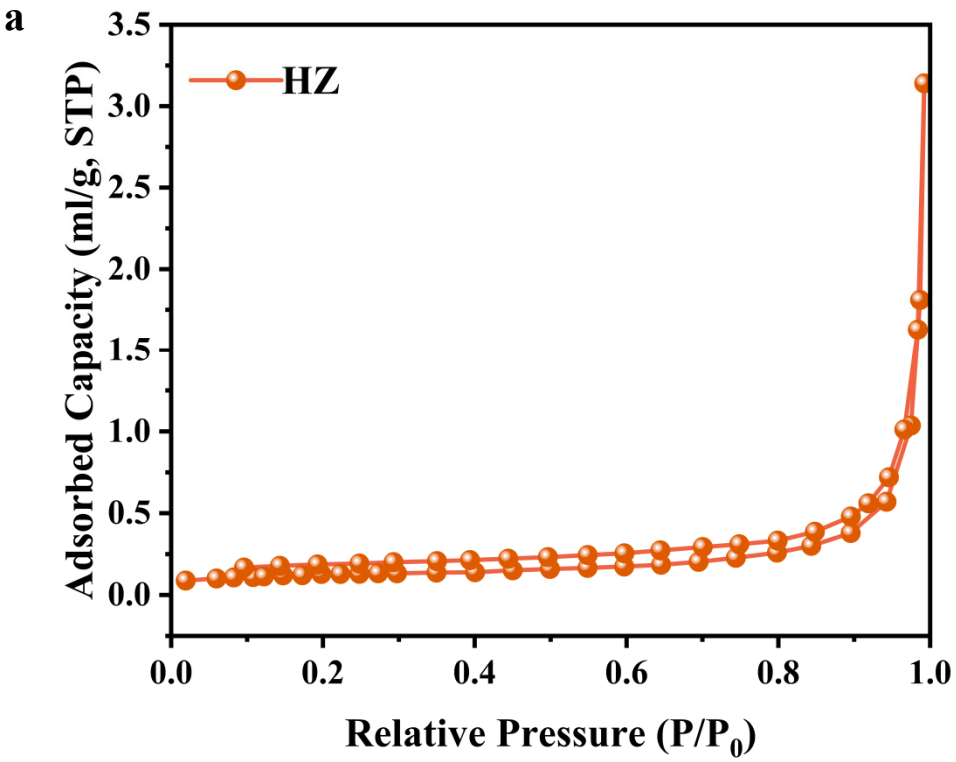


Figure S4. HRTEM image of HZ.



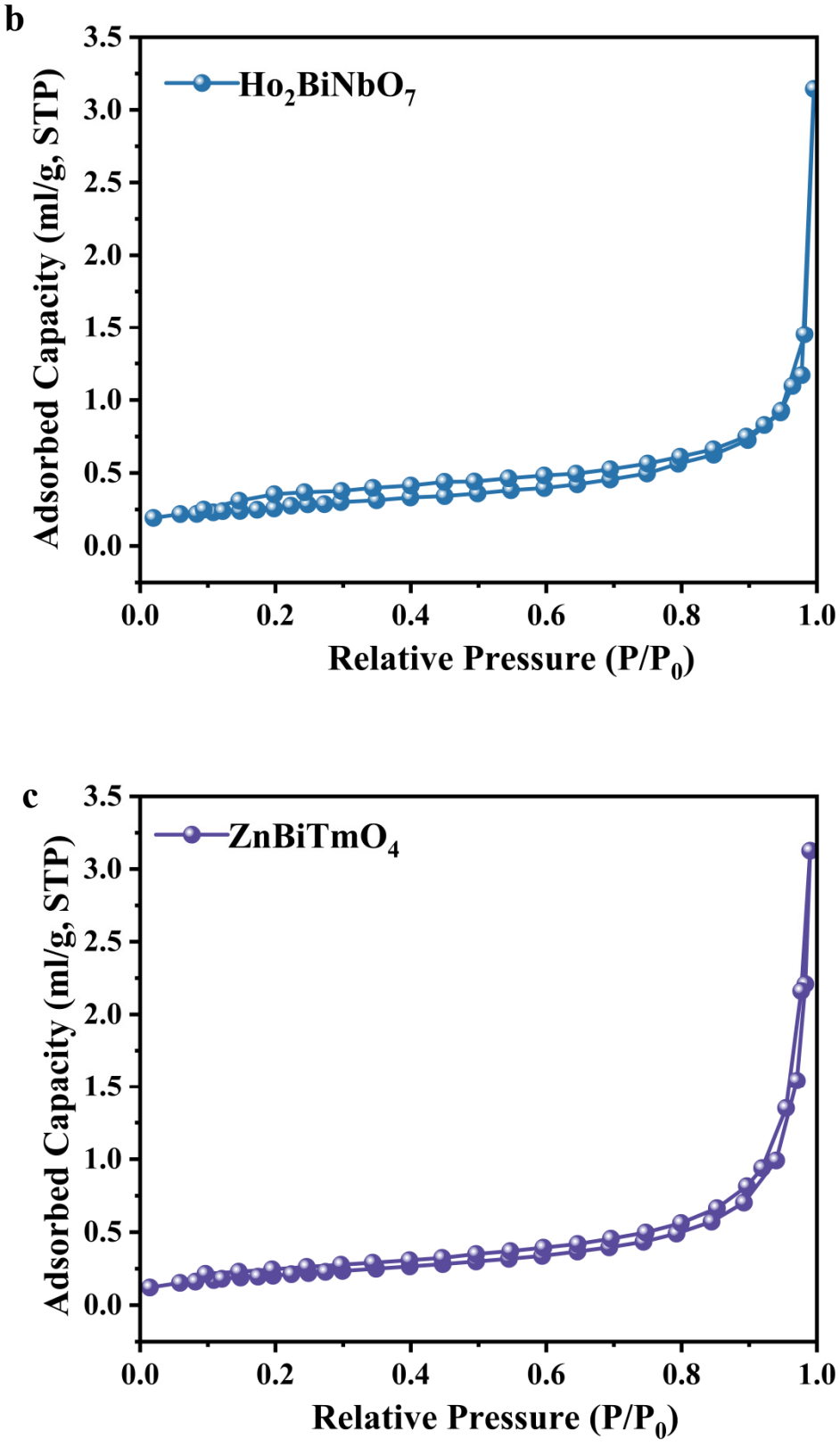


Figure S5. The N_2 sorption isotherms of of **(a)** HZ, **(b)** Ho_2BiNbO_7, and **(c)** $ZnBiTmO_4$.

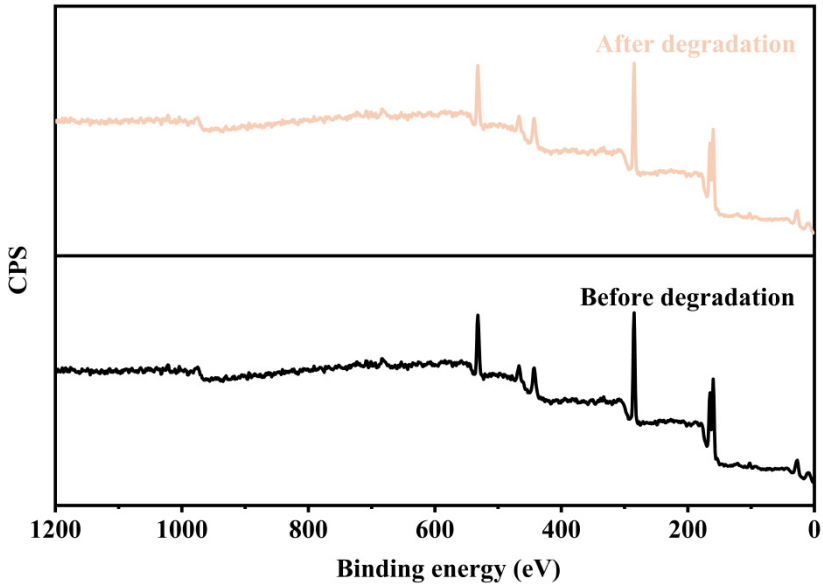


Figure S6. The XPS patterns of the unused HZ and the used HZ.

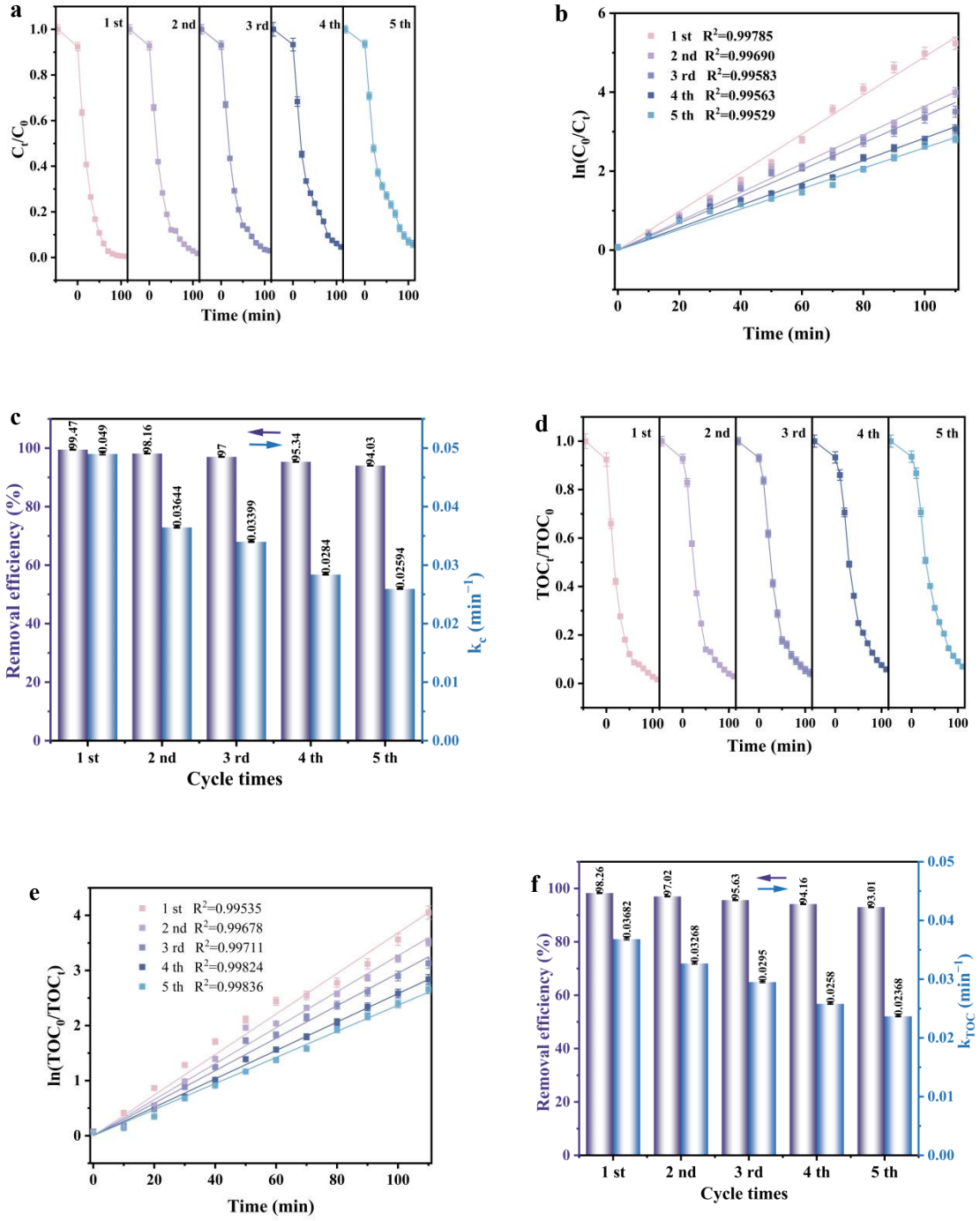


Figure S7. (a) The degradation curves of the BLG, **(b)** the kinetic curves for the BLG concentration variation, and **(c)** the removal efficiencies and kinetic constants of the BLG concentration after five cyclical tests for degrading the BLG; **(d)** The mineralization curves for removing TOC concentration, **(e)** the kinetic curves for TOC concentration variation, and **(f)** the mineralization efficiencies and kinetic constants for TOC concentration after five cyclical degradation tests for removing TOC concentration with HZ as catalyst under visible light irradiation.

Table S4. Comparison of photocatalytic performance of the HZ photocatalyst with other reported photocatalysts.

Photocatalyst	Pollutant	Irradiation Time (min)	Removal Rate	Reference
$Bi_2SmSbO_7/ZnBiYO_4$ heterojunction photocatalyst	direct orange	160	99.10%	[39]
$MnFe_2O_4$	Rhodamine B	90	68.51%	[10]
$YGdTi_2O_7$	methylene blue	180	66.00%	[40]
$Ho_2BiNbO_7/ZnBiTmO_4$ heterojunction photocatalyst	brilliant green	110	99.47%	This study

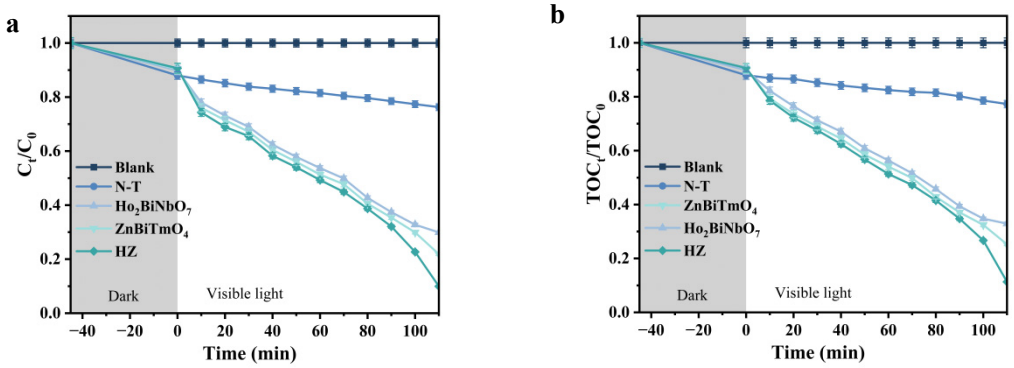


Figure S8. (a) The degradation curves of the phenol, **(b)** The mineralization curves for removing TOC concentration with Ho_2BiNbO_7, $ZnBiTmO_4$, HZ or N-T as photocatalyst under visible light irradiation.