Supplementary Information (SI) for Nanoscale.

Supporting Information

Unveiling the Efficient S-scheme Charge Carrier Transfer in Hierarchical BiOBr/TiO_2 Heterojunction Photocatalysts

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Table S1. *Represents the weight fraction of anatase and rutile in TNF and BTNF heterojunction samples.*

Sample Code	Anatase %	Rutile %
TNF	68.03	31.96
$BTNF_{0.5}$	73.73	26.26
$BTNF_{1.0}$	77.28	22.71
$BTNF_{1.5}$	91.70	8.29
$BTNF_{2.0}$	88.29	11.70

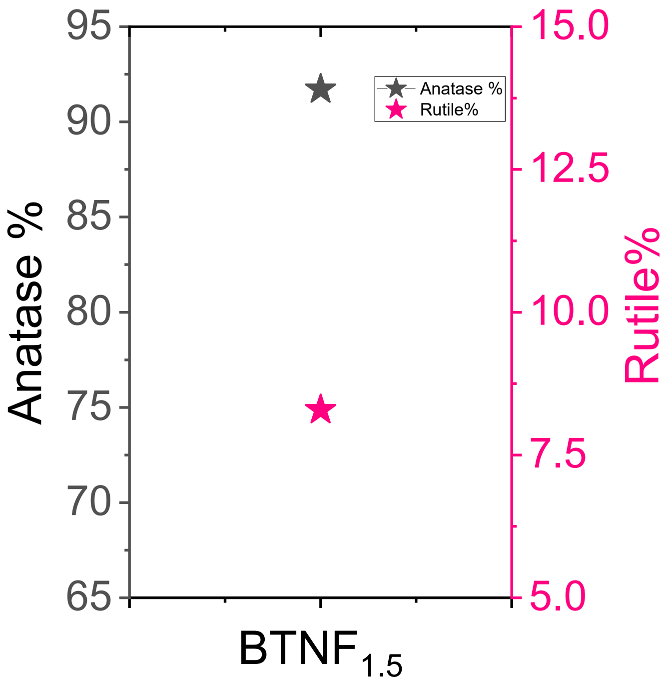

Fig. S1 Represents the Anatase-Rutile weight % of BTNF $_{1.5}$.

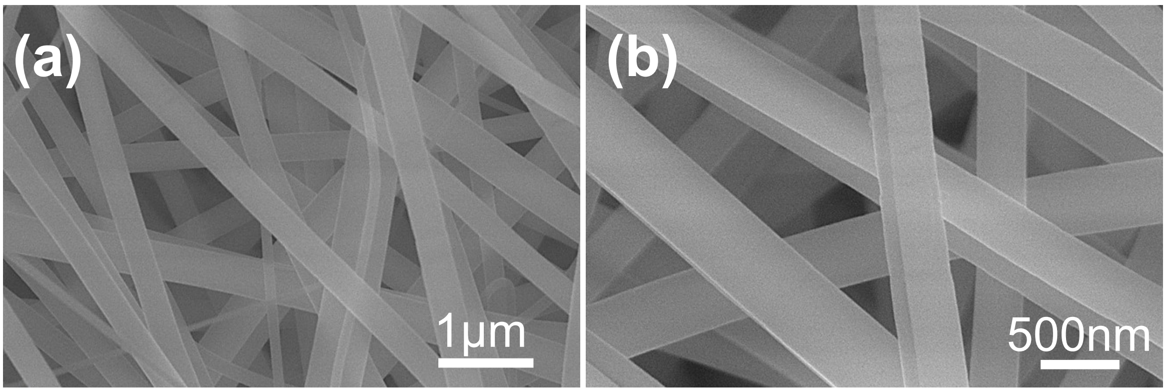

Fig. S2 (a) Low Resolution and (b) High Resolution images for as-fabricated Titania nanofiber mat

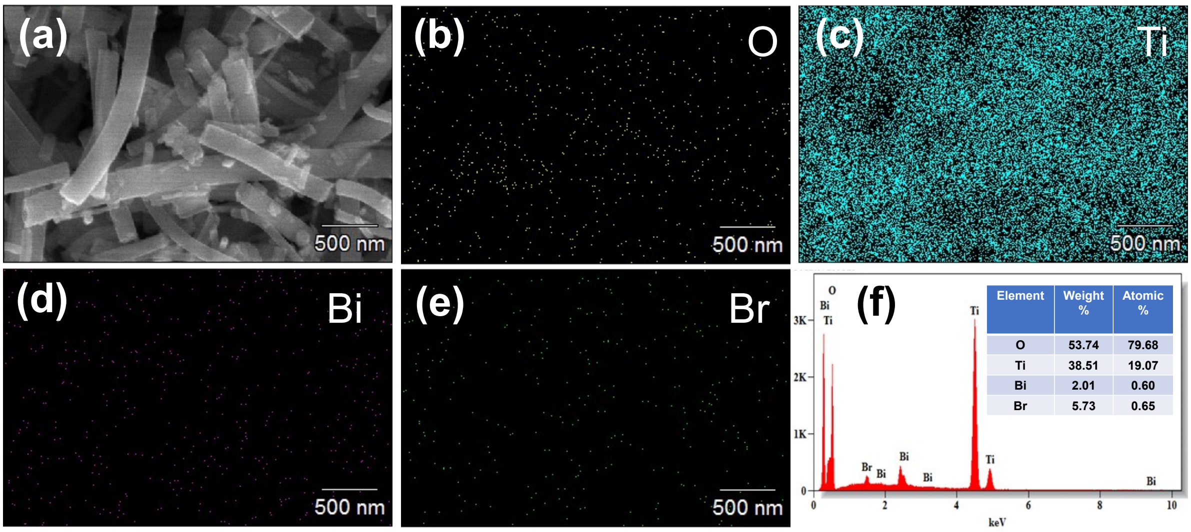

Fig. S3 *(a) Morphology of BTNF$_{0.5}$ (b-e) Elemental Mapping of BTNF$_{0.5}$ (f) corresponding EDAX spectra*

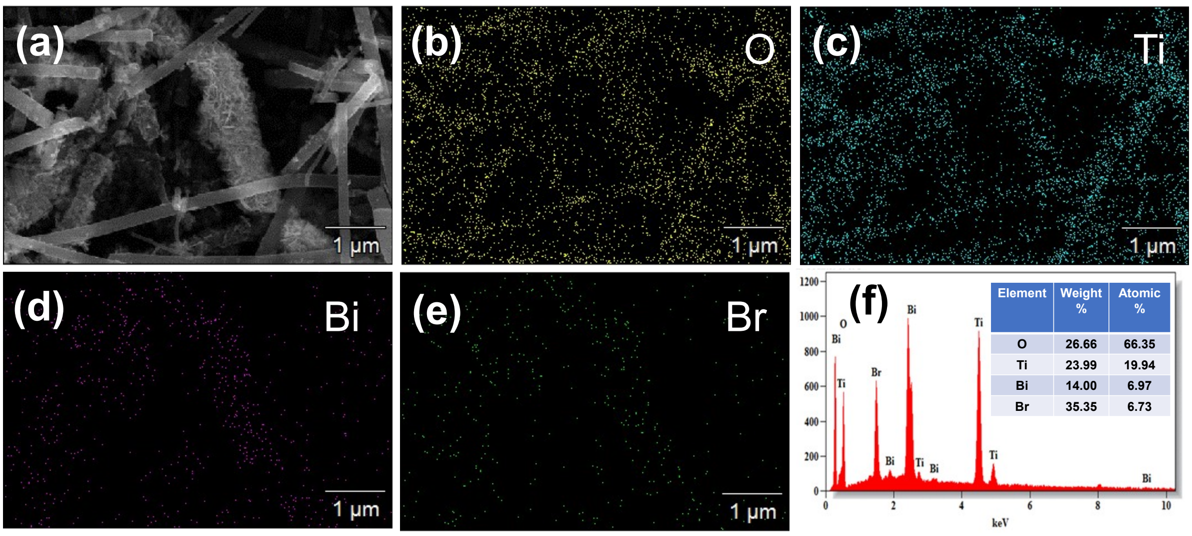

Fig. S4 *(a) Morphology of BTNF$_{1.0}$ (b-e**)** Elemental Mapping of BTNF$_{1.0}$ (f) corresponding EDAX spectra*

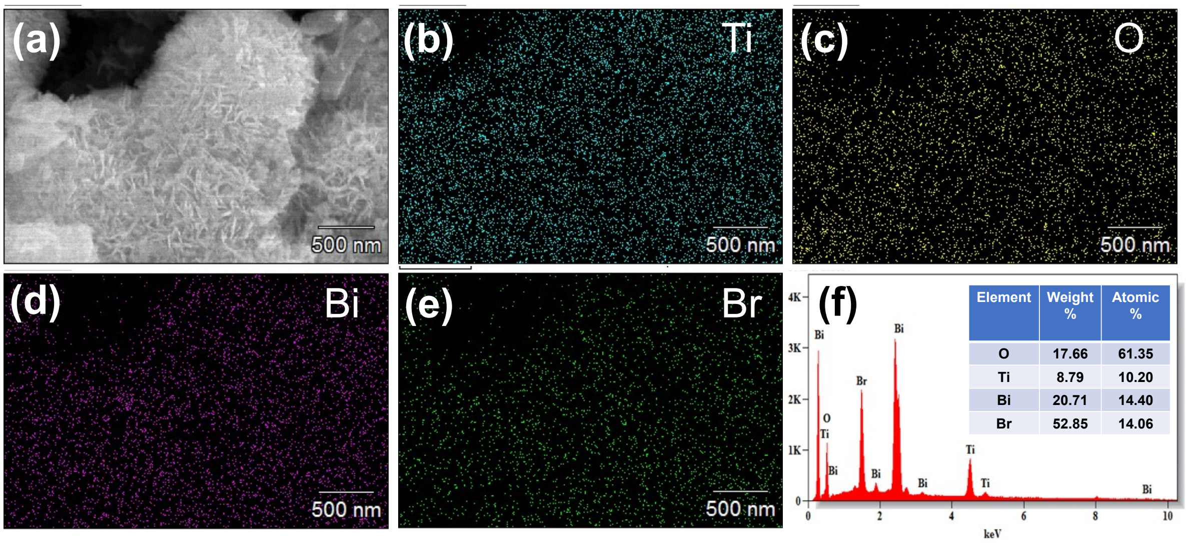

Fig. S5(*a) Morphology of BTNF*$_{2.0}$ *(b-e****)*** *Elemental Mapping of BTNF*$_{2.0}$ *(f) corresponding EDAX spectra*

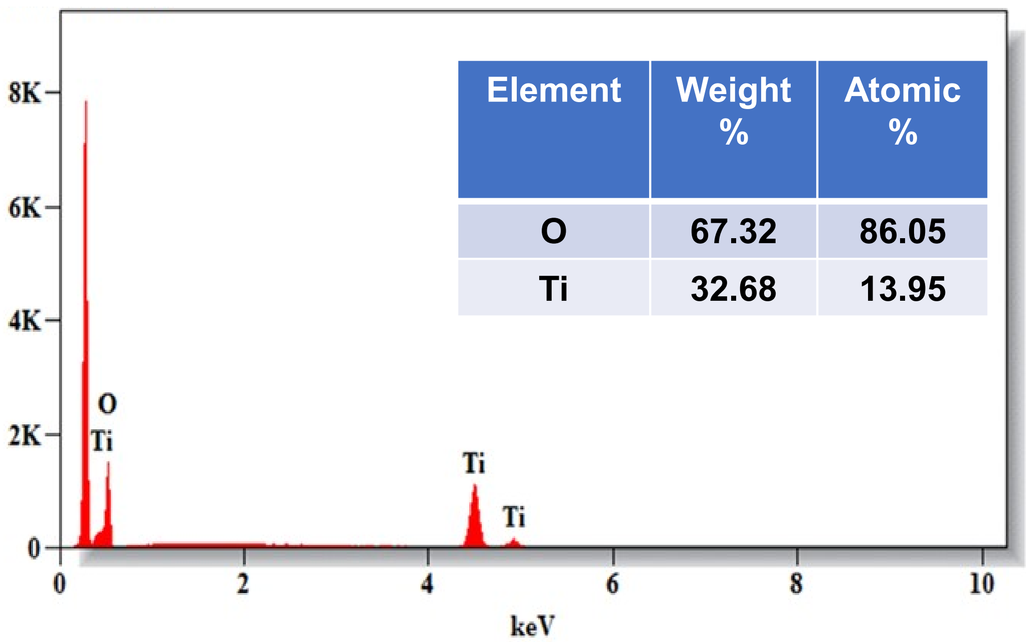

Fig. S6 *EDAX analysis of TNF sample*

Table S2. *Represents the quantitative elemental analysis in TNF and BTNF heterojunction sample.*

Sample Code	Ti	O	Br	Bi	Total (Ti, Bi,Br)
TNF	67.32	32.68	0	0	67.32
$BTNF_{0.5}$	53.74	38.51	2.01	5.73	61.48
$BTNF_{1.0}$	26.66	23.99	14	35.35	76.01
$BTNF_{1.5}$	22.57	14.07	18.94	44.42	85.93
$BTNF_{2.0}$	17.66	8.79	20.71	52.85	91.22

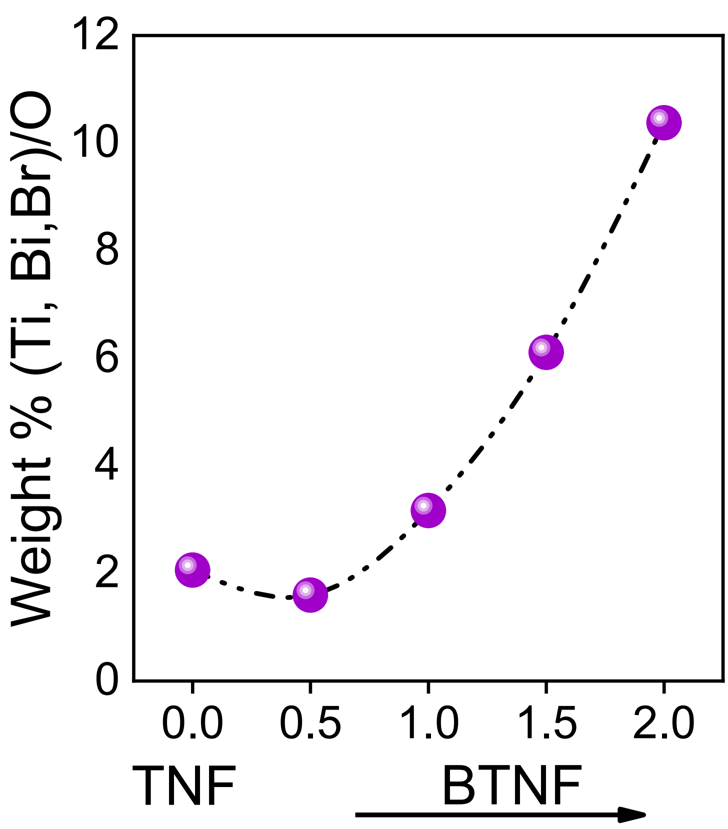

Fig. S7 Denotes the weight % of sum of Ti,Bi nd Br elements with respect to Oxygen.

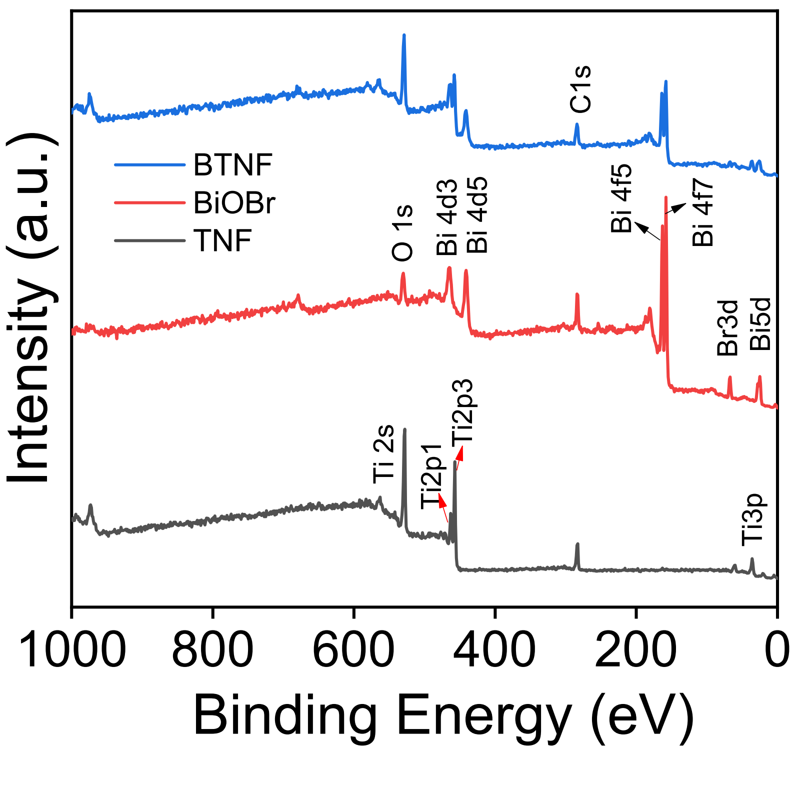

***Fig. S8** XPS survey spectrum of TNF, BiOBr, and BTNF.*

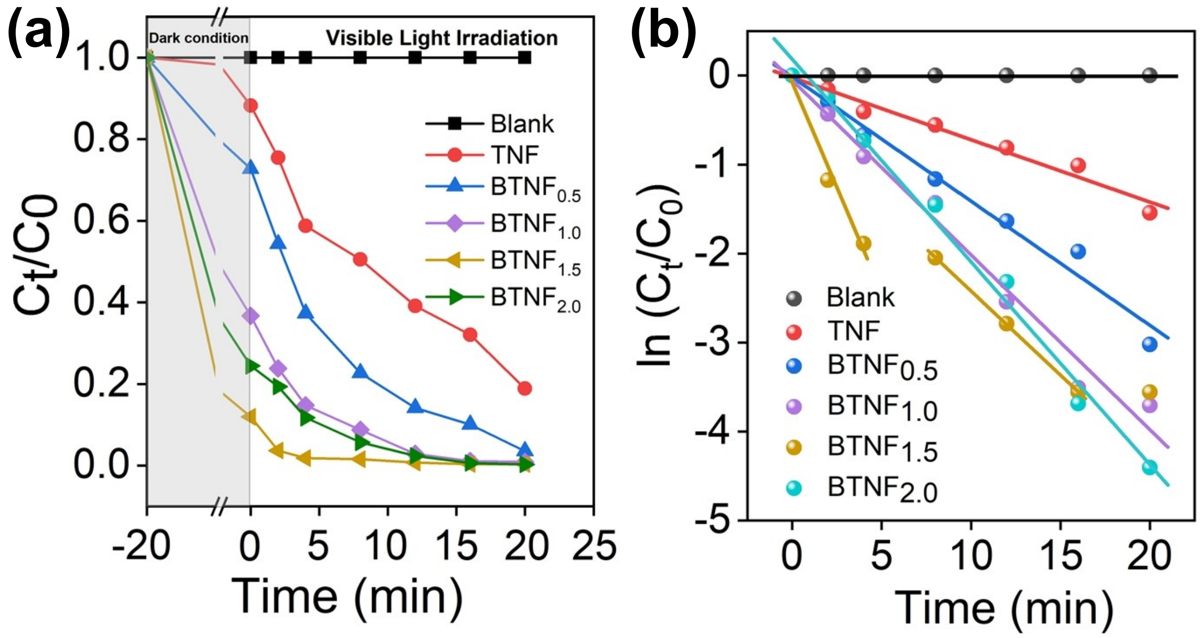

Fig. S9 *(a) Photolysis and photocatalysts dye degradation shown using the plot* C_t/C_0 *versus time, and (b) reaction kinetic plots with different photocatalysts under the visible light irradiation*

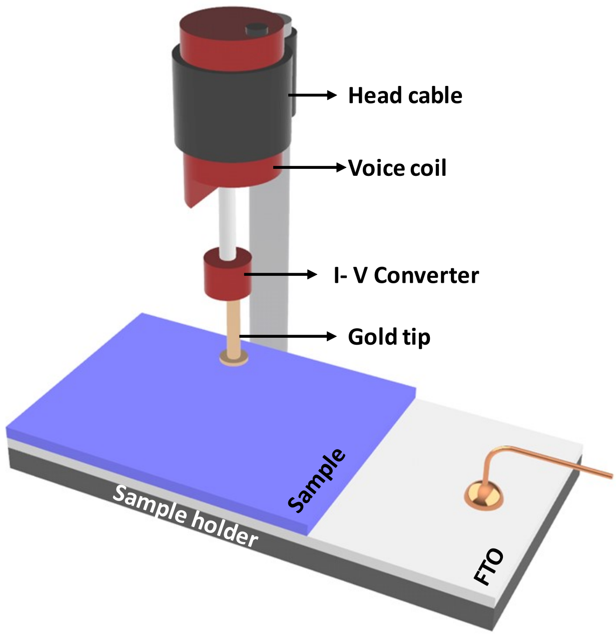

Fig. S10 *Illustration of the SKP setup.*

Sample Preparation for SKP measurement

For the sample preparation FTO was chosen to promote the conductivity, on which the sample was coated. Initially a slurry was prepared where ~2 mg of the sample was taken and dissolved in 500 mL of ethanol. From it, 150 μL of solution was taken and using spin-coating technique the sample was coated at 500 RPM for 40 sec with 3 times interval. This enabled the uniform coating of the solution on the FTO surface. Later, the coated sample was allowed for drying in ambient atmosphere and was used for SKP analysis.

***Table S3**. Comparison of photocatalytic degradation efficiency of various materials from Reported Literature*

Catalyst used and amount	Conc.and volume of RhB	Light source	Degradation time (min)	Degradation %	Reference
$BiOBr/TiO_2$ Nanoheterostructure (40mg)	5 mg. L^{-1}, 40 mL	Metal halide lamp, 300 W(λ=350 - 650nm)	8, 12	98.4, 100	This Work
2D/2D BiOBr/(001)-TiO_2 heterojunction (40 mg)	10 mg·L^{-1},40 mL	Xenon lamp, 500 W (λ=290 - 700nm)	60	99	[1]
BiOBr Nanoplates onto TiO_2 Nanorods (70 mg)	15 mg·L^{-1}, 70 mL	Xenon lamp, 300 W (λ> 420 nm)	10	99	[2]
SnO_2/BiOBr Heterojunction (50 mg)	20 mg L^{-1}, 50 mL	5W LED lights (λ>400 nm)	20	98.2	[3]
S-scheme In_2O_3/BiOBr heterojunction (100 mg)	10 mg·L^{-1}, 200 mL	Xenon lamp, 300 W (λ = 290-700 nm)	30	56.6	[4]
Hierarchical heterostructured BiOBr@TiO_2 (2 mg)	10 mg L^{-1}, 10 mL	Xenon lamp, 300 W (λ> 420nm)	120	95.5	[5]
BiOBr–TiO_2–graphene composite with graphene as a nano-filler (25 mg)	10 mg·L^{-1}, 100 mL	Xenon lamp, 300 W (λ> 400 nm)	12	100	[6]
BiOBr nanosheets@TiO_2 nanobelts (50mg)	20 mg·L^{-1}, 50 mL	Xenon lamp, 300 W (λ=420 nm)	40	92.8	[7]
TiO_2- Au-BiOBr Z-scheme system (4mg)	25 mg·L^{-1}, 20 mL	Xenon lamp, 300 W (λ=290 -	30	99.9	[8]

		700nm)			
Hybrid $BiOBr–TiO_2$ nanocomposites (25 mg)	10 $mg·L^{-1}$, 100 mL	Xenon lamp, 300 W (λ>400 nm)	20	100	9
p-BiOBr/n-TiO_2 hierarchical nanostructures (100mg)	10 $mg·L^{-1}$, 100 mL	Xenon lamp 150 W (λ>400 nm)	20	76	10

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