

Supplementary Information

**Facile synthesis of a Bi₂WO₆/BiO_{2-x} heterojunction efficient for
photocatalytic degradation of ciprofloxacin under visible light**

Hongzhong Zhang ^{1,*}, Zhaoya Fan ¹, Qingqing Chai ², and Jun Li ^{2,*}

¹ *School of Materials and Chemical Engineering, Zhengzhou University of Light Industry,
Zhengzhou 450001, P. R. China;*

² *Henan Institute of Advanced Technology, Zhengzhou University, Zhengzhou 450052, P.R.
China.;*

^{*} Correspondence: zhz@zzuli.edu.cn; junli2019@zzu.edu.cn (J. Li)

Table S1. Crystallite size of the prepared materials.

Samples	Crystallite size (nm)
BiO _{2-x}	48.9
Bi ₂ WO ₆	6.4
5%Bi ₂ WO ₆ /BiO _{2-x}	40.4
10%Bi ₂ WO ₆ /BiO _{2-x}	39.5
15%Bi ₂ WO ₆ /BiO _{2-x}	38.9
20%Bi ₂ WO ₆ /BiO _{2-x}	37.4
25%Bi ₂ WO ₆ /BiO _{2-x}	36.5

The average crystallite sizes for pure BiO_{2-x} as well as Bi₂WO₆/BiO_{2-x} composites are calculated using the Scherrer equation:

$$D = \frac{0.9\lambda}{\beta \cos\theta} \quad (1)$$

where D is the crystallite size, λ is the wavelength of the incident X-ray, β is the value of full width at half maxima (FWHM), and θ is the diffraction angle corresponding to the most intense peak, i.e. (1 1 1) plane. The lattice parameters were calculated from the inter-planar distance (d) and the miller indices (h k l) of the most intense (1 1 1) plane using the equation[1]:

$$\frac{1}{d^2} = \frac{h^2}{a^2} + \frac{k^2}{b^2} + \frac{l^2}{c^2} \quad (2)$$

These results indicated that the proposed heterostructure induced lattice strain in Bi₂WO₆/BiO_{2-x} did not reflect any significant changes in the lattice parameters a, b, and c.

Table S2. Porous parameters of BiO_{2-x}, Bi₂WO₆ and 20% Bi₂WO₆/BiO_{2-x}.

Samples	Surface (m ² /g)	Area	Pore Volume (cm ³ /g)	Pore Size (nm)
BiO _{2-x}	5.1639		0.032946	53.7777
Bi ₂ WO ₆	101.5031		0.255709	8.7168
20%Bi ₂ WO ₆ /BiO _{2-x}	10.4902		0.043427	32.0445

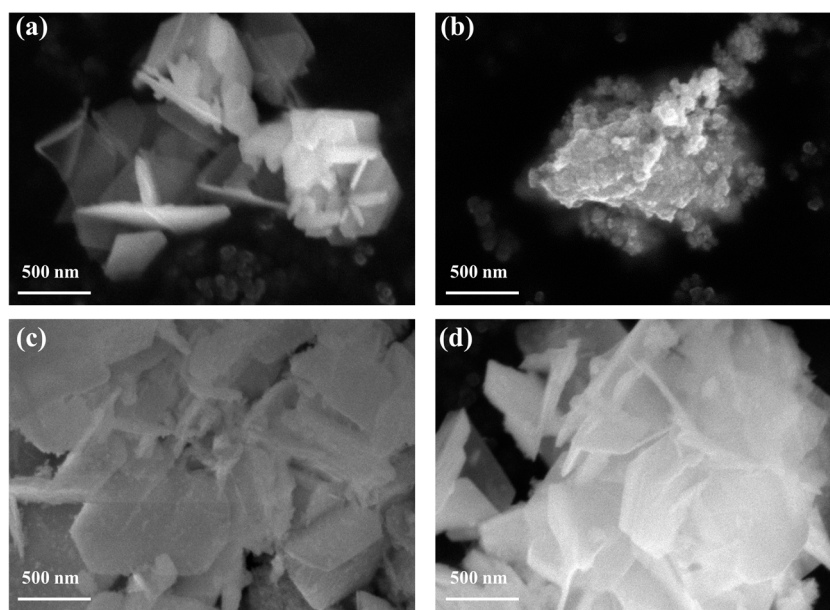


Figure S1. SEM image of (a) BiO_{2-x}; (b) Bi₂WO₆; 20% Bi₂WO₆/BiO_{2-x}(c) before and(d) after use

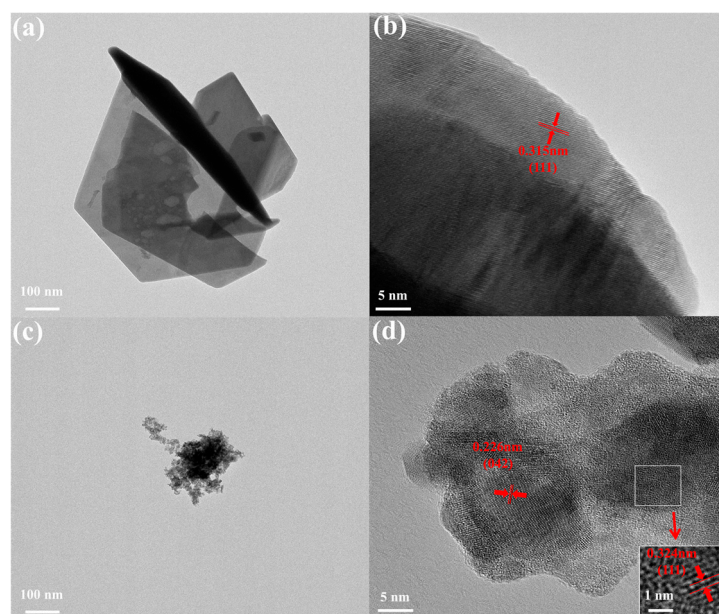


Figure S2. TEM images of (a) BiO_{2-x} ; (c) Bi_2WO_6 and HRTEM images of (b) BiO_{2-x} ; (d) Bi_2WO_6 .

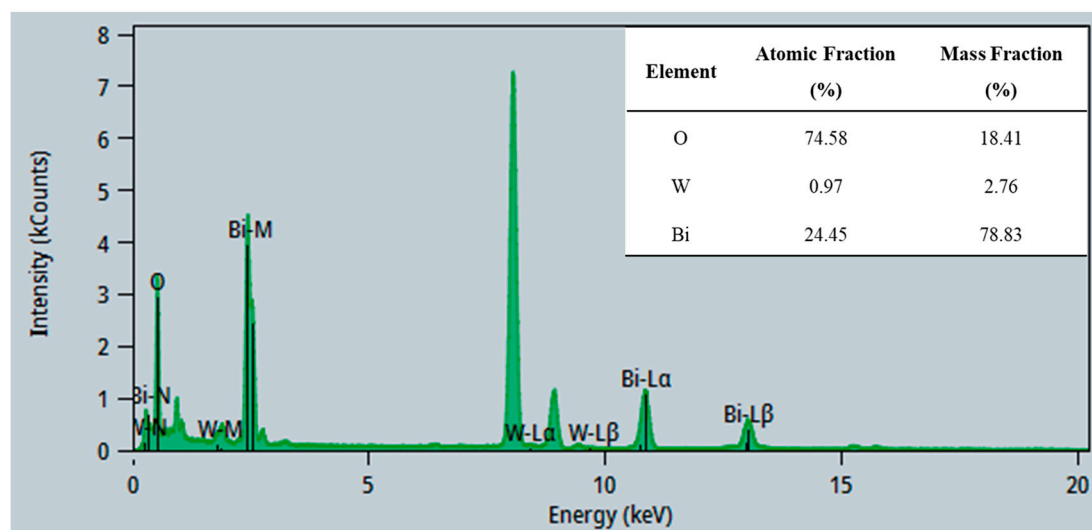


Figure S3. EDX spectrum of 20% Bi₂WO₆/BiO_{2-x}.

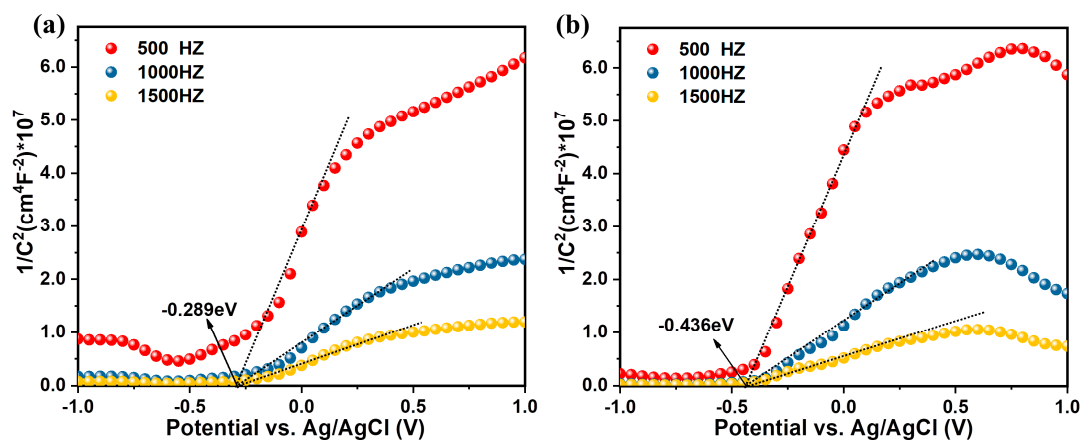


Figure S4. The Mott-Schottky plots of (a) Bi_2WO_6 and (b) BiO_{2-x} at different frequencies (500 Hz, 1000 Hz and 1500 Hz).

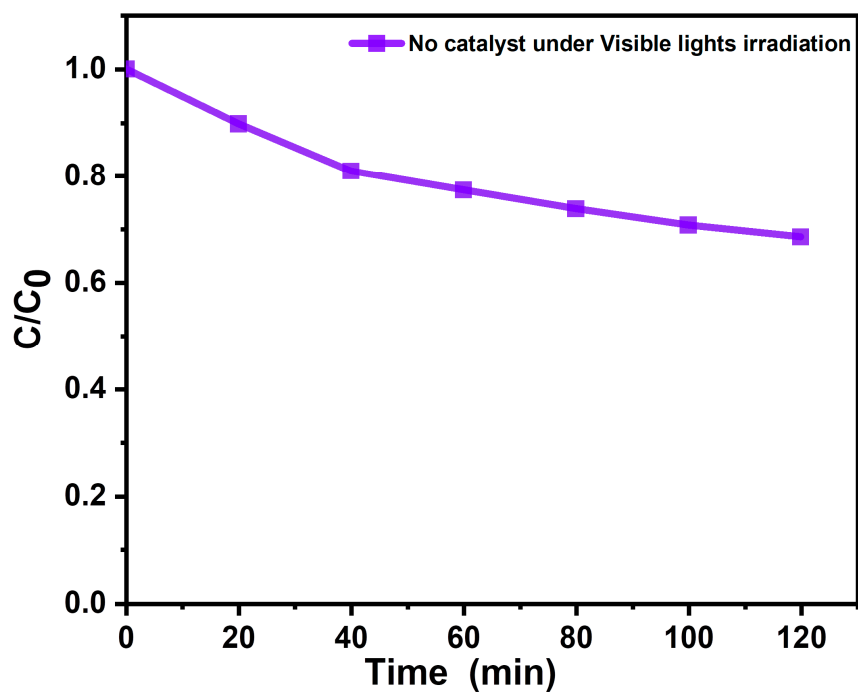


Figure S5. Photocatalytic degradation of CIP without any catalyst for comparison tests. (condition: sample dosage = 0.5 g/L, CIP concentration: 10 mg/L).

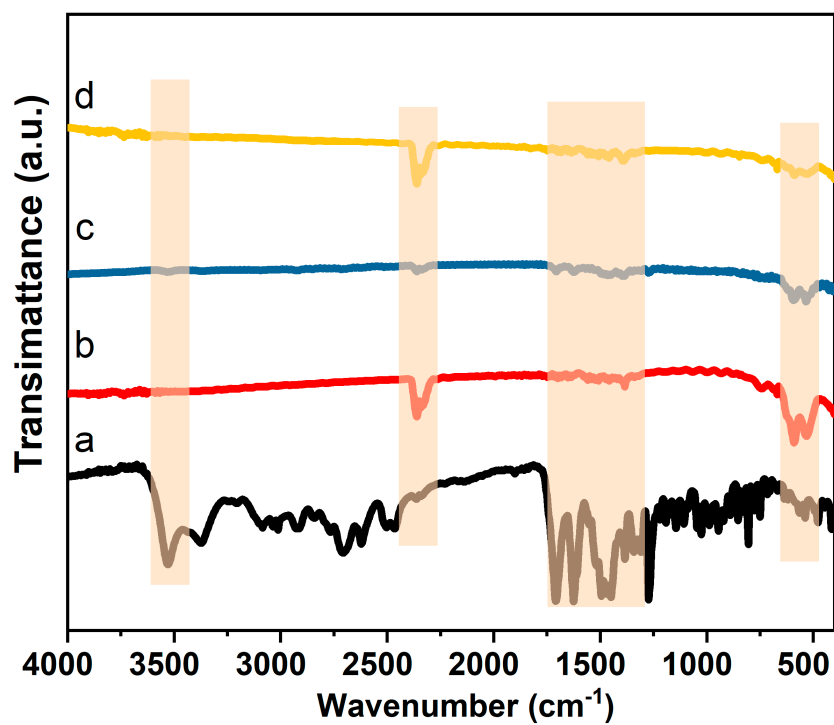


Figure S6. FT-IR spectra of (a)CIP ,(b)20% Bi₂WO₆/BiO_{2-x} (c) 20% Bi₂WO₆/BiO_{2-x} after mixing with CIP in the dark for 30 min, and (d) 20% Bi₂WO₆/BiO_{2-x} after mixing with CIP in the dark for 30 min and then under visible light irradiation for 2h.

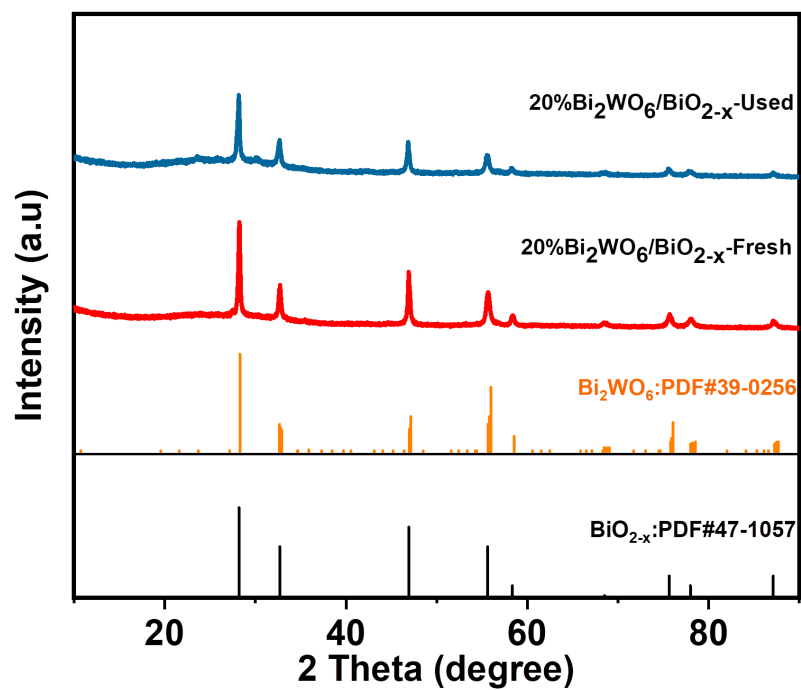


Figure S7. XRD patterns of BiO_{2-x}, Bi₂WO₆, fresh and used Bi₂WO₆/BiO_{2-x} composites.

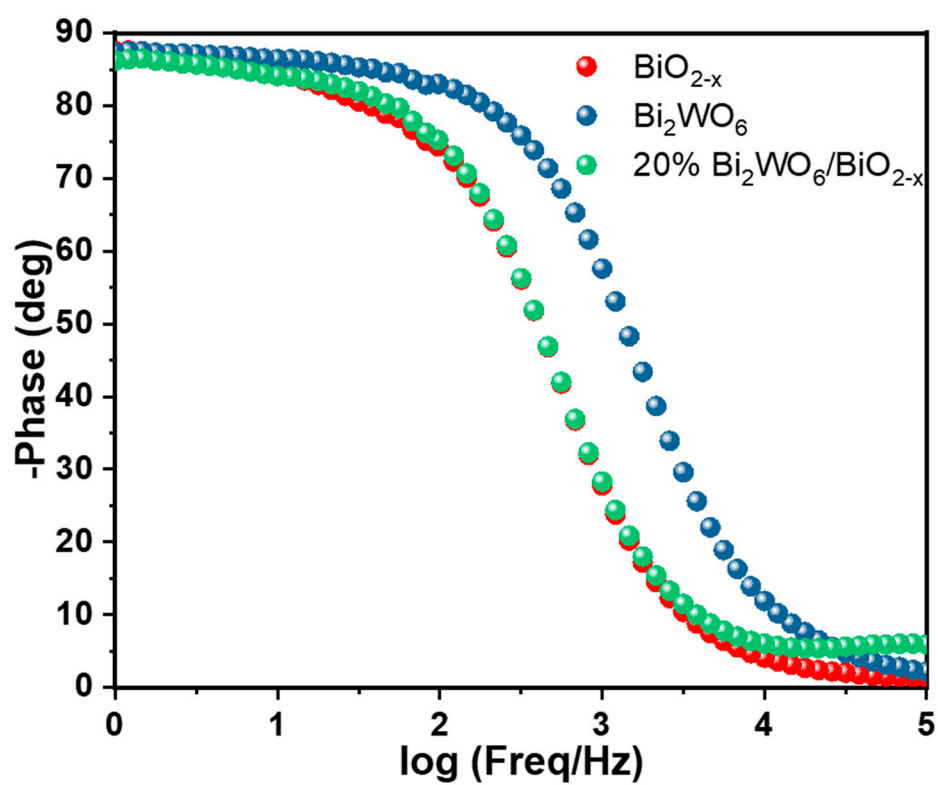


Figure S8. Bode plots of BiO_{2-x} , Bi_2WO_6 and 20% $\text{Bi}_2\text{WO}_6/\text{BiO}_{2-x}$.

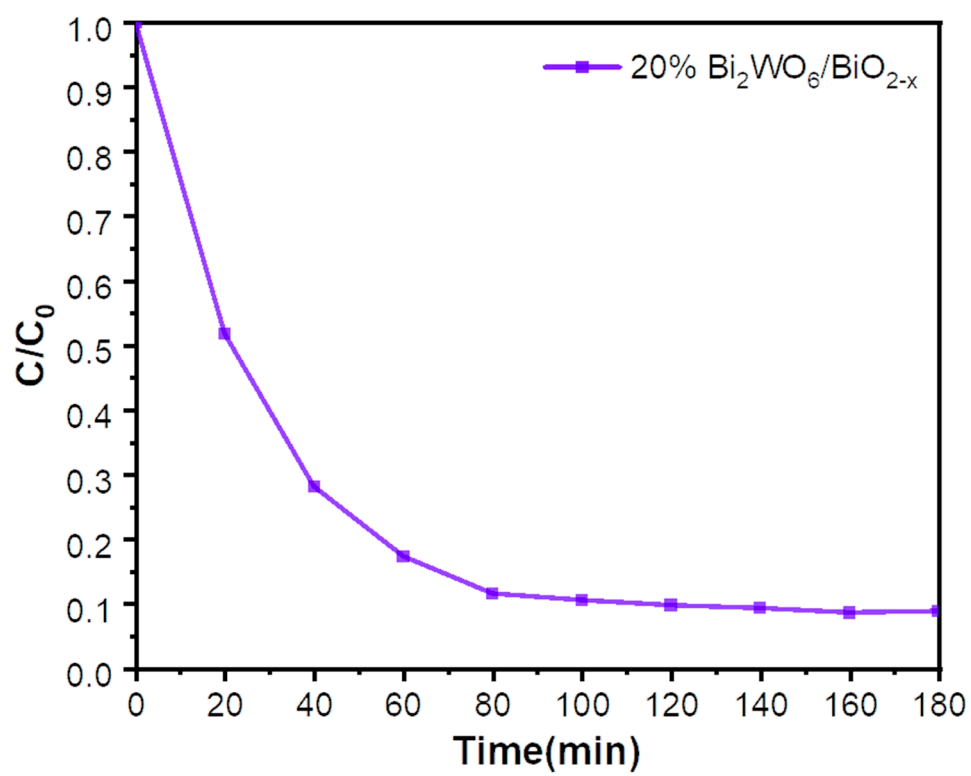


Figure S9. Photocatalytic degradation of CIP with prolonged light time for comparison test. (condition: sample dosage = 0.5 g/L, CIP concentration: 10 mg/L)

Table S3. The catalytic performance comparison of recently reported catalysts for CIP degradation based on reduction percentages and reaction time.

Catalyst	Catalyst dosage (g/L)	Pollutant concentration (mg/L)	Time (min)	Reduction percentage (%)	Ref.
Vo-WO ₃ /Bi ₂ WO ₆	0.4	10	120	79.5	[2]
0.9-BiOI ₃ /Bi ₂ O ₄	0.6	20	60	85.6	[3]
R ₂ -Cu ₂ O	0.6	20	240	94.6	[4]
20%In ₂ O ₃ /BiOCl	1	20	35	91	[5]
BS/BOC	0.4	20	120	61	[6]
BWO/ BOB/R ₅	0.25	10	120	90.7	[7]
N-TiO ₂	0.5	10	180	55	[8]
g-C ₃ N ₄ /Bi ₂ WO ₆	1	15	120	97.87	[9]
BOB-Cu	0.5	10	120	88	[10]
BiOBr-7	0.5	10	180	94	[11]
20% Bi ₂ WO ₆ /BiO _{2-x}	0.5	10	120	91.8	This work

Reference

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