

Rice Husk Biochar-Boosted BiOCl Nanoplates: A Sunlight-Responsive Route to Wastewater Detoxification and Pathway Insights for Methylene Blue Degradation

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S1: Materials

Rice husk was collected from Rajpura, Punjab. Bismuth nitrate pentahydrate [Bi(NO₃)₃·5H₂O] (98%, AR), potassium chloride (KCl) (99.5%–100%, AR), nitric acid (HNO₃) (69%), and methylene blue were purchased from LOBA CHEMIE, India. All solutions were formulated with ultrapure double-distilled water, and high-purity analytical-grade reagents were employed throughout the experiments without additional purification.

S2: Characterizations

A wide range of analytical techniques was employed to investigate the physicochemical properties of the synthesized photocatalysts. XRD (Bruker D8 Advance, Germany) was used to determine crystallinity and phase composition, while FTIR (Shimadzu IRTracer-100, Japan) identified functional groups. FESEM (JEOL) and HR-TEM (JEOL JEM-2100 Plus, Japan) examined morphology and lattice structure. UV–Vis (Shimadzu UV-2600, Japan) and UV-DRS analyses estimated optical properties and band gaps using Tauc plots. PL (Shimadzu RF-6000, Japan) assessed charge carrier recombination, and BET/BJH (Belsorp Mini II, MicrotracBEL, Japan) measured surface area and porosity. XPS (Thermo Fisher Scientific K-ALPHA) analyzed elemental composition and surface states. HRMS (Waters Mass-QTOF with UPLC XEVO G2 XS) identified degradation intermediates, while TOC and COD analyses quantified pollutant mineralization efficiency.

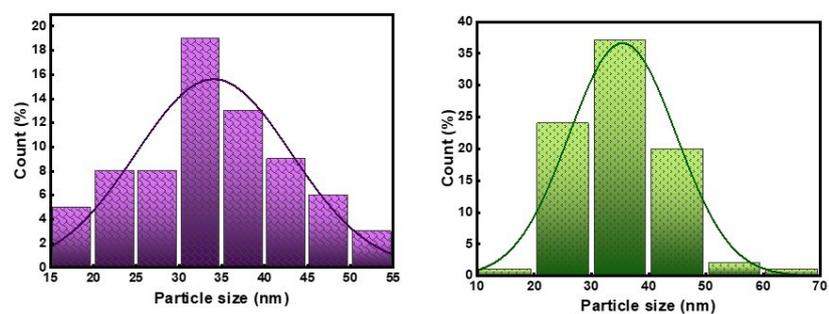


Figure S1: (a) Particle size distribution histogram obtained from FESEM images using ImageJ analysis, and (b) particle size distribution histogram derived from HRTEM images using ImageJ analysis.

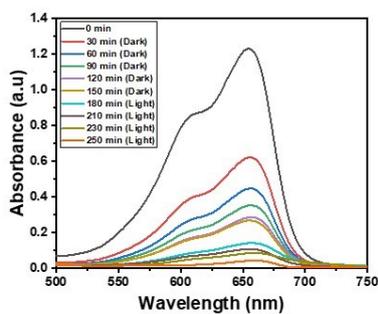


Figure S2: UV–visible absorption spectra of methylene blue solution during photocatalytic degradation over BR13 under dark and sunlight irradiation at different time intervals.

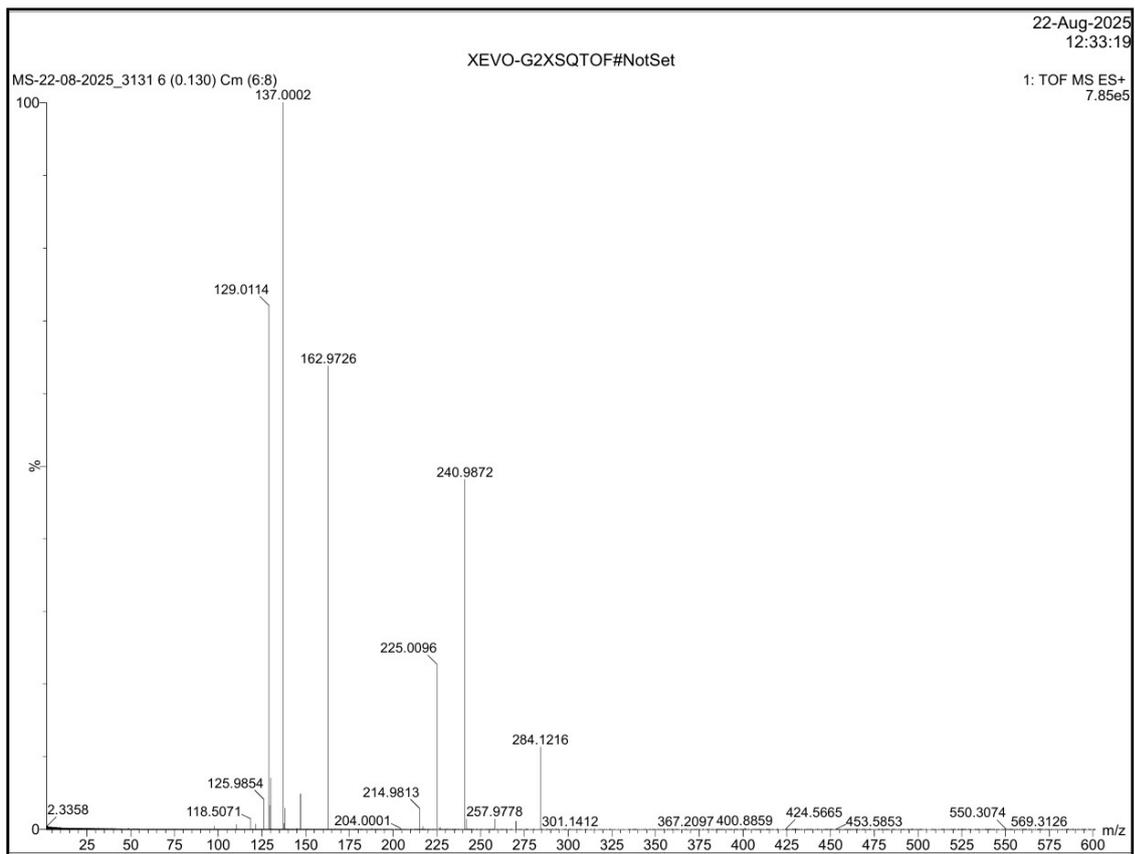


Figure S3: HRMS spectra