Electronic Supplementary Material (ESI) for RSC Advances.

Supporting information

Biofabricated BiOI with enhanced photocatalytic activity under visible light irradiation

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S 1: The average crystallite size of BiOI-G and BiOI-C was calculated using Debye Scherer's Equation.

$$D=K\lambda / (\beta \cos\theta) \quad (1)$$

Where, D is the size of particles, K is shape factor (0.9), λ is the wavelength of emitted X-rays (0.15418 nm), β is full width at half maximum of corresponding XRD peak and θ is the angle of incidence of the X-ray beam.

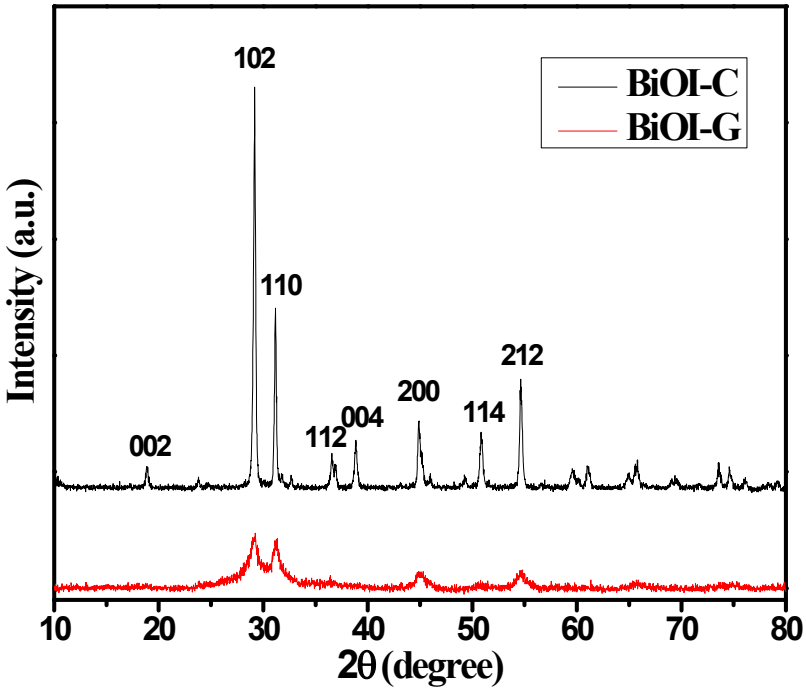

Figure S1: XRD patterns of BiOI-G and BiOI-C.

S 2: In order to investigate the stability of BiOI-C and BiOI-G, the recyclability study was carried out. In the study, the as-prepared samples after every 90 minutes of photocatalytic activity were collected by centrifugation. The materials were washed several times with double distilled water and reused in the photocatalytic reactions five times under the same conditions. As shown in Figure S 2 (a) and (b), both the samples exhibited strong stability and maintained their respective photocatalytic activity during five reaction cycles. In addition, the FE-SEM images of both the samples after the photocatalytic actvity were taken. As shown in Figure S 2 (c) and (d), the morphology of both the samples remained intact.

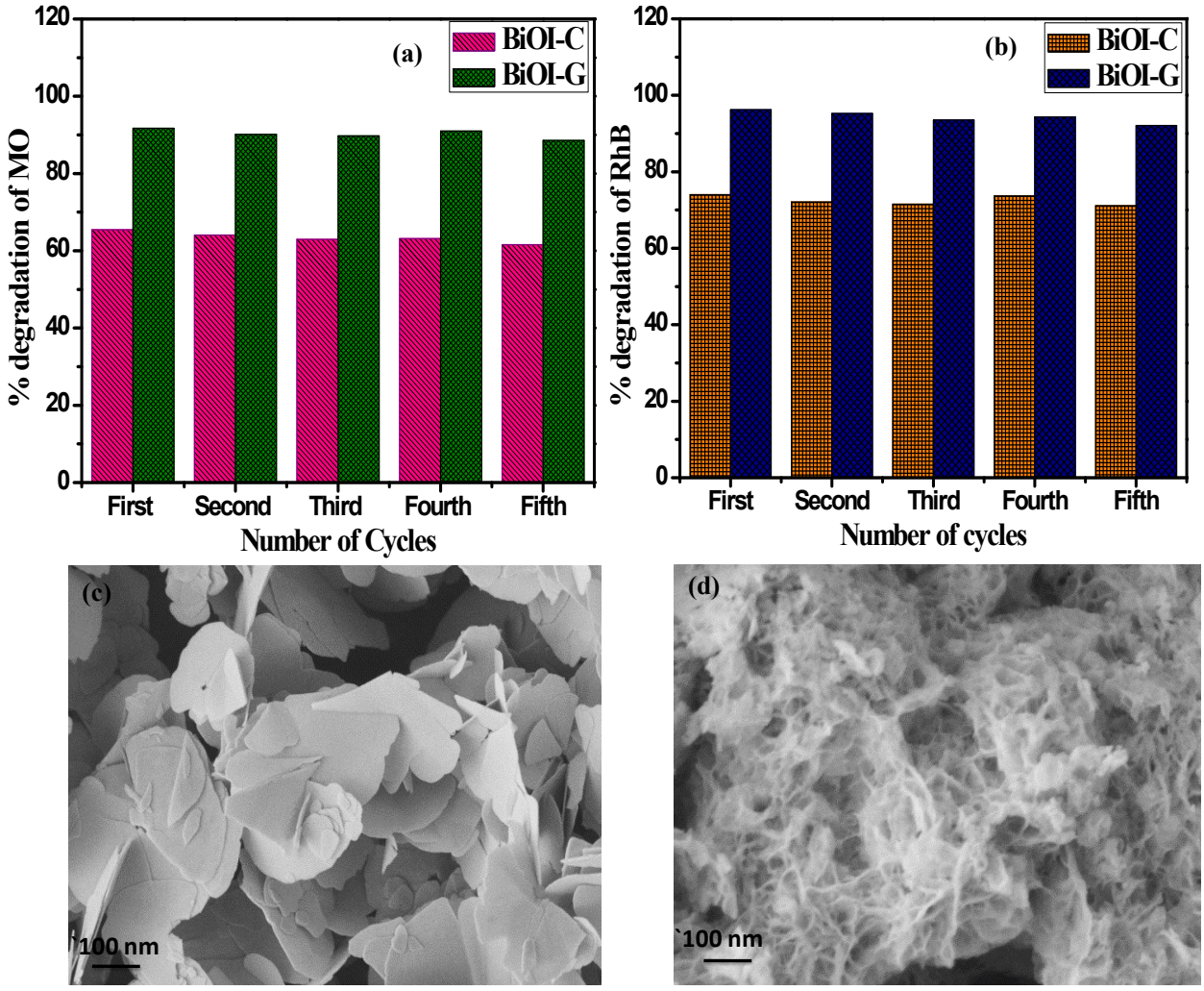

Figure S2: Recyclability of BiOI-C and BiOI-G for (a) MO (b)RhB. FESEM images after five cycles, (c) BiOI-C and (d) BiOI-G.

S 3: In prospect of the dye sensitization, a typical colourless pollutant i.e. benzotriazole was also chosen to further evaluate the photocatalytic activity of the as-prepared BiOI-C and BiOI-G. Fig. S3 (a) shows that, in the presence of BiOI-C and BiOI-G the photodegradation rate of BT was found to be 49.02 % and 67.12 % within 600 minutes. In addition, no change in the degradation efficiency of BT was observed without the photocatalyst, indicating the stability of BT under visible light irradiation. In Fig. S3 (b) and (c), upon increasing BiOI-C and BiOI-G concentration from 50-125 mg, the photodegradation efficiency of BT was further increased upto 62.13 % and 79.72 %, respectively.

In order to investigate the active species responsible for BT degradation, a similar study was carried out. As shown in Fig. S3 (d and e), almost no inhibition of the photocatalytic performance was observed when isopropanol and benzoquinone were used to quench $\cdot OH$ and $\cdot O_2^-$, indicating that $\cdot OH$ and $\cdot O_2^-$ showed a comparatively weak effect on the BT degradation. However, a discern inhibition of photocatalytic activity was seen when sodium oxalate was used to quench h^+, confirming the importance of h^+ in the photooxidation process. Hence, the holes were the major active species responsible for degradation of BT.

Fig. 3(f) shows, the pseudo-first-order kinetic model for BT degradation. The rate constants for BiOI-C and BiOI-G were calculated, and they were found to be 0.0013 min^{-1} and 0.0021 min^{-1} respectively. Interestingly, the calculated value of the rate constant for BiOI-G is greater than BiOI-C, which explains the superior photocatalytic BiOI-G towards benzotriazole

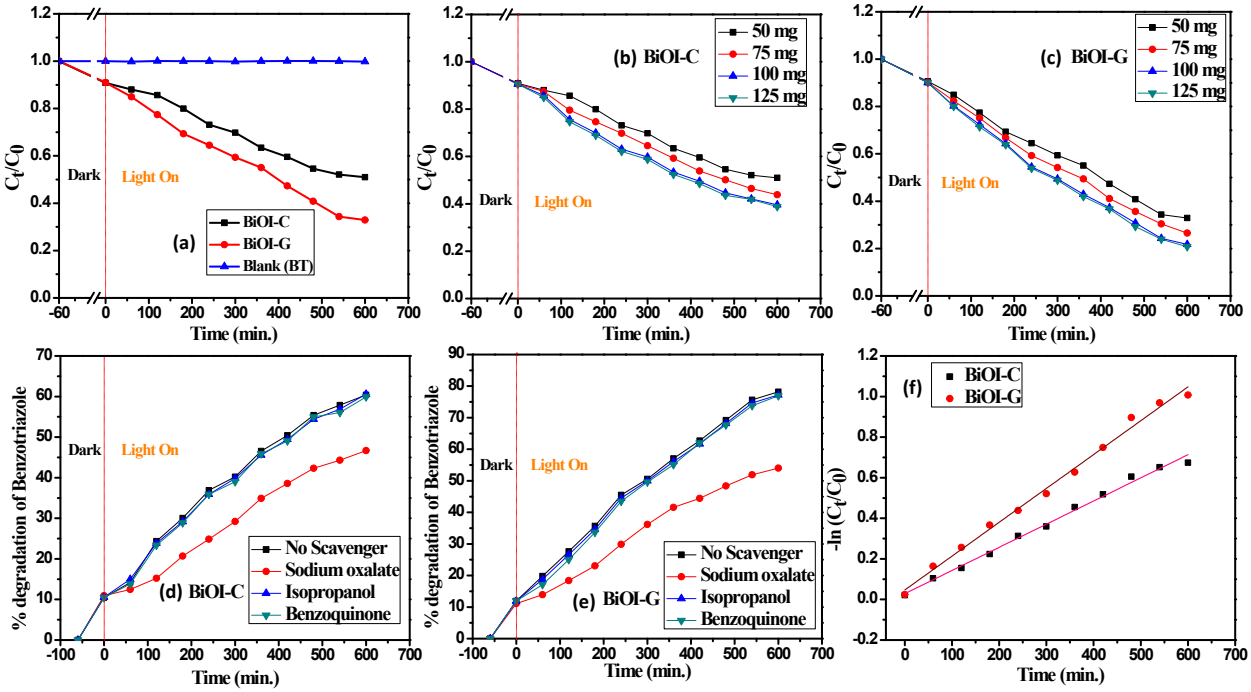

Fig. S3. Photodegradation efficiency of BT by BiOI-C and BiOI-G (a) with time (b) with different concentrations of BiOI-C (c) with different concentrations of BiOI-G (d) Effects of different scavengers on degradation of BT in presence of BiOI-C (e) Effects of different scavengers on degradation of BT in presence of BiOI-G (f) Kinetic linear simulation curves of BT over the samples.