Electronic Supplementary Material (ESI) for RSC Advances.

Supporting Information

Recyclable magnetic $CoFe_2O_4$/BiOX (X=Cl, Br and I) microflowers for photocatalytic water treatments contaminated with methyl orange, rhodamine B, methylene blue, and a mixed dyes

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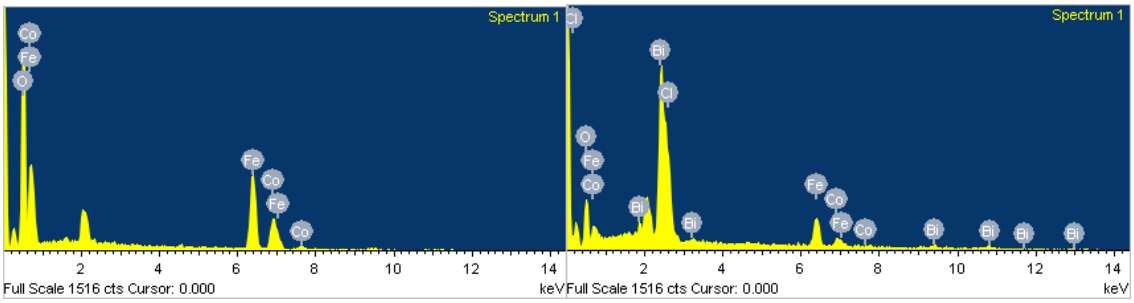
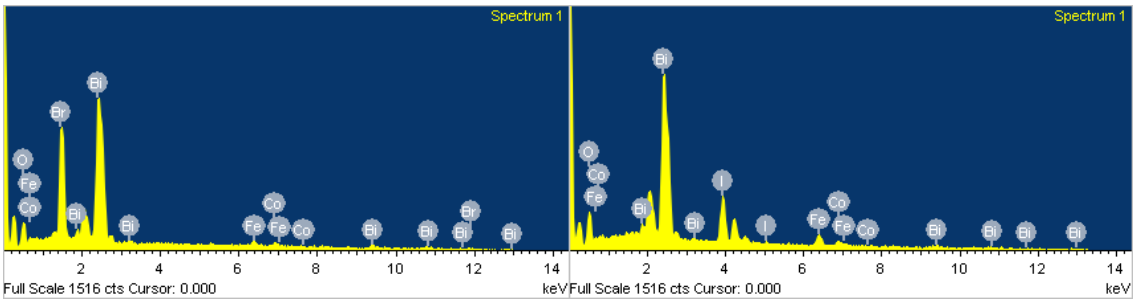
Table S1. Literature reviews for magnetic hybrid BiOX photocatalysts.

Catalysts	Experimental conditions	Test systems
BiOCl–$SrFe_{12}O_{19}$ nanoplates[32]	$SrFe_{12}O_{19}$+ Bi nitrate + NaCl, dilute HCl	MB under UV and visible,
dandelion-like Fe_3O_4@C@BiOCl[33]	Fe_3O_4@C (by solvothermal method with glucose) + Bi nitrate +KCl in EG	RhB under visible
BiOBr@SiO_2@Fe_3O_4[34]	SiO_2@Fe_3O_4 (by Stober method) + Bi nitrate + CTAB in EG	2,2-bis(4-hydroxyphenyl) propane (BPA) under UV and visible
Fe_3O_4/BiOCl[35]	Fe_3O_4 NPs + Bi nitrate + chloroform, dilute nitric acid	RhB and MB under visible
Flower like Fe_3O_4/BiOCl[36]	Fe_3O_4 NPs + $BiCl_3$ + dilute HCl	RhB under visible
Fe_3O_4@SiO_2@BiOBr[37]	core–shell Fe_3O_4@SiO_2 NPs + Bi nitrate + KBr in EG	RhB under visible
BiOBr/Fe_2O_3 microspheres[38]	Fe_3O_4 NPs + Bi nitrate + CTAB in EG	RhB and MO under visible
BiOBr–$ZnFe_2O_4$ microflowers[39]	$ZnFe_2O_4$ + Bi nitrate + KBr under ultrasonication	RhB under visible
Fe_3O_4/BiOI flakes[40]	Fe_3O_4 + Bi nitrate +KI in water	RhB under visible
$CoFe_2O_4$/BiOX (X=Cl, Br, I) microflowers (***this work***)	$CoFe_2O_4$ + Bi nitrate + KX in EG (120°C, 12 hrs)	Mixed dye (MO + RhB + MB), Rh B under UV and visible



(a) $CoFe_2O_4$ NPs (b) $CoFe_2O_4$/BiOCl



(c) $CoFe_2O_4$/BiOBr (d) $CoFe_2O_4$/BiOI

Figure S1. EDX analysis of the $CoFe_2O_4$ NPs and $CoFe_2O_4$/BiOX (X= Cl, Br and I) microflowers.

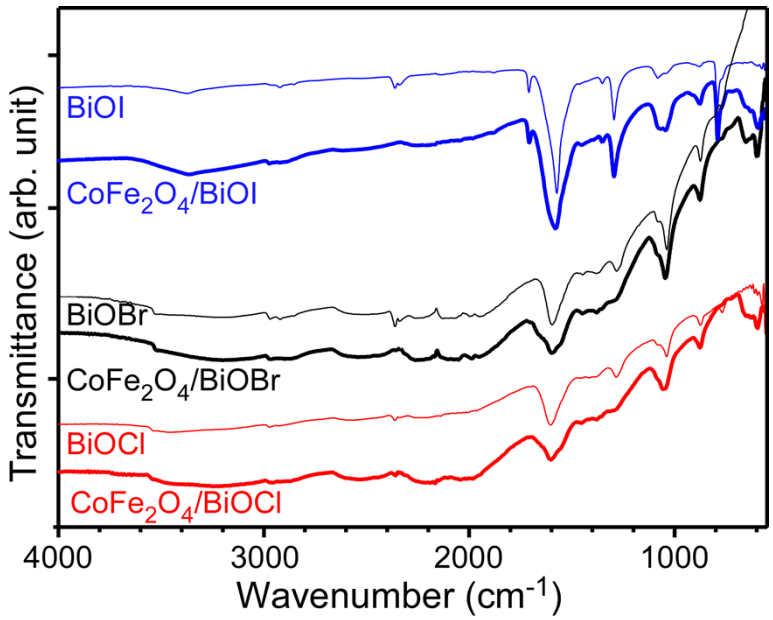


Figure S2. FT-IR spectra of the $CoFe_2O_4$/BiOX (X= Cl, Br and I) and BiOX microflowers.

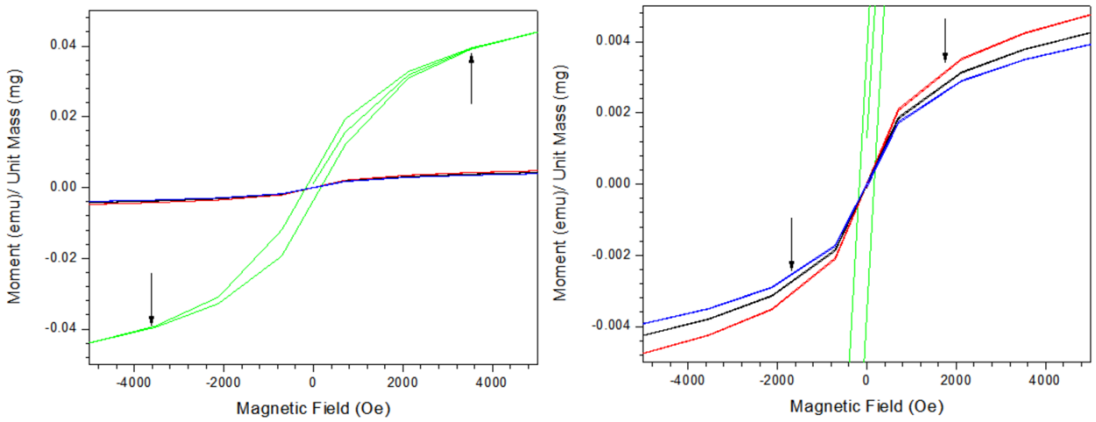


Figure S3. Magnified magnetization (M–H) curves for $CoFe_2O_4$ NPs (left) and $CoFe_2O_4$/BiOX (X= Cl: red color, Br: black color and I: blue color) microflowers (right) with applied magnetic fields from –4.5 to 4.5 kOe.

Figure S4. Powder sample dispersed in a dye solution is easily attracted by a magnet.

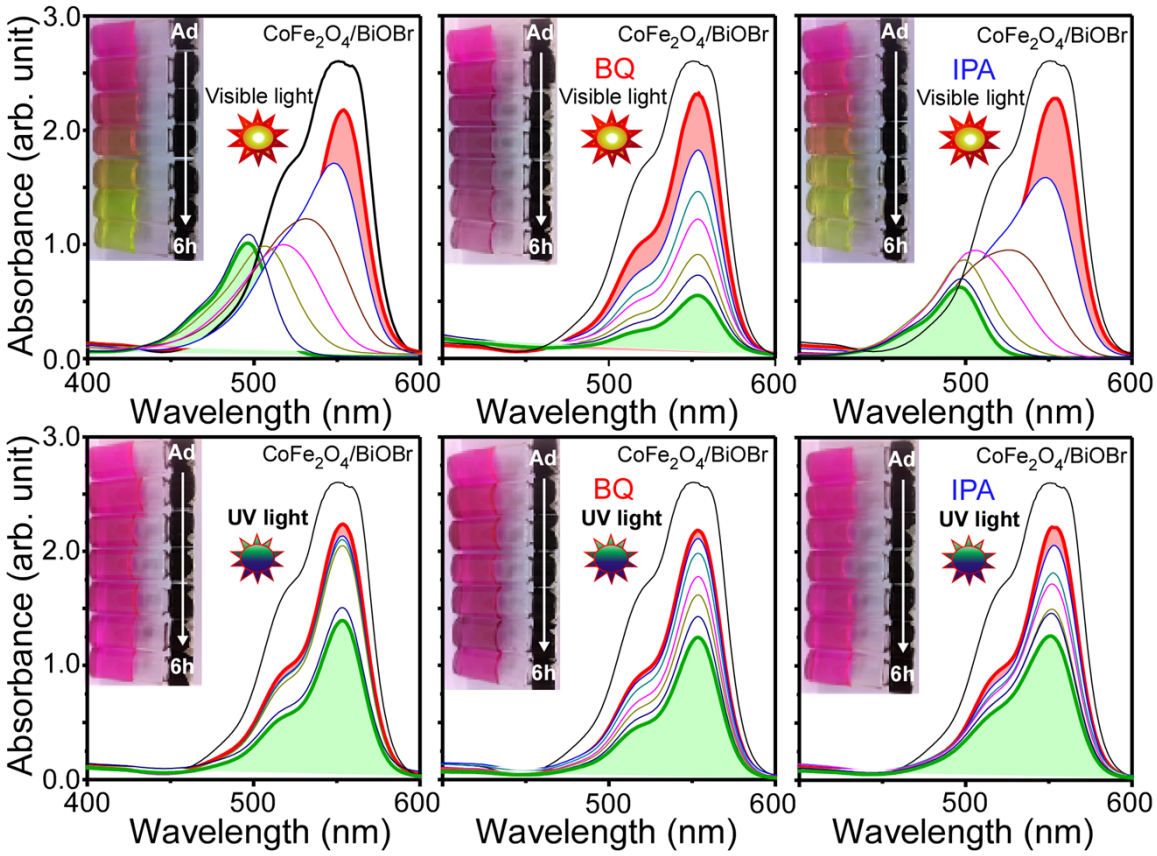


Figure S5. Adsorption (in dark) and photodegradation (under UV and visible lights) tests of RhB (20 mg/L, 100 mL) over 25 mg $CoFe_2O_4$/BiOBr microflowers. The insets show the corresponding photographs displaying a change in dye color with the photodegradation time.

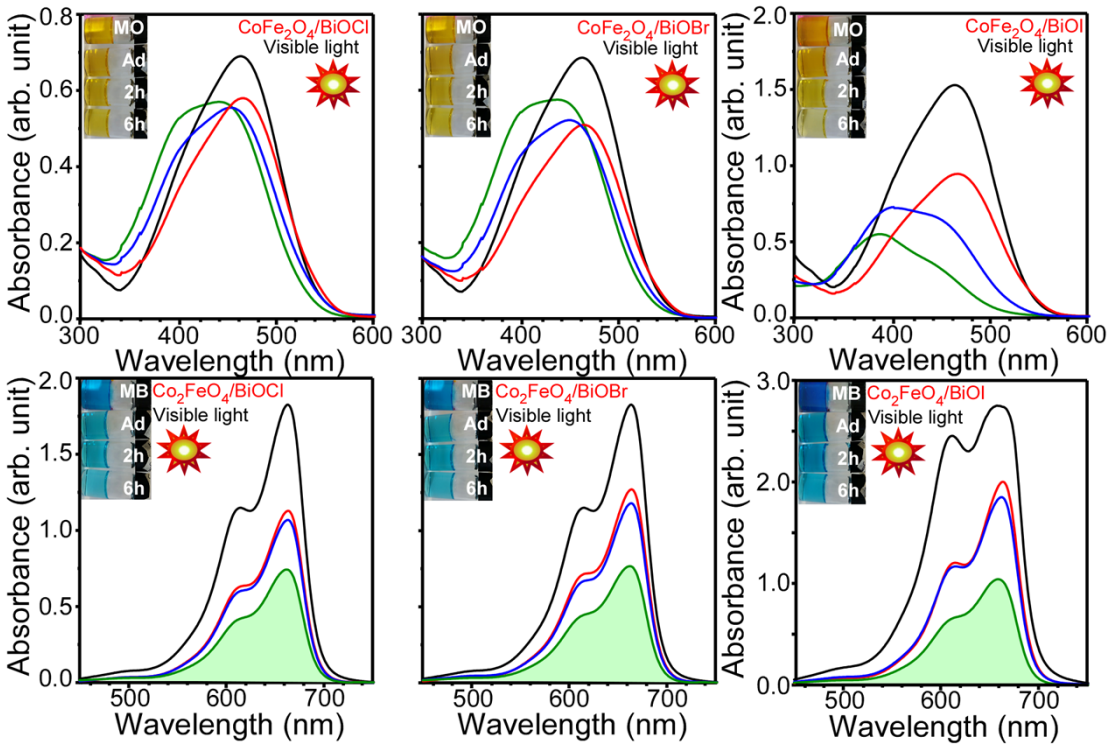


Figure S6. Adsorption (in dark) and photodegradation (under visible lights) tests of MO and MB (50 mL) over 25 mg $CoFe_2O_4$/BiOX microflowers. Dye concentrations were 10 mg/L for $CoFe_2O_4$/BiOCl and $CoFe_2O_4$/BiOBr, and 20 mg/L for $CoFe_2O_4$/BiOI. The insets show the corresponding photographs displaying a change in the dye color with photodegradation time.

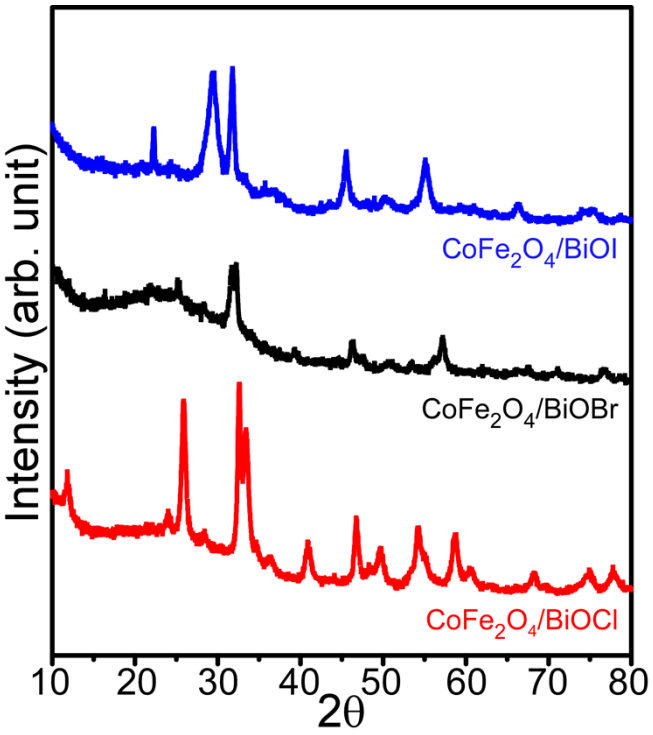


Figure S7. Power X-ray diffraction patterns of $CoFe_2O_4$/BiOX (X= Cl, Br and I) microflowers after photocatalytic dye degradation experiments.

Figure S8. Recycability tests of the catalyst samples.