# SUPPLEMENTARY INFORMATION

# A 2D/1D Heterojunction Nanocomposite built from Polymeric Carbon Nitride and MIL–88A(Fe) derived α-$Fe_2O_3$ for Enhanced Photocatalytic degradation of Rhodamine-B

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| Sl. No. | $Fe_2O_3$ Precursor | Synthesis | Photocatalytic condition | Degradation efficiency | Reference No. |
|---|---|---|---|---|---|
| 1. | MIL-53(Fe) | Hydrothermal | 50 mg, 100W LED lamp (420 nm) | 92% of TC for 60 m. | 52 |
| 2 | MIL-101 | Hydrothermal | 300W Xe lamp | Hydrogen evolution | 53 |
| 3 | MIL-100 | Hydrothermal | 300W Xe lamp | Hydrogen evolution | 54 |
| 4 | Waste iron rust | Calcination | 100 mg, Sunlight | 99% MO for 120 m | 44 |
| 5 | $FeCl_3 \cdot 6H_2O$ | Hydrothermal | 100 mg, 300W Xe lamp | 98% Cr(VI) reduction for 150 m | 40 |
| 6 | $Fe(NO_3)_3 \cdot 9H_2O$ | Calcination | 50 mg, 300W Xe lamp | 90% Hg reduction for 60 m | 37 |
| 7 | $Fe_2(C_2O_4)_3 . 6H_2O$ | Calcination | 10 mg, | Removal of Phospate | 38 |
| 8 | $FeCl_3 \cdot 6H_2O$ | Calcination | 100 mg | $CO_2$ reduction | 39 |
| 9 | $FeCl_3 \cdot 6H_2O$ | Calcination | 20mg, 300W Xe lamp | Hydrogen evolution | 34 |
| 10 | $Fe(NO_3)_3$ | Calcination | 65 W CFL lamp, intensity-125 W/m2, λ > 400 nm | 94.7% RhB reduction for 140 m | 35 |
| 11 | $Fe(NO_3)_3 . 9H_2O$ | Hydrothermal | 70mg, 300W Xe lamp | 96.7% RhB reduction for 4 h | 42 |
| 12 | $FeCl_3$ | Hydrothermal | 300W Xe lamp | Completely degraded 4-nitrophenol 100% for 6h | 43 |
| 13 | MIL-88A(Fe) | Calcination | Sunlight | 92% of RhB for 60 minutes | **This Work** |

**Table S1. Comparison of the photocatalytic degradation efficiency of MIL-88A derived $Fe_2O_3$ /$C_3N_4$ with literature**

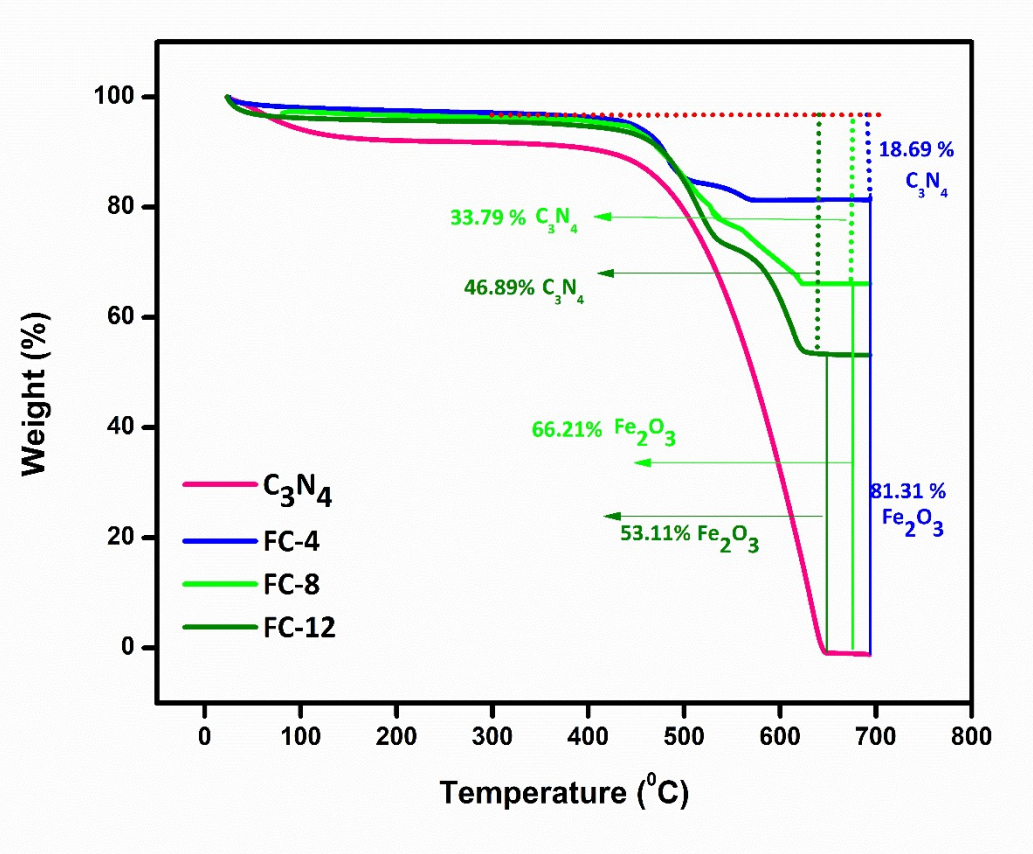


**Figure S1. Thermogravimetry curve of $C_3N_4$, FC-4, FC-8 and FC-12**

| Sample Name | % of $C_3N_4$ evolved | % of $C_3N_4$ left in the residue | % of Residue ($Fe_2O_3/C_3N_4$) | Reference |
|---|---|---|---|---|
| MIL-88A | 0% | - | 45% Corresponding to only $Fe_2O_3$ | RSC Adv., 2015, 5, 32520–32530 |
| $C_3N_4$ | 100% | - | 0 % | This work |
| $Fe_2O_3/C_3N_4$ (FC-4) | 18.69% | 36.31% | 81.31% | This work |
| $Fe_2O_3/C_3N_4$ (FC-8) | 33.79% | 21.21% | 66.21% | This work |
| $Fe_2O_3/C_3N_4$(FC-12) | 46.89% | 8.11% | 53.11% | This work |

**Table S2. Tabulated data of weight % of $C_3N_4$ evolved and % of $C_3N_4$ left in the residue by the decomposition of FC-4, FC-8 and FC-12**

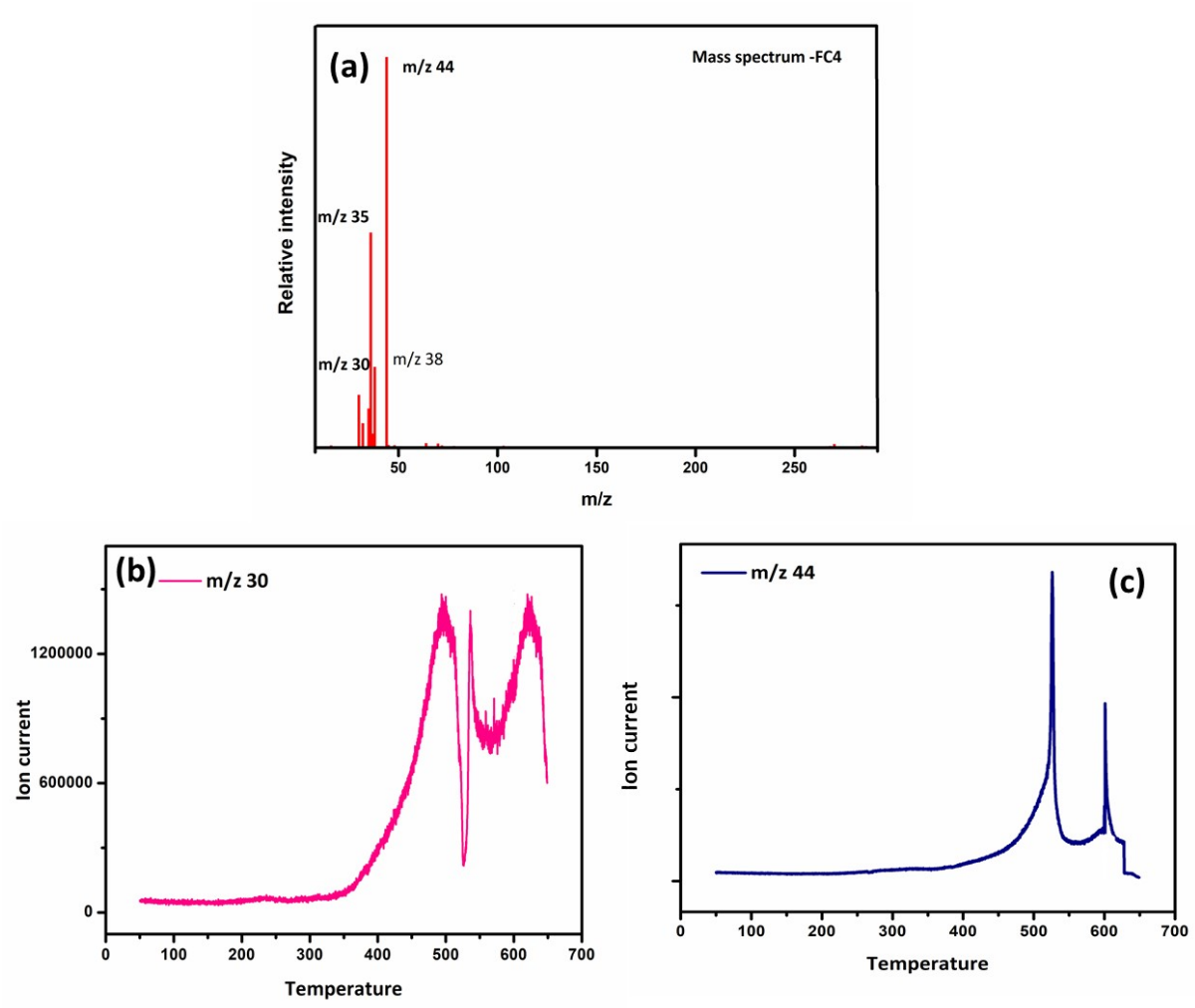


**Figure S2. a) Mass spectrum of FC-4 b) Gas chromatogram (m/z=30) c) Gas chromatogram (m/z=44)**

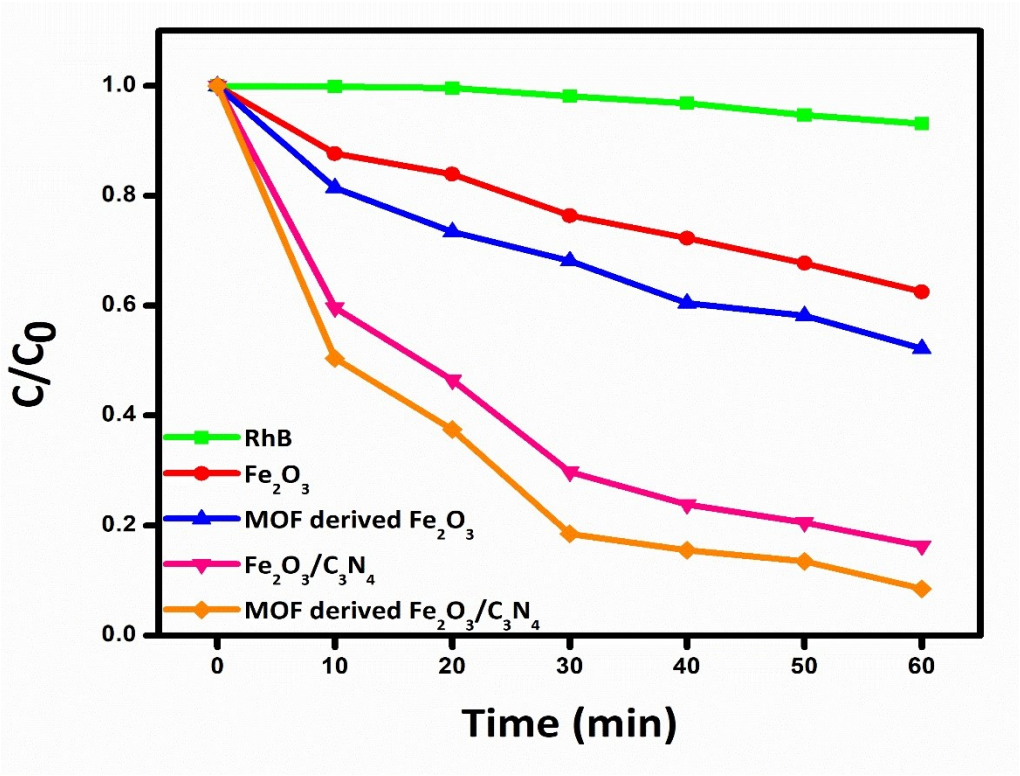


**Figure S3. Photocatalytic degradation curves of RhB using α-$Fe_2O_3$ / $C_3N_4$ and MOF-derived α-$Fe_2O_3$/ $C_3N_4$**

| Parameters | $Fe_2O_3$ | g-$C_3N_4$ |
|---|---|---|
| Bandgap $E_g$ (eV) | 2.0 | 2.97 |
| Absolute electronegativity χ (eV) | 5.82 | 4.72 |
| Free electrons energy $E^e$ (eV) | 4.50 | 4.50 |
| Valence band position ($E_{VB}$) (eV) | +2.32 | +1.705 |
| Conduction band position $E_{CB}$ (eV) | +0.32 | -1.265 |

**Table S3. Bandgap, Conduction and Valence band values of α-$Fe_2O_3$ and $C_3N_4$**