# Supporting Information

## Modulation of pore sizes of titanium dioxide photocatalysts by a facile template free hydrothermal synthesis method: Implications for photocatalytic degradation of rhodamine B

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**Table S1. Optimal instrumental conditions for ESI-MS studies.**

| Parameters | Optimal values/conditions |
|---|---|
| Infusion rate | 10 μLmin$^{-1}$ |
| Spray Shield voltage | 600 V |
| Mode | Positive |
| Mass range (*m/z*) | 50-500 |
| Capillary voltage | 80 V |
| Drying gas temperature | 400 °C |
| Nebulizer pressure | 10 psi |
| Needle voltage | 5000 V |
| Detector | Dynode ion detector |
| Electron multiplier voltage | 1360 V |

**Table S2. Dye degradation rate constants of $TiO_2$ materials.**

| Sample | $k_{app} \times 10^{-5}$ [$s^{-1}$] | $R^2$ |
|---|---|---|
| Ti-HTS-40 | 25.9 | 0.991 |
| Ti-HTS-90 | 59.8 | 0.985 |
| Ti-HTS-150 | 96.9 | 0.933 |
| Ti-HTS-210 | 97.9 | 0.962 |
| Ti-HTS-240 | 109.8 | 1.000 |

Ti-HTS refers to $TiO_2$ hydrothermal synthesized materials and the following number denotes the hydrothermal treatment temperature in °C. $k_{app}$ is the photocatalytic pseudo first-order degradation rate constant.

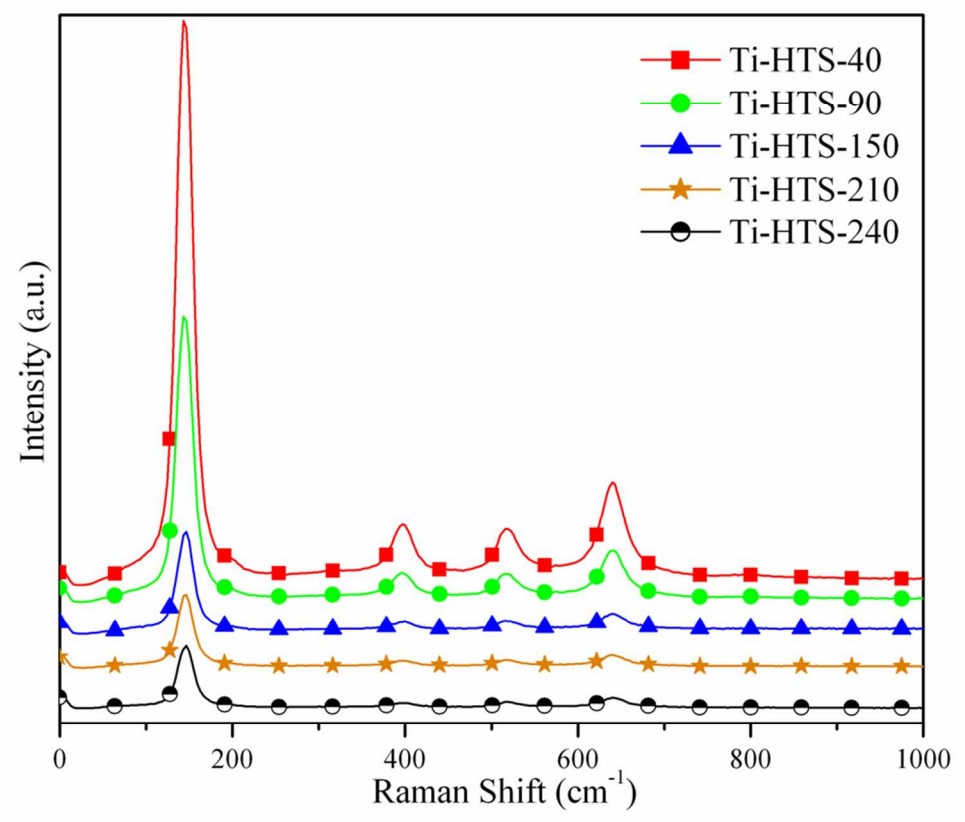


**Fig. S1.** Raman spectra of $TiO_2$ materials prepared at different hydrothermal temperatures of 40, 90, 150, 210, and 240 °C.

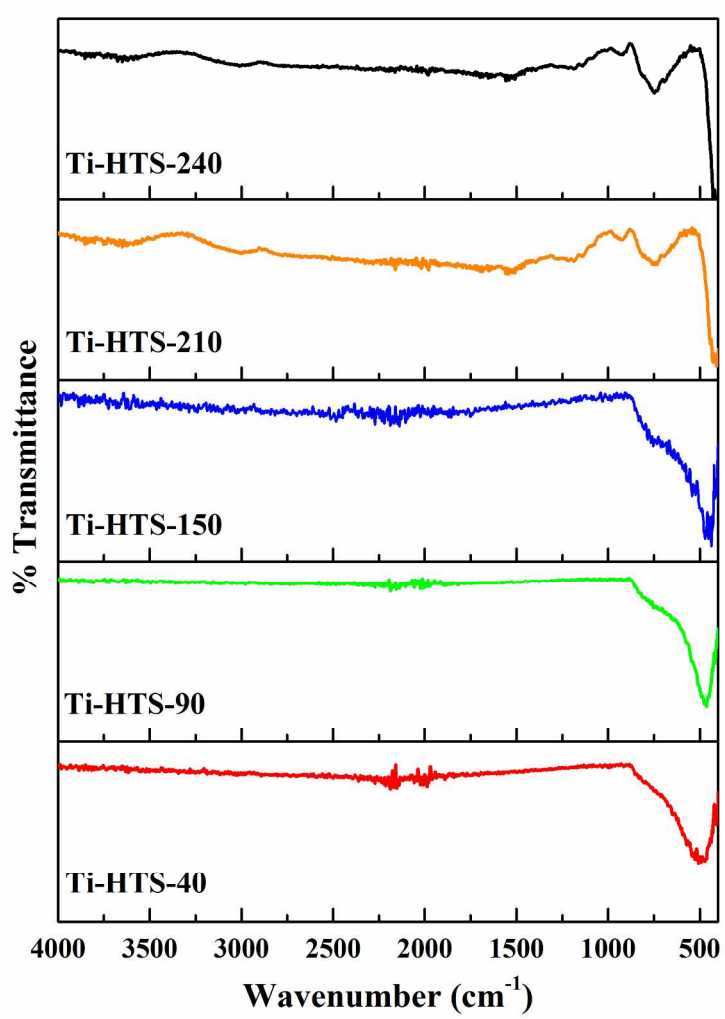


**Fig. S2.** FT-IR spectra of $TiO_2$ materials prepared at different hydrothermal temperatures 40, 90, 150, 210, and 240 °C.

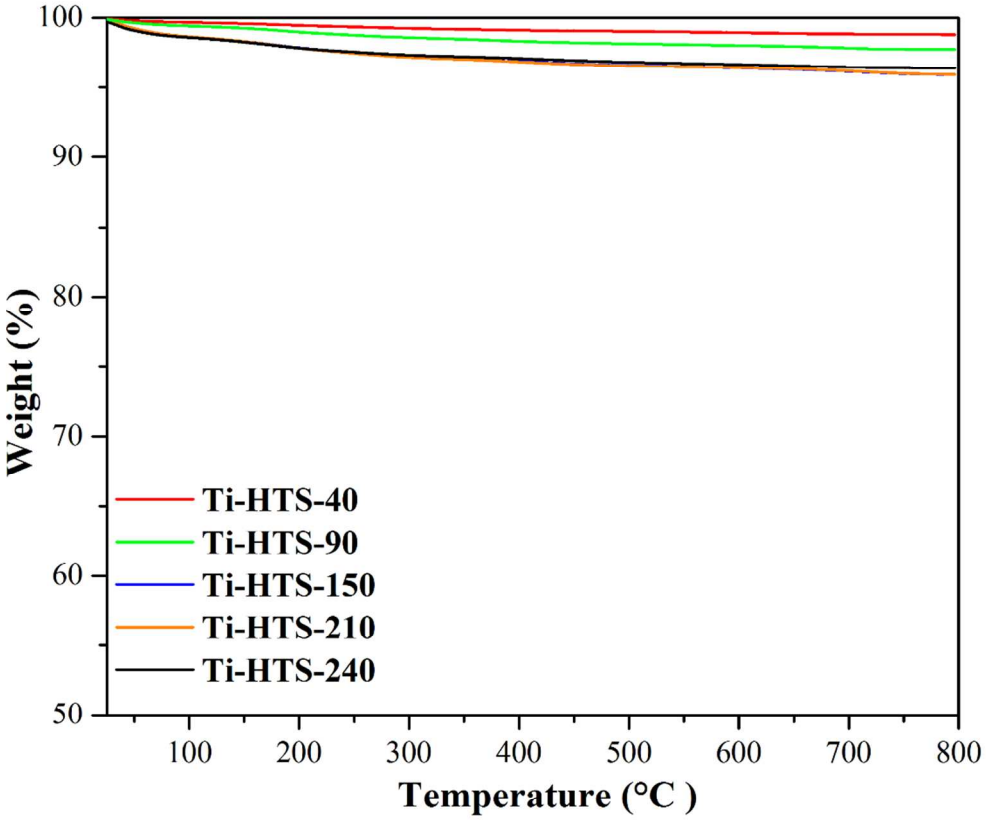


**Fig. S3.** TGA analysis of $TiO_2$ materials.

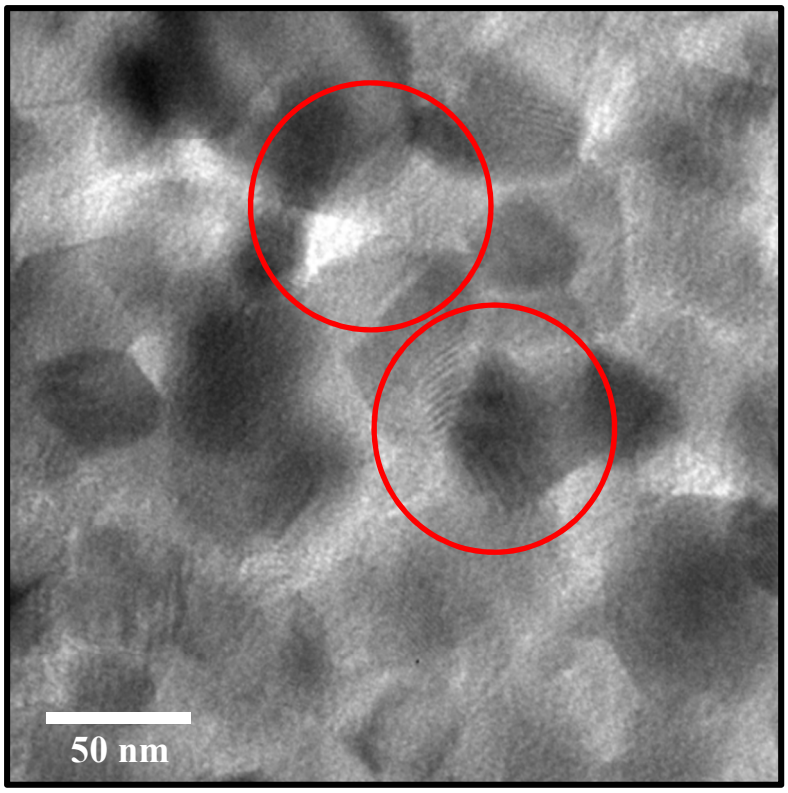


**Fig. S4.** TEM image of a representative $TiO_2$ material (Ti-HTS-40) prepared at the hydrothermal temperature of 40 °C.

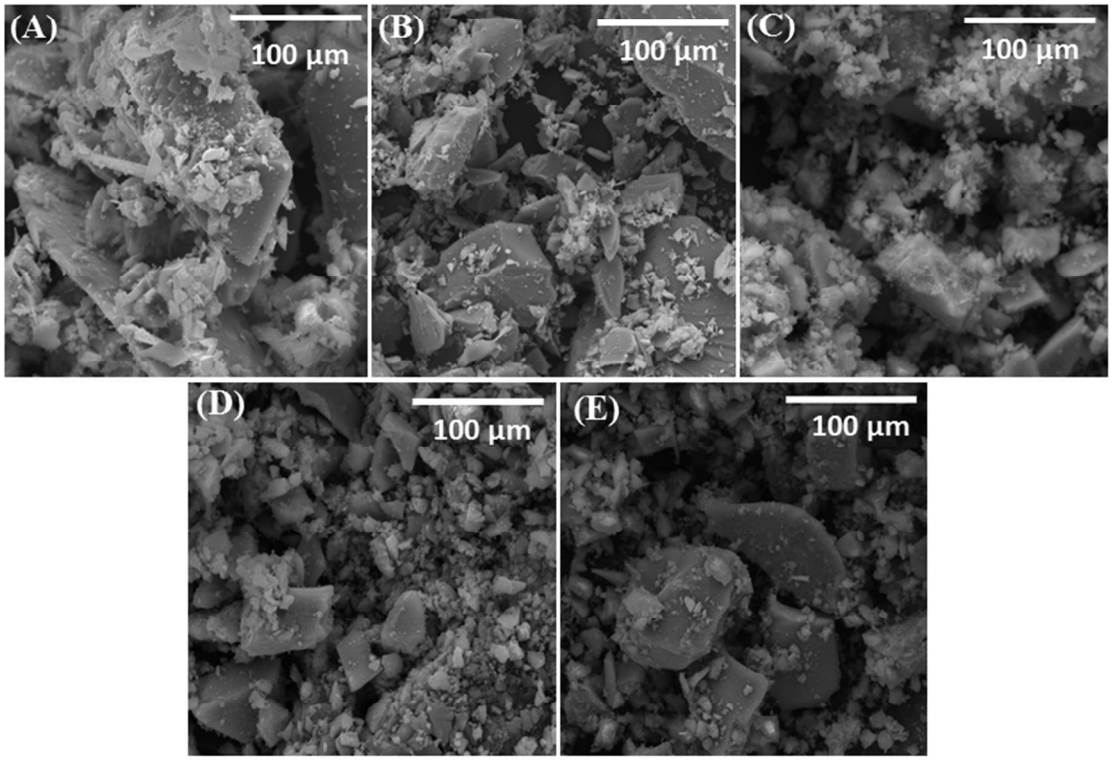


**Fig. S5.** SEM images of $TiO_2$ materials.

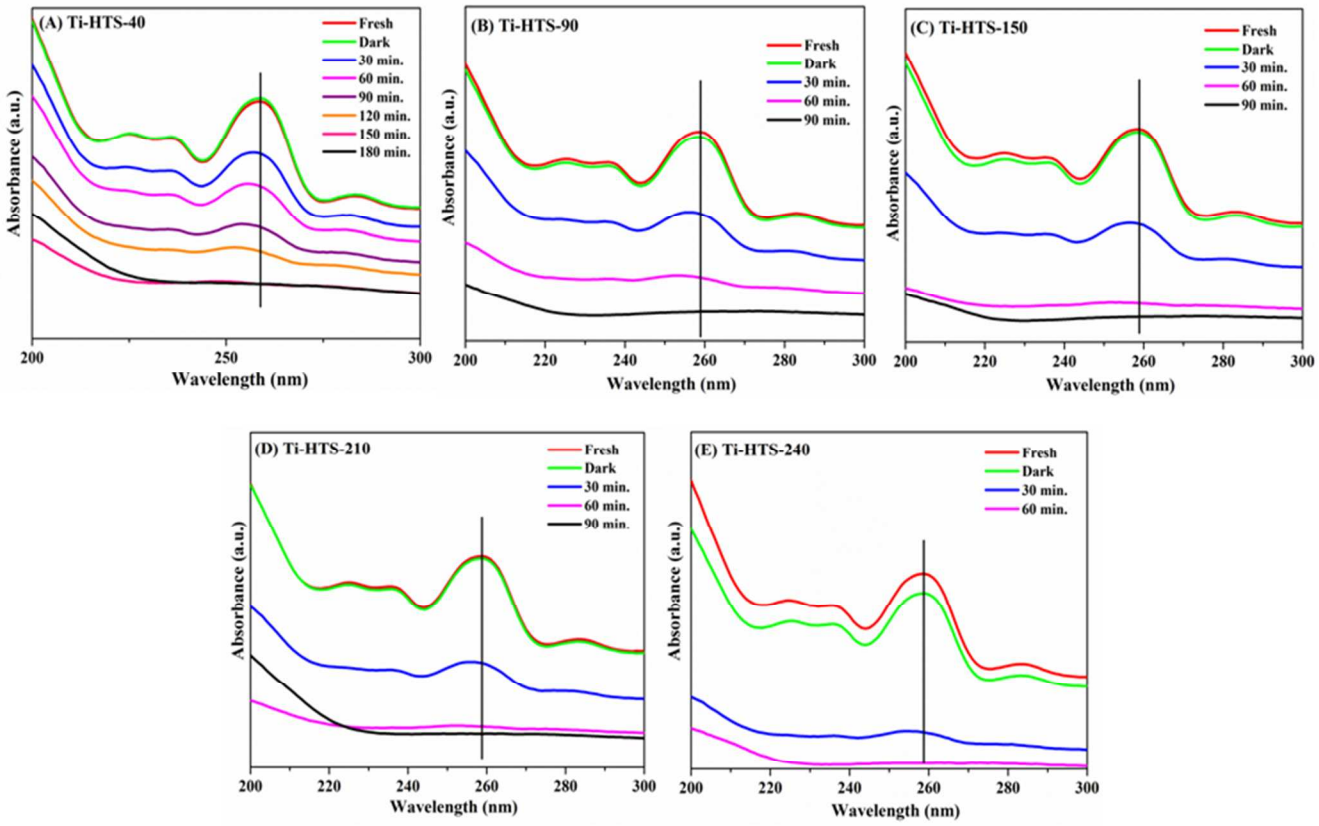


**Fig. S6.** Absorption spectra (aromatic region) of RhB dye degraded under visible light irradiation for 6 h using (A) Ti-HTS-40, (B) Ti-HTS-90, (C) Ti-HTS-150 , (D) Ti-HTS-210, and (E) Ti-HTS-240 prepared at different hydrothermal temperatures of 40, 90, 150, 210, and 240 °C respectively

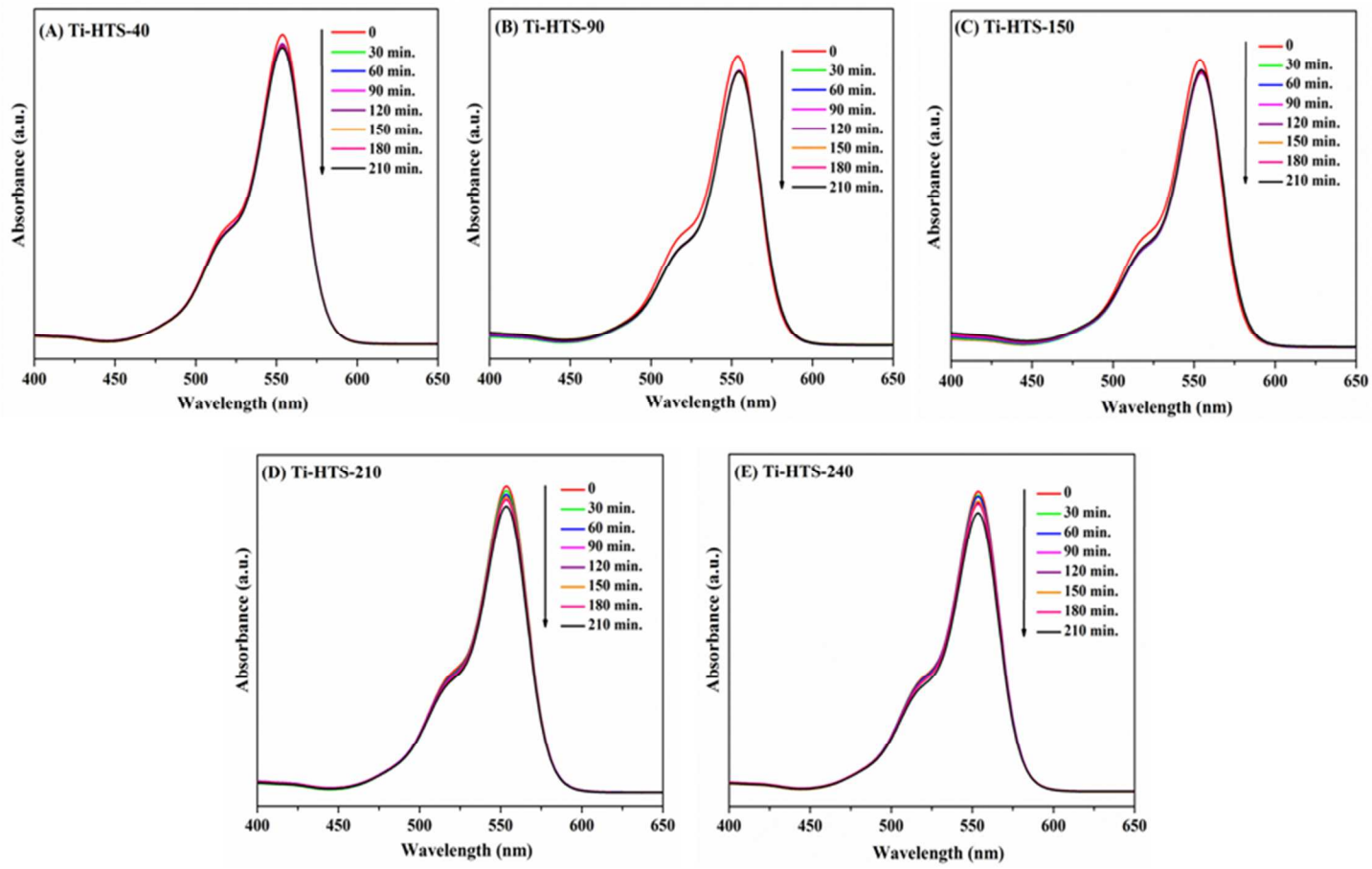


**Fig. S7.** Absorption spectra of RhB after dark adsorption with time for (A) Ti-HTS-40, (B) Ti-HTS-90, (C) Ti-HTS-150, (D) Ti-HTS-210, and (E) Ti-HTS-240

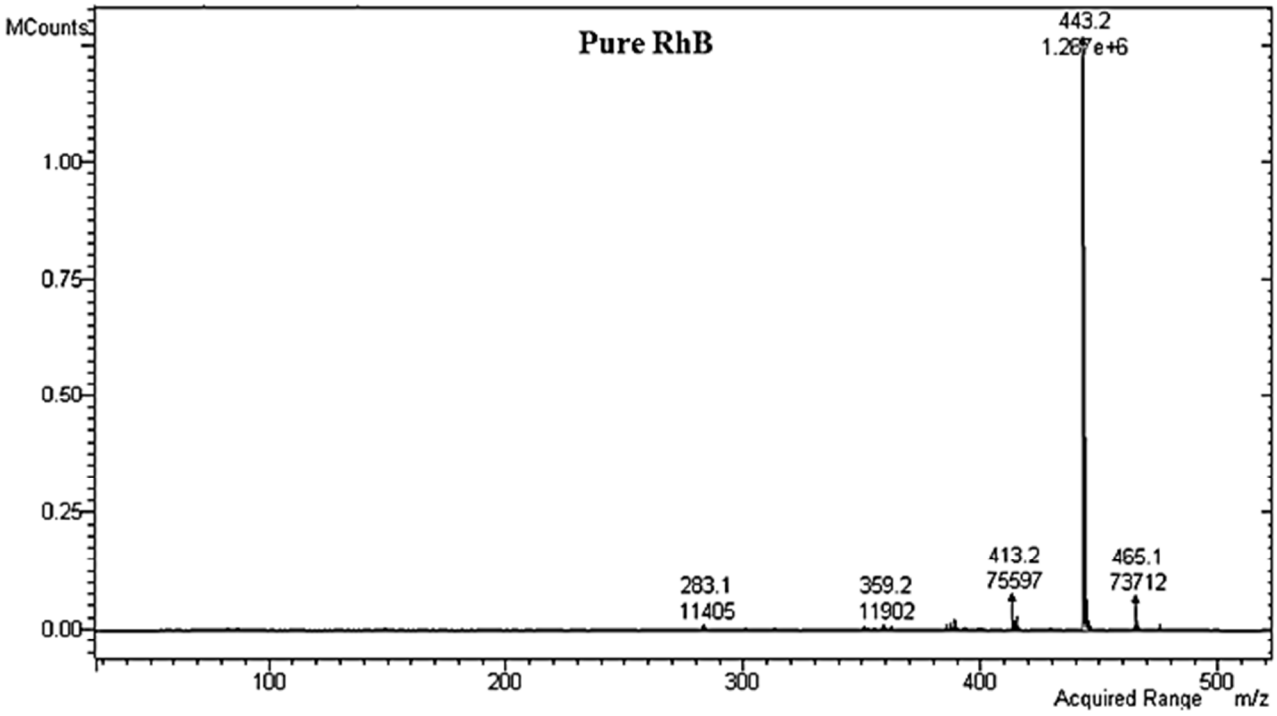


**Fig. S8.** ESI-MS of Pure RhB.

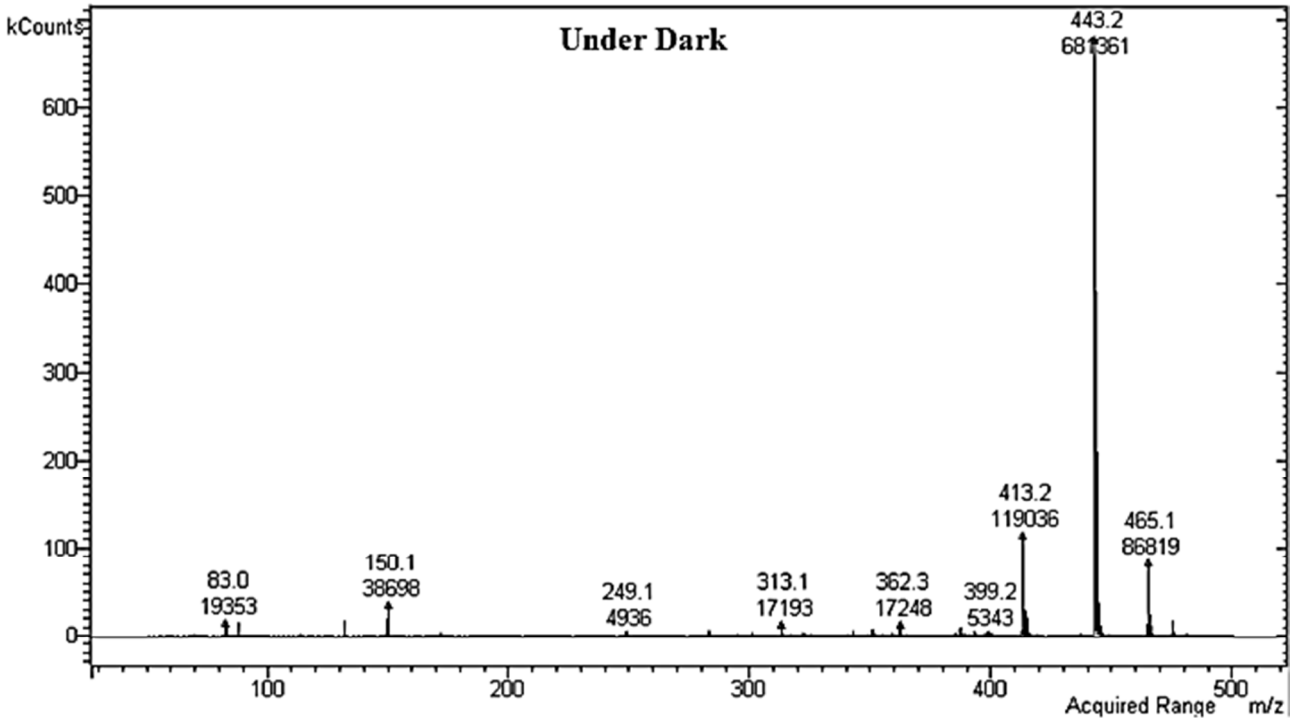


**Fig. S9.** ESI-MS of RhB solution after dark adsorption over Ti-HTS-40.

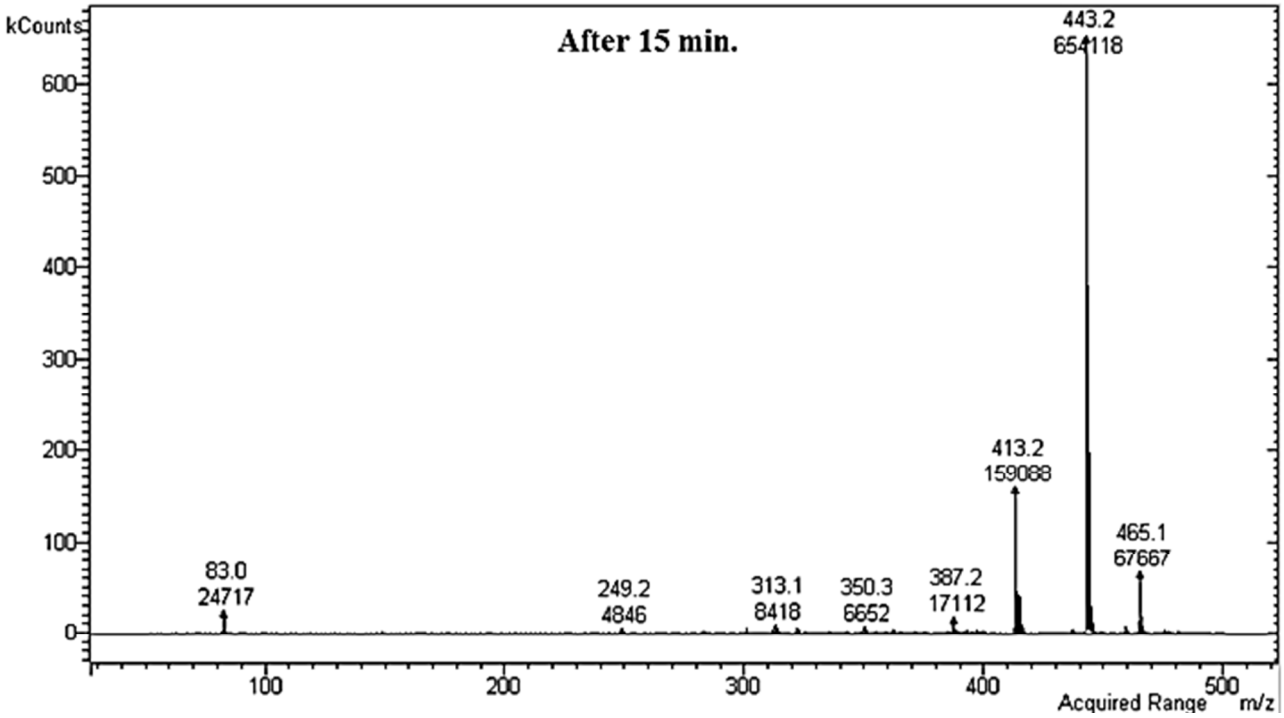


**Fig. S10.** ESI-MS of RhB solution after 15 min. of photocatalytic reaction with Ti-HTS-40.

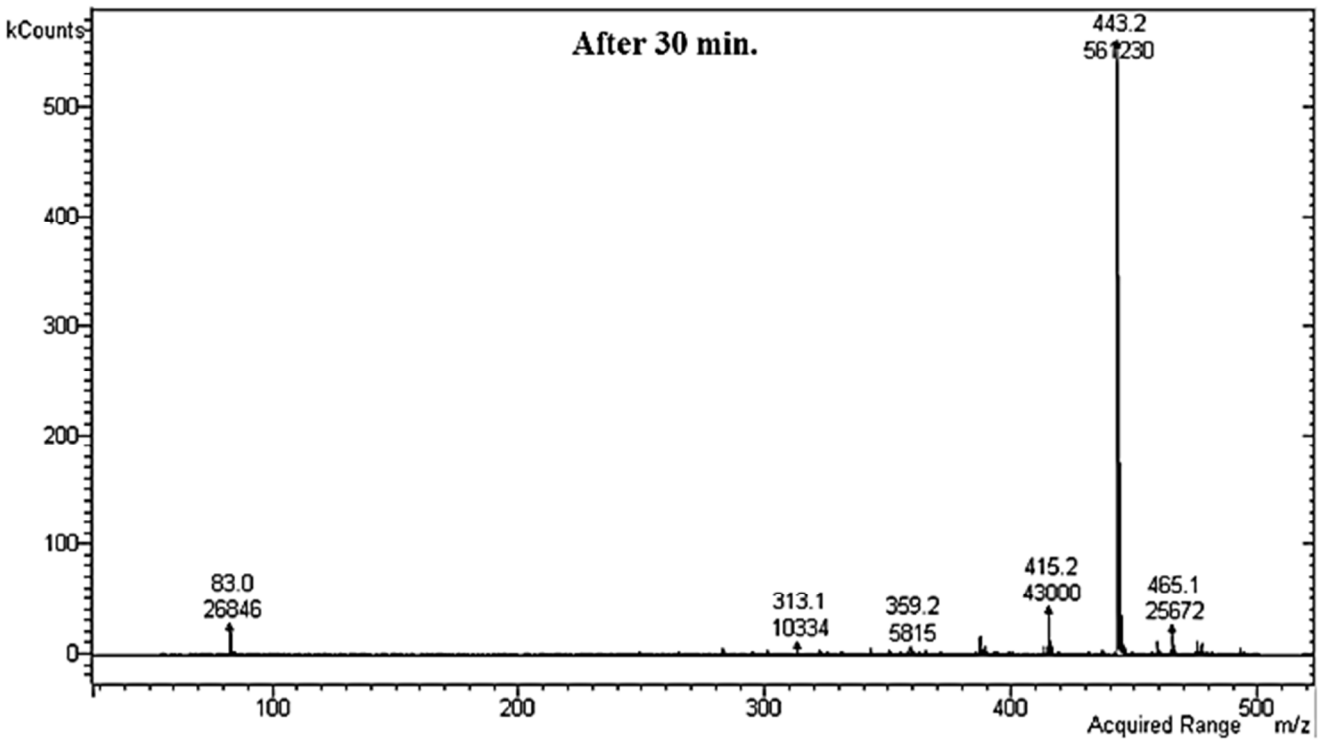


**Fig. S11.** ESI-MS of RhB solution after 30 min. of photocatalytic reaction with Ti-HTS-40.

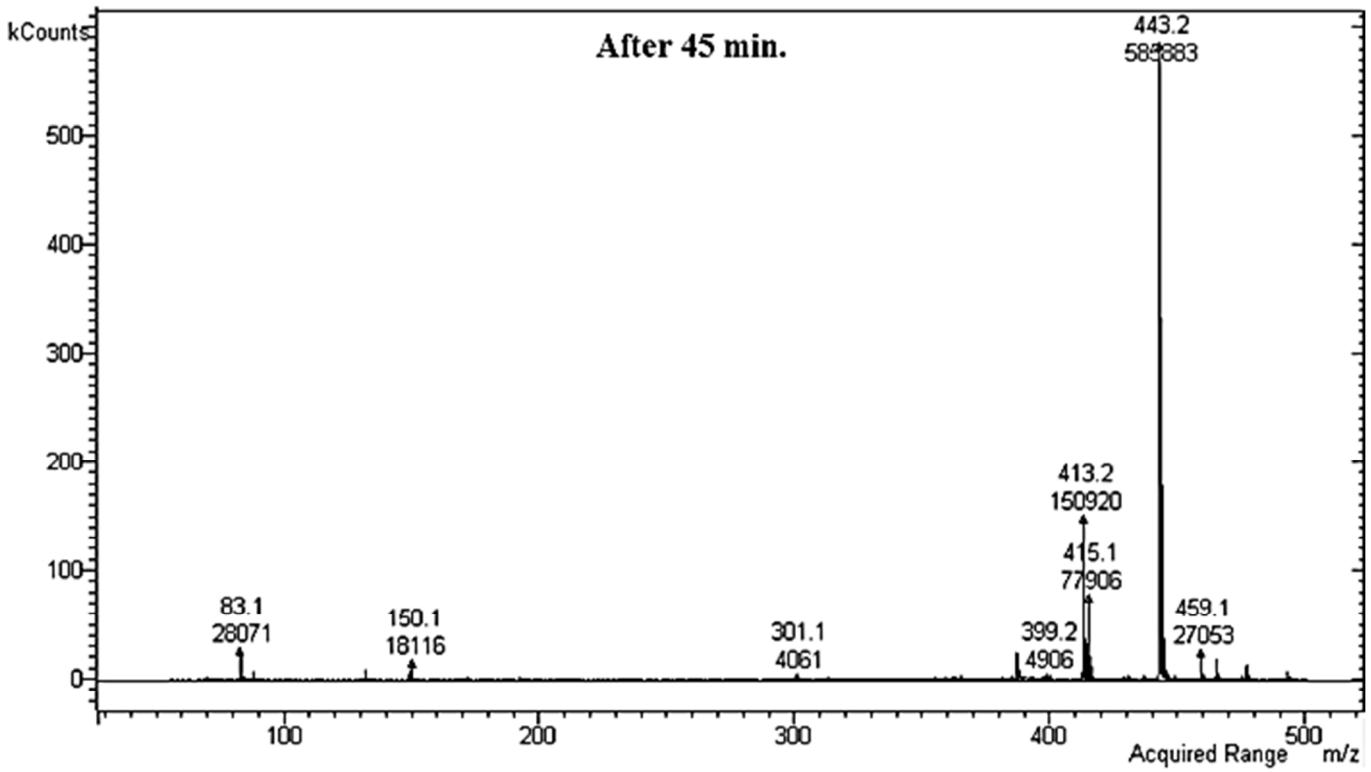


**Fig. S12.** ESI-MS of RhB solution after 45 min. of photocatalytic reaction with Ti-HTS-40.

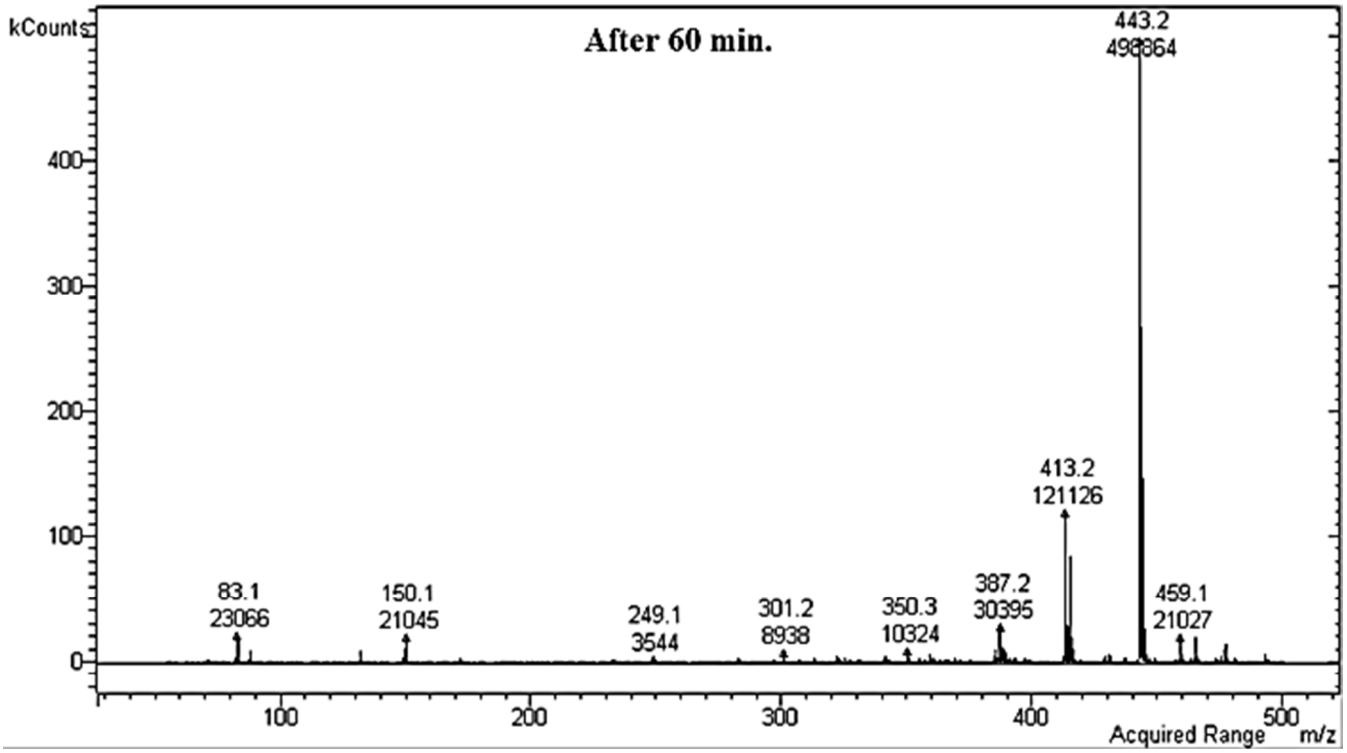


**Fig. S13.** ESI-MS of RhB solution after 60 min. of photocatalytic reaction with Ti-HTS-40.

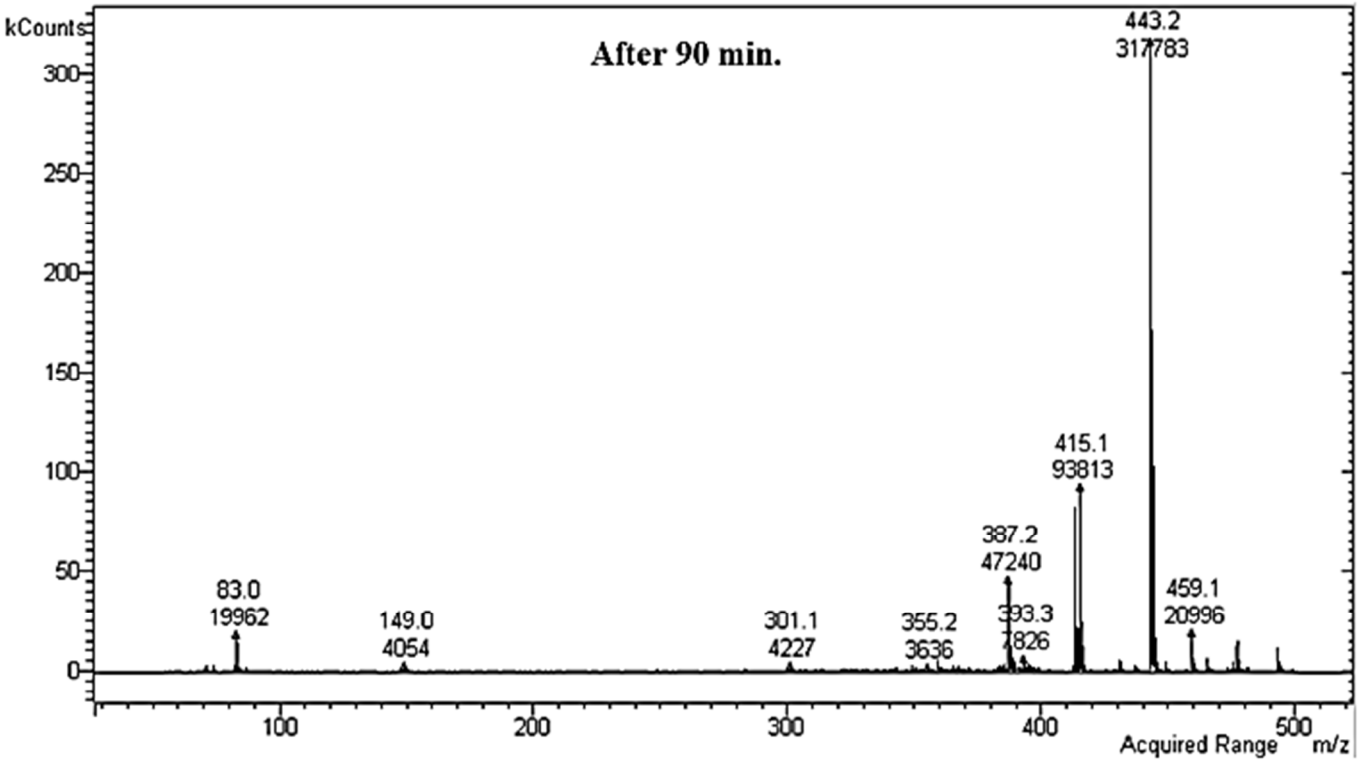


**Fig. S14.** ESI-MS of RhB solution after 90 min. of photocatalytic reaction with Ti-HTS-40.

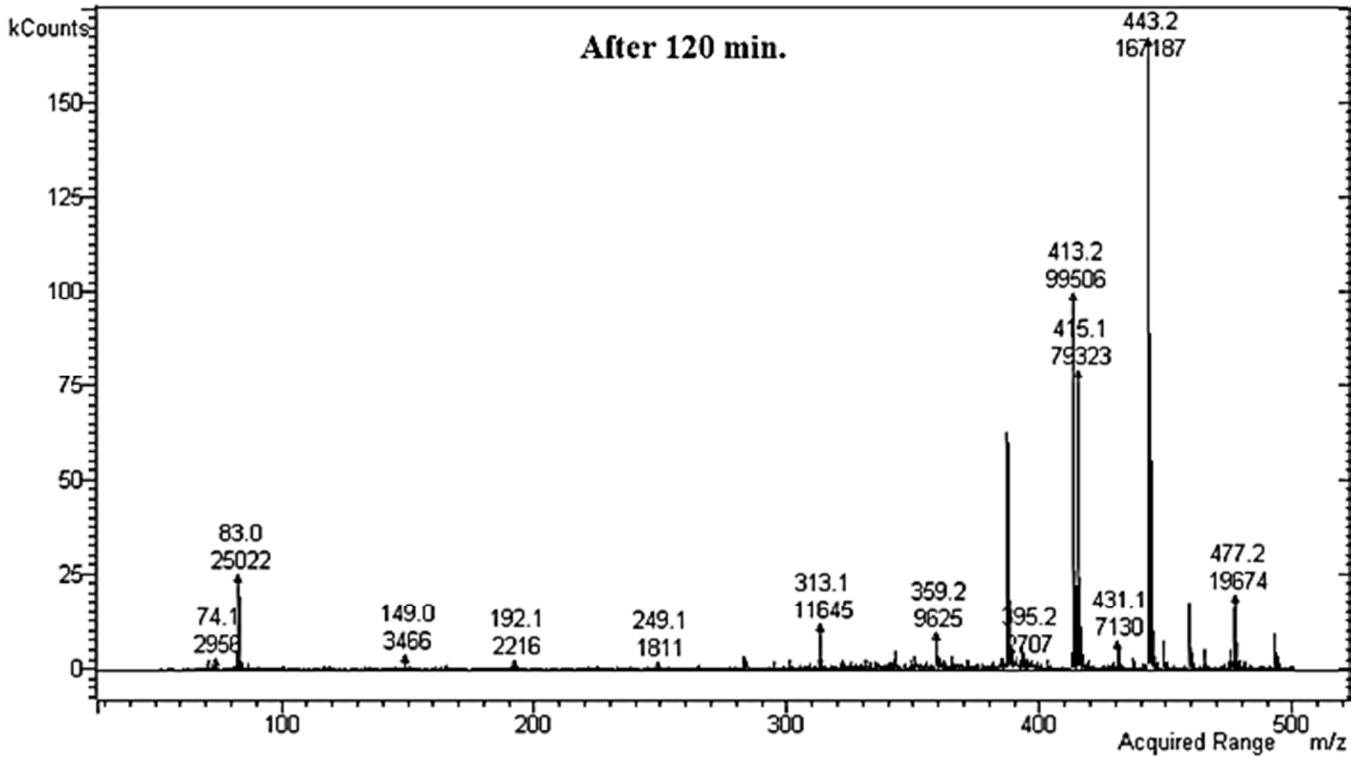


**Fig. S15.** ESI-MS of RhB solution after 120 min. of photocatalytic reaction with Ti-HTS-40.

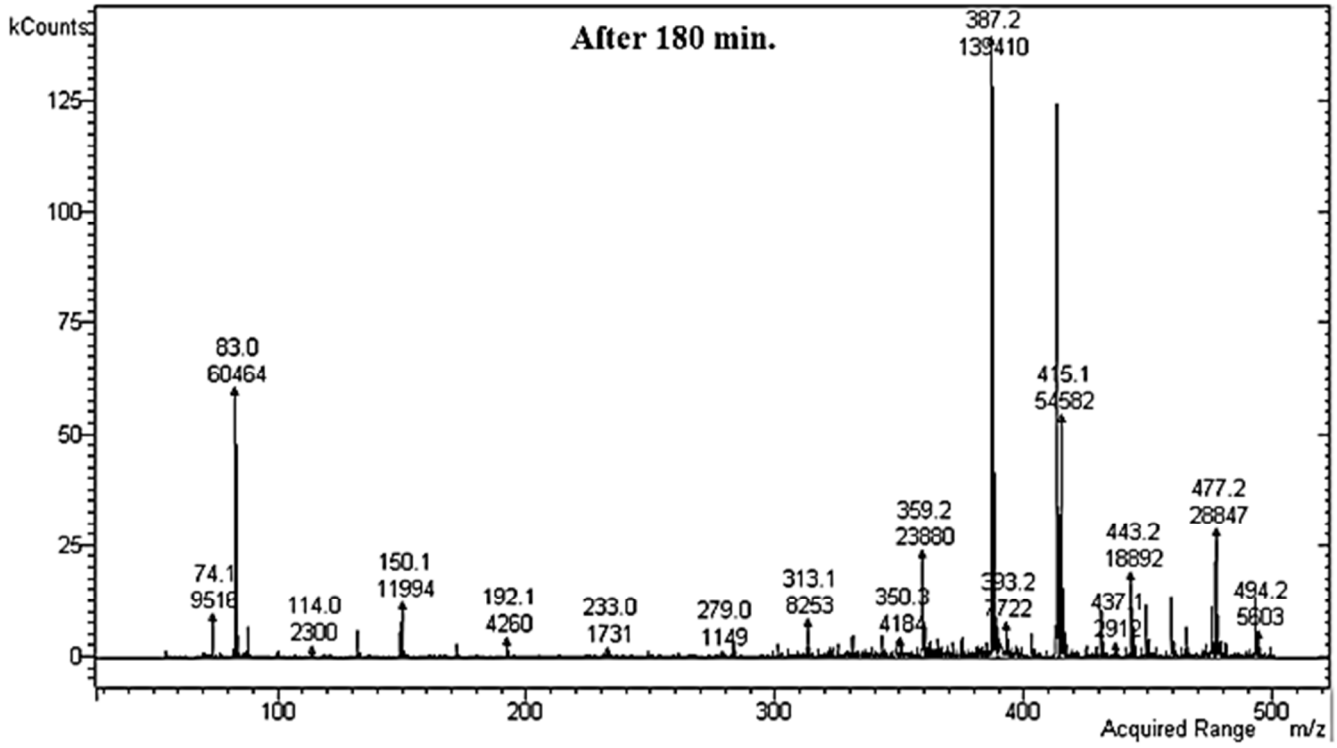


**Fig. S16.** ESI-MS of RhB solution after 180 min. of photocatalytic reaction with Ti-HTS-40.

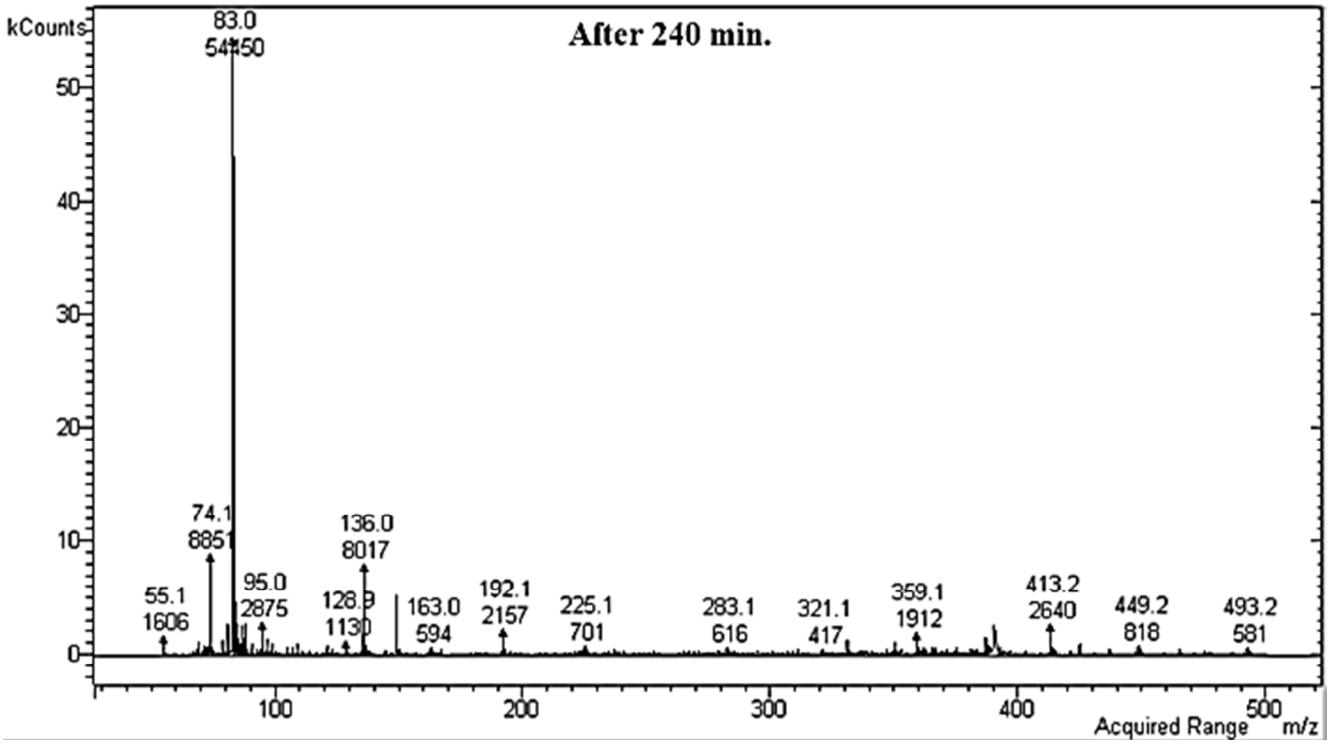


**Fig. S17.** ESI-MS of RhB solution after 240 min. of photocatalytic reaction with Ti-HTS-40.

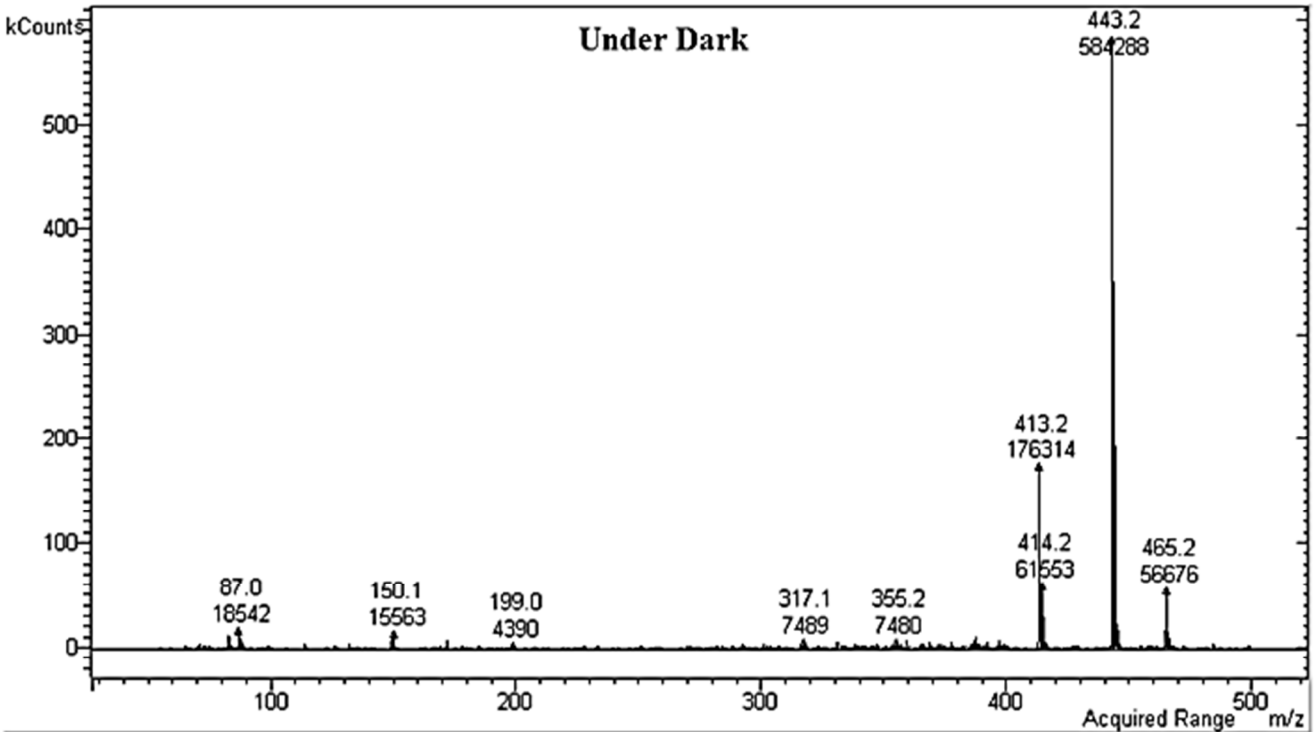


**Fig. S18.** ESI-MS of RhB solution after dark adsorption over Ti-HTS-240.

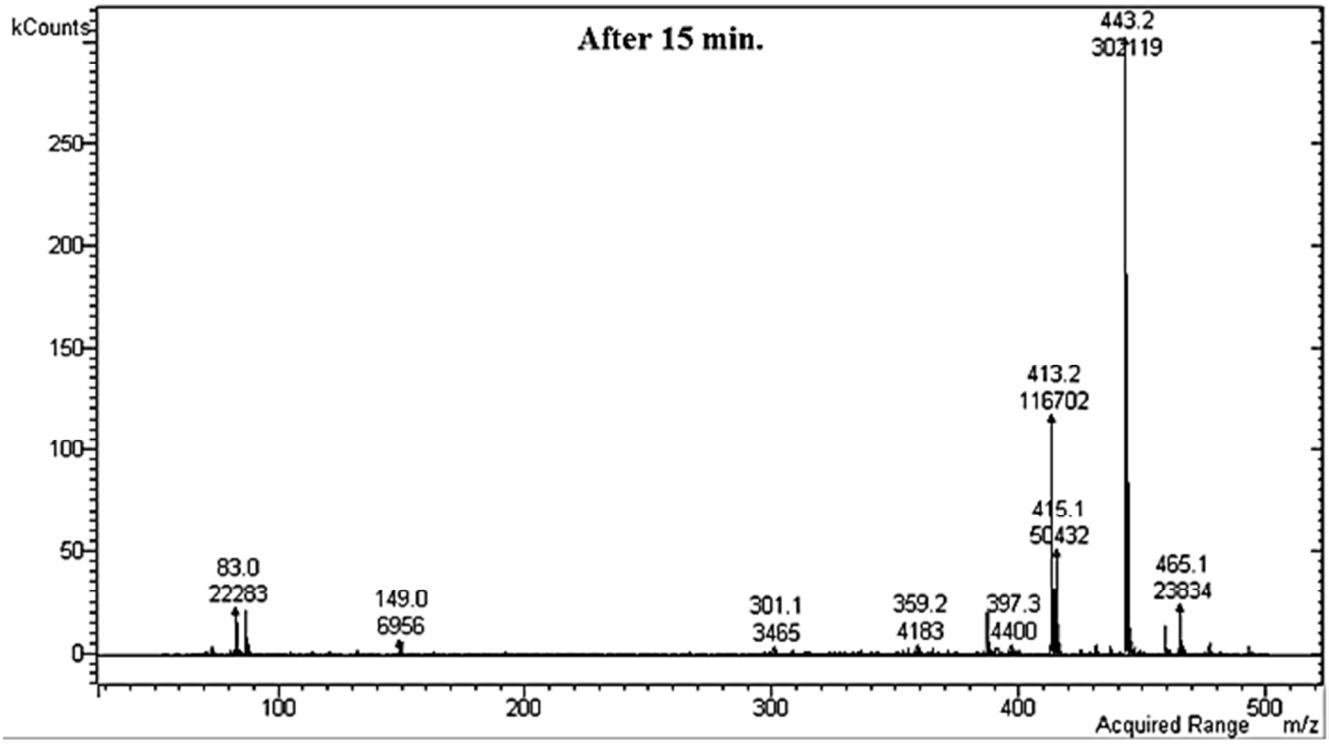


**Fig. S19.** ESI-MS of RhB solution after 15 min. of photocatalytic reaction with Ti-HTS-240.

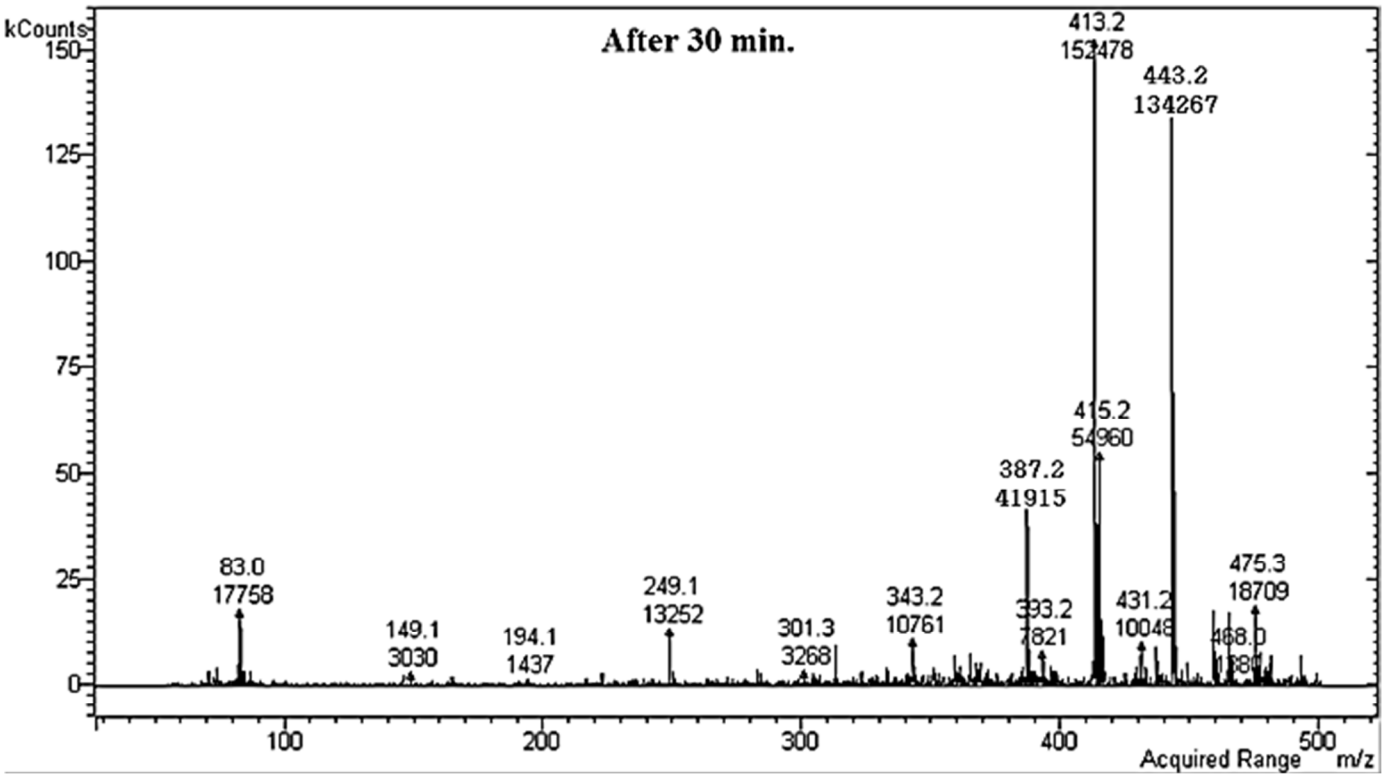


**Fig. S20.** ESI-MS of RhB solution after 30 min. of photocatalytic reaction with Ti-HTS-240.

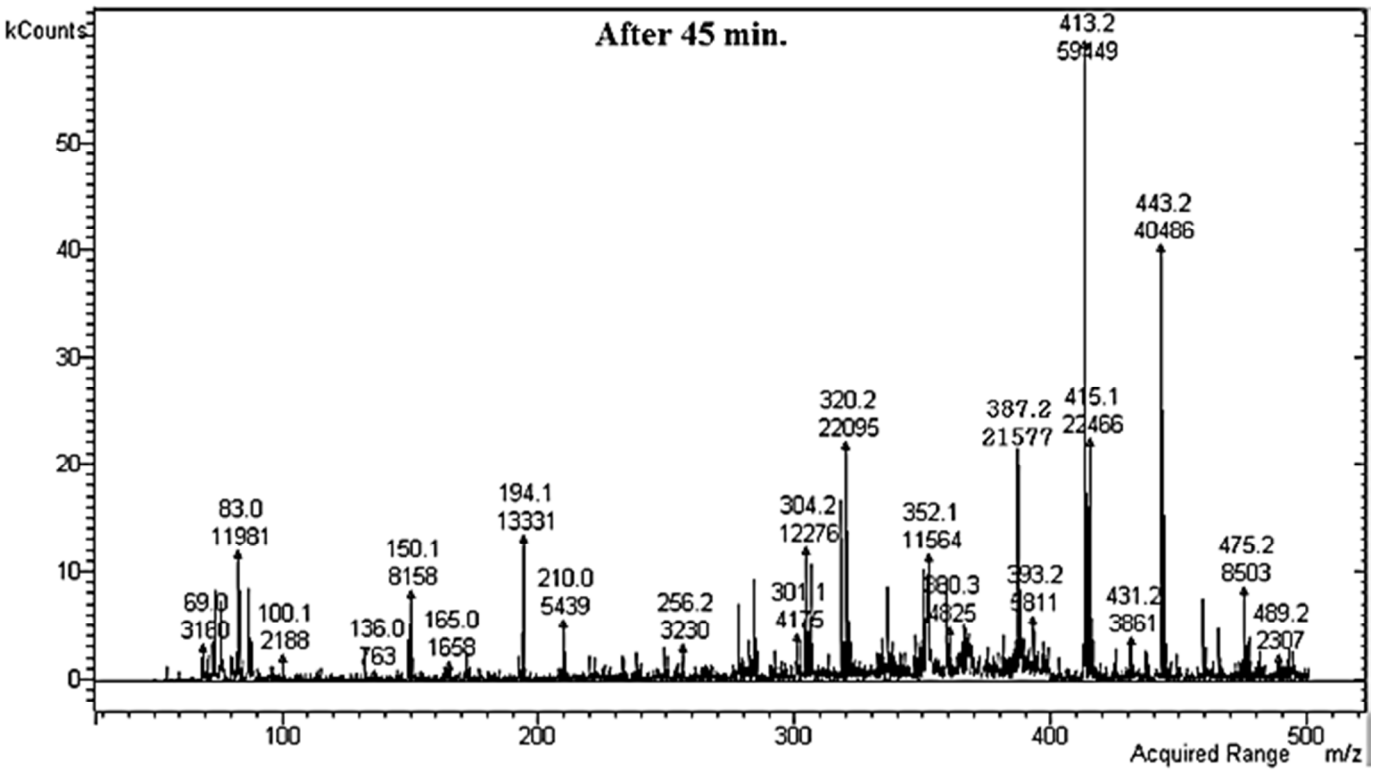


**Fig. S21.** ESI-MS of RhB solution after 45 min. of photocatalytic reaction with Ti-HTS-240.

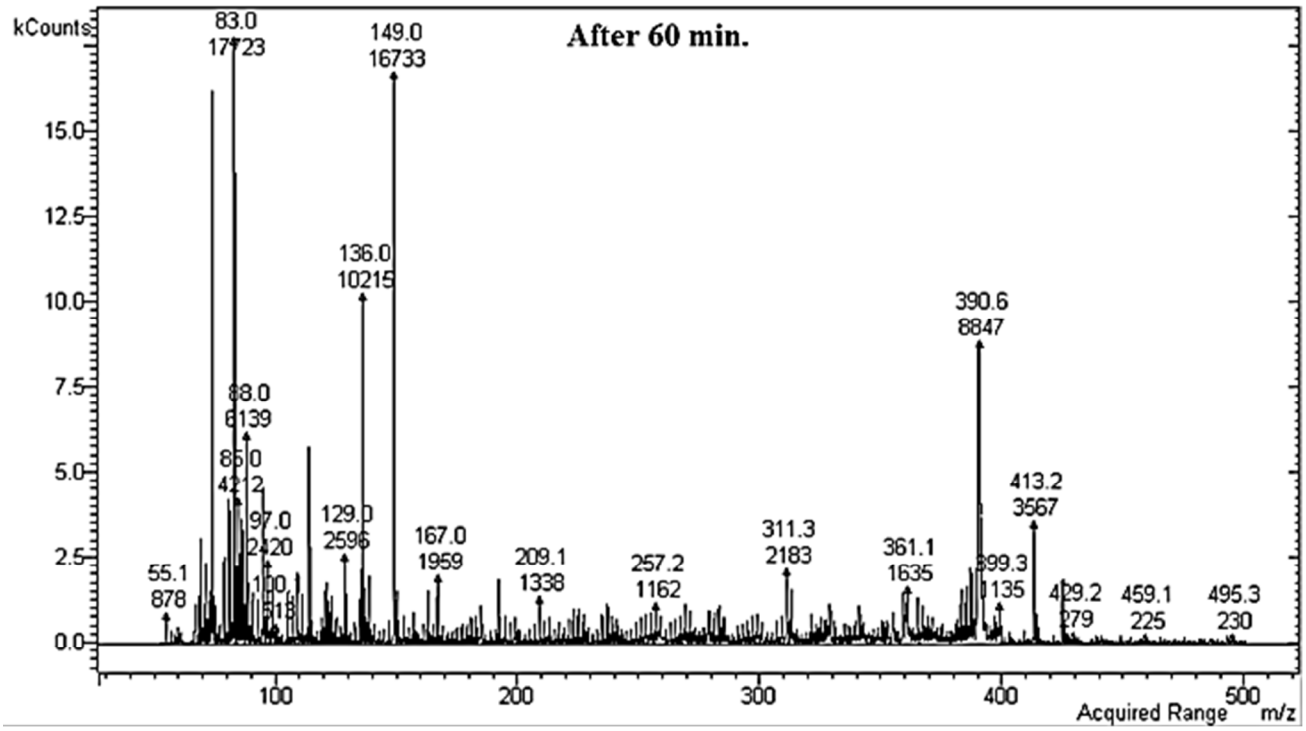


**Fig. S22.** ESI-MS of RhB solution after 60 min. of photocatalytic reaction with Ti-HTS-240.

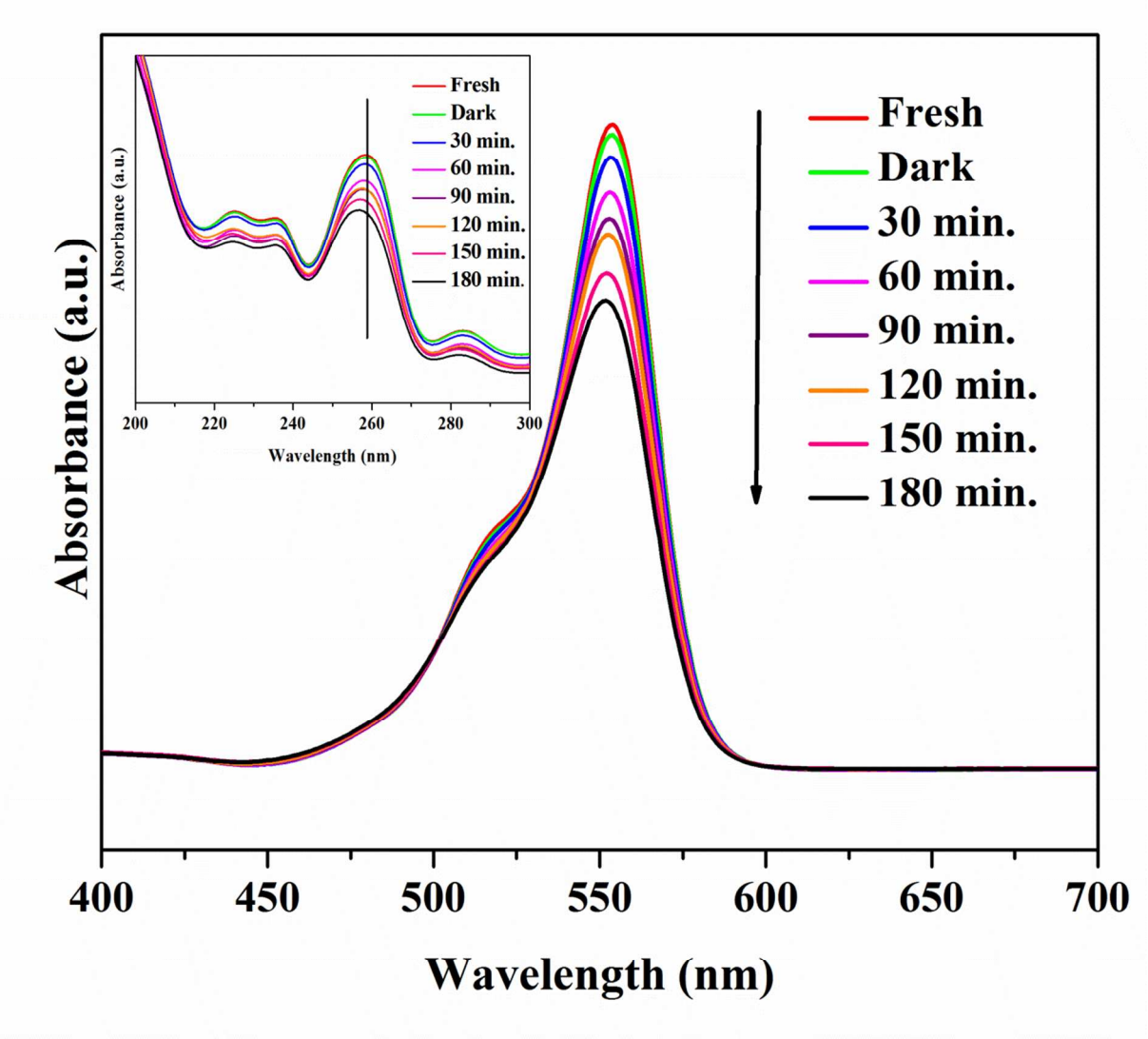


**Fig. S23.** UV-Vis spectra of RhB filtrate after visible light irradiation under $N_2$ flow for Ti-HTS-240. Inset shows the absorbance spectra for the aromatic region of RhB.

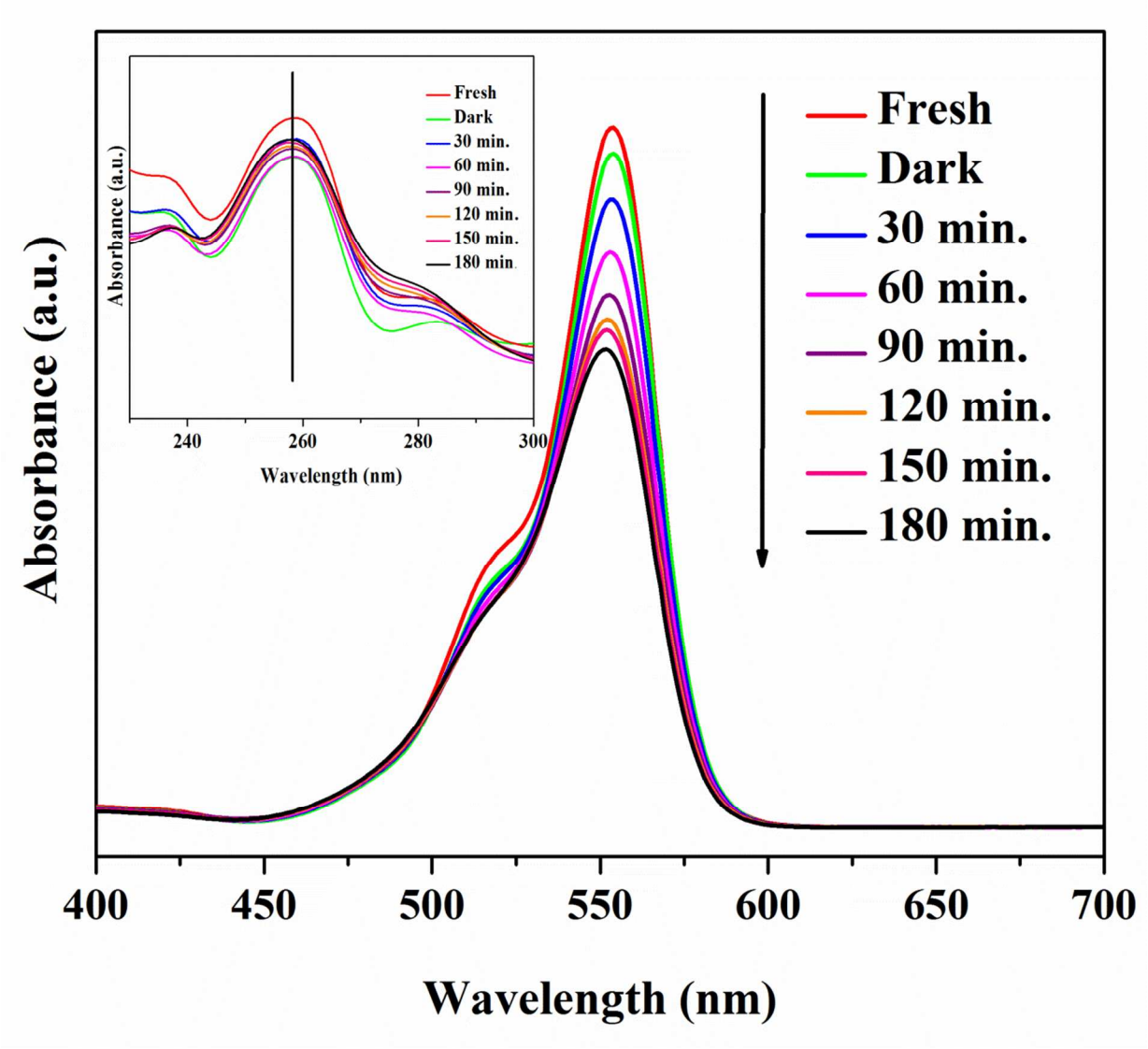


**Fig. S24.** UV-Vis spectra of RhB filtrate after visible light irradiation for Ti-HTS-240 in the presence of isopropyl alcohol (IPA). Inset shows the absorbance spectra for the aromatic region of RhB.