

Design and Development of Symmetric Aromatic Bischalcogenide based Photocatalysts for water treatment Application: A Concise study of Diphenyldiselenide Polypyrrole nanocatalysis

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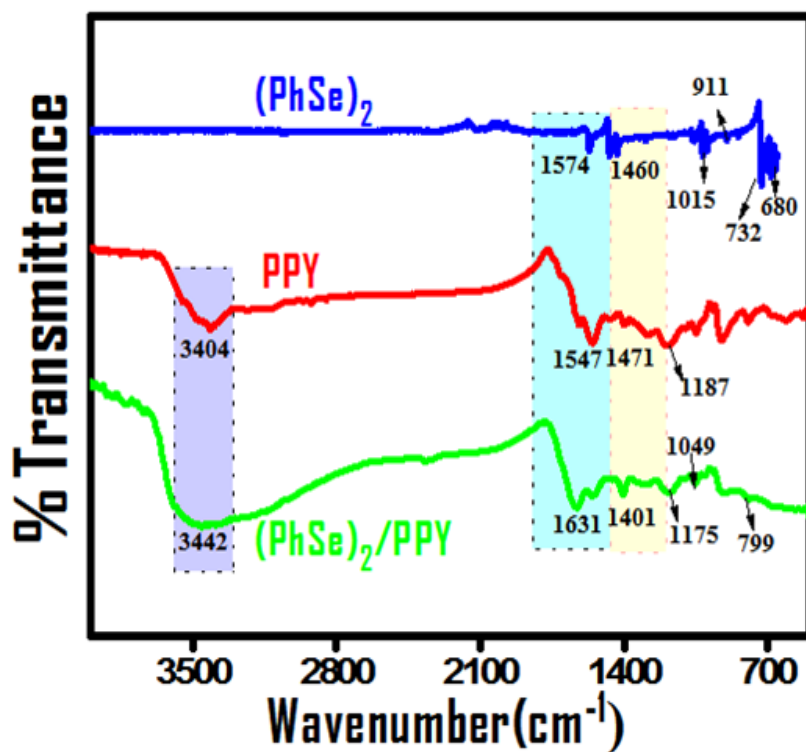


Fig.S1 Comparative FTIR spectra of $(\text{PhSe})_2$, PPY and $(\text{PhSe})_2/\text{PPY}$ confirming composite formation.

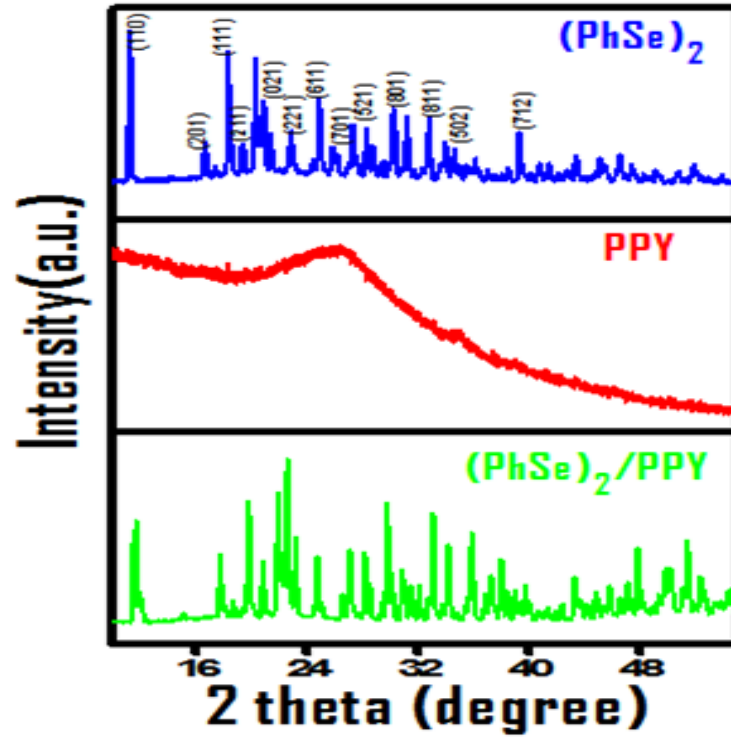


Fig.S2 Comparative powder X-ray diffraction patterns of $(\text{PhSe})_2$, PPY and $(\text{PhSe})_2/\text{PPY}$ nanocomposite

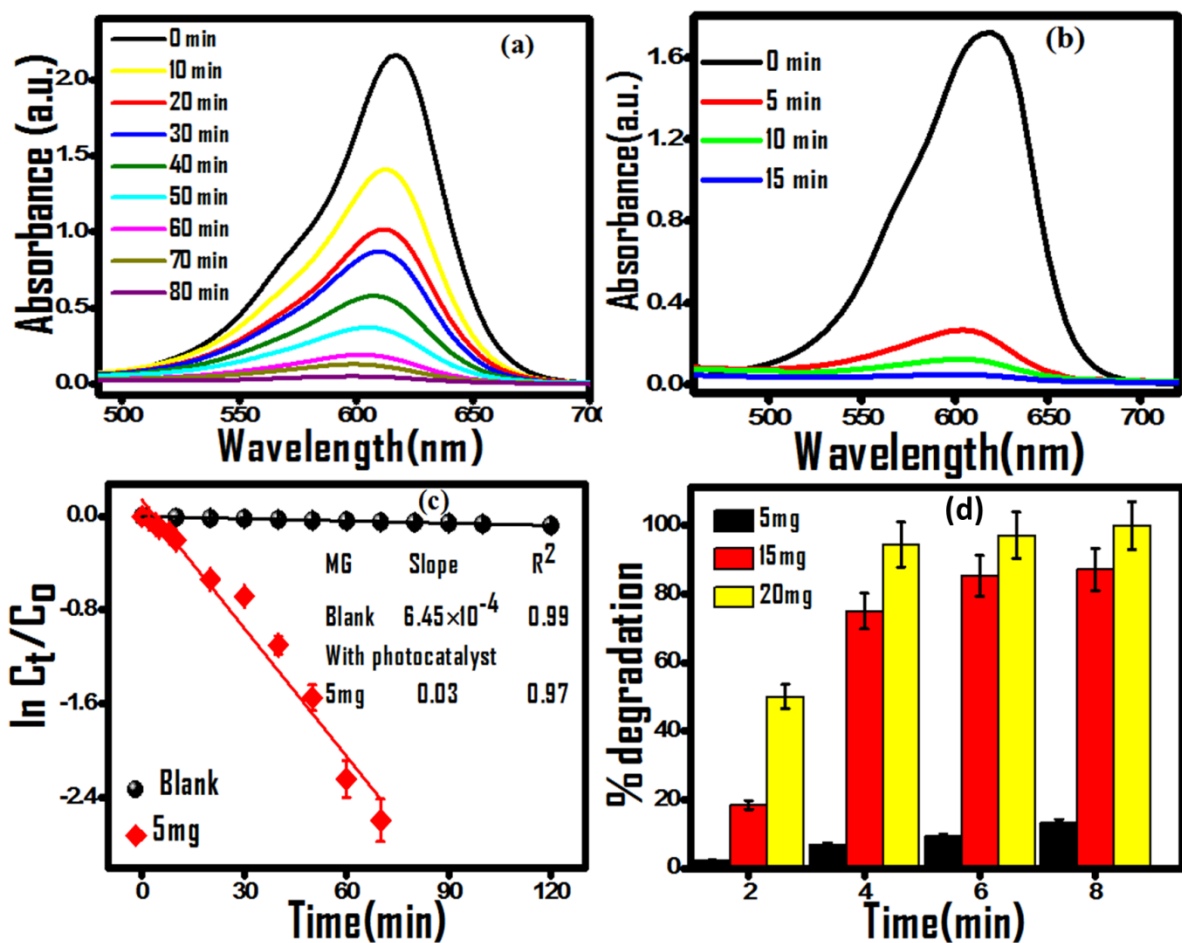


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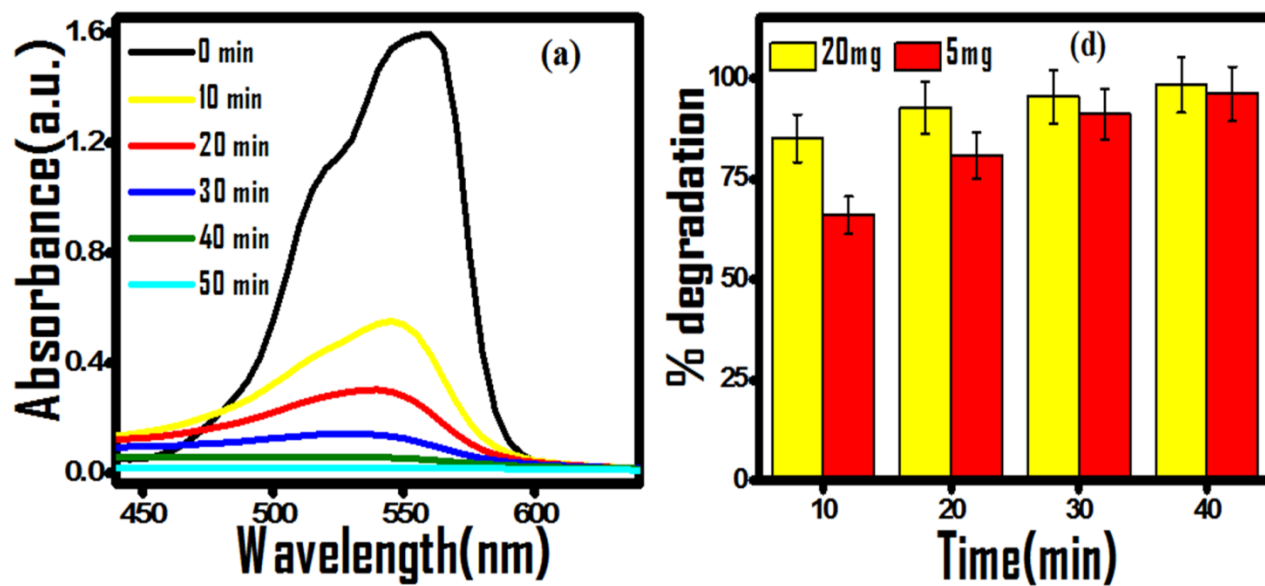


Fig. S4 (a) Absorbance spectra of 20 ppm RhB dye solutions at pH 7 as a function of irradiation time in the presence of (a) 5 mg (PhSe)₂/PPY photocatalyst and (b) corresponding evolution of the degradation rate during the first 40 minutes of reaction.

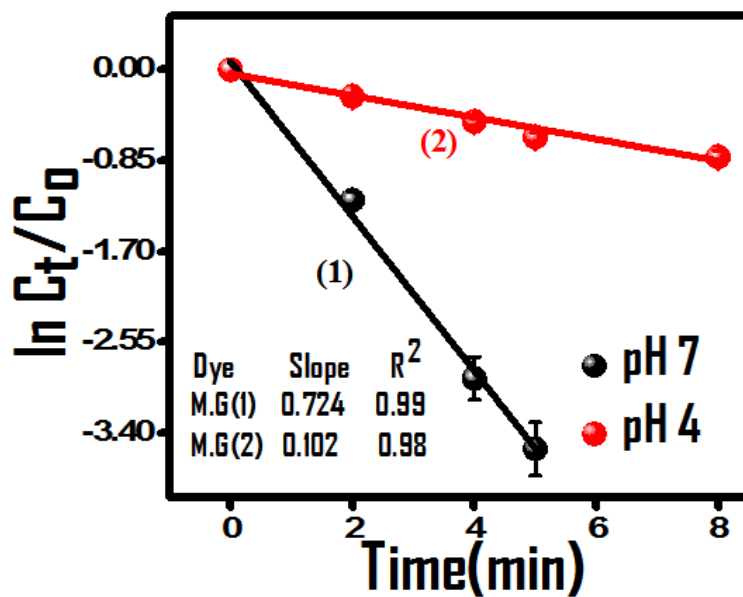


Fig. S5 Comparison of Kinetic plots of M.G dye degradation in the presence of 20 mg of (PhSe)₂/PPY photocatalyst at pH 7 and pH 4.

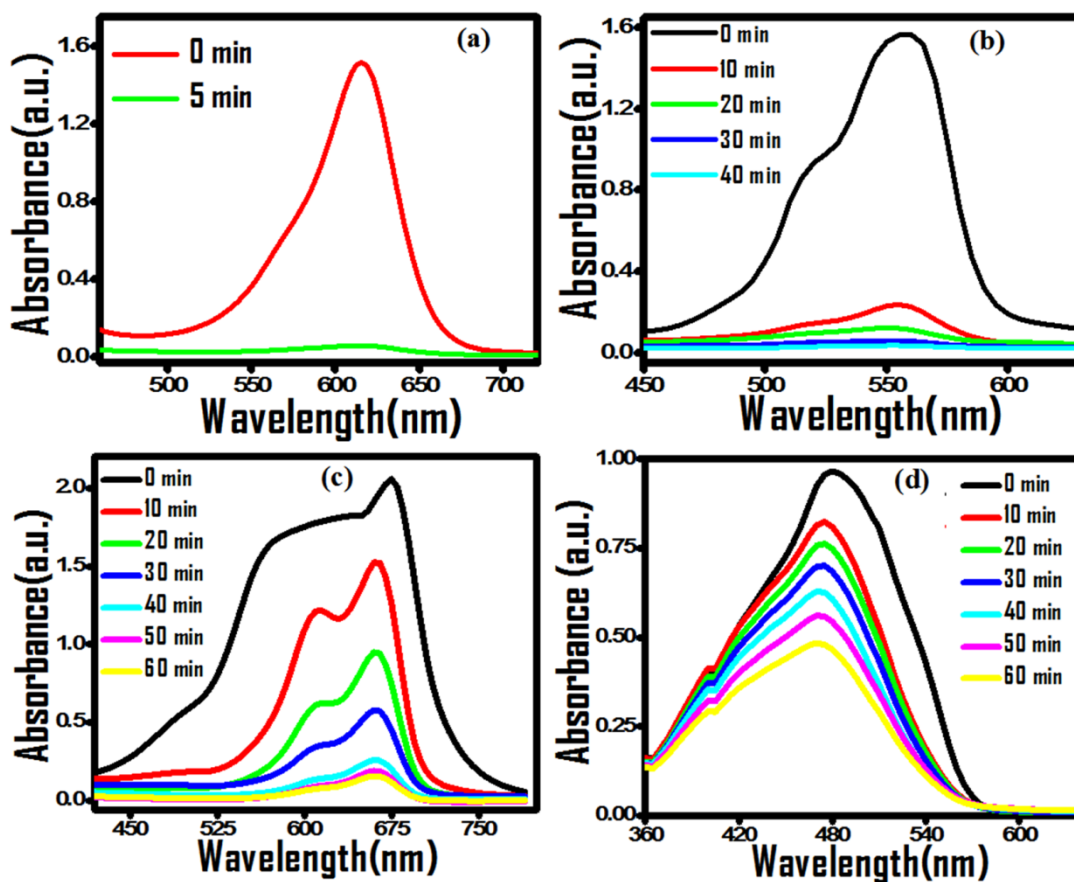


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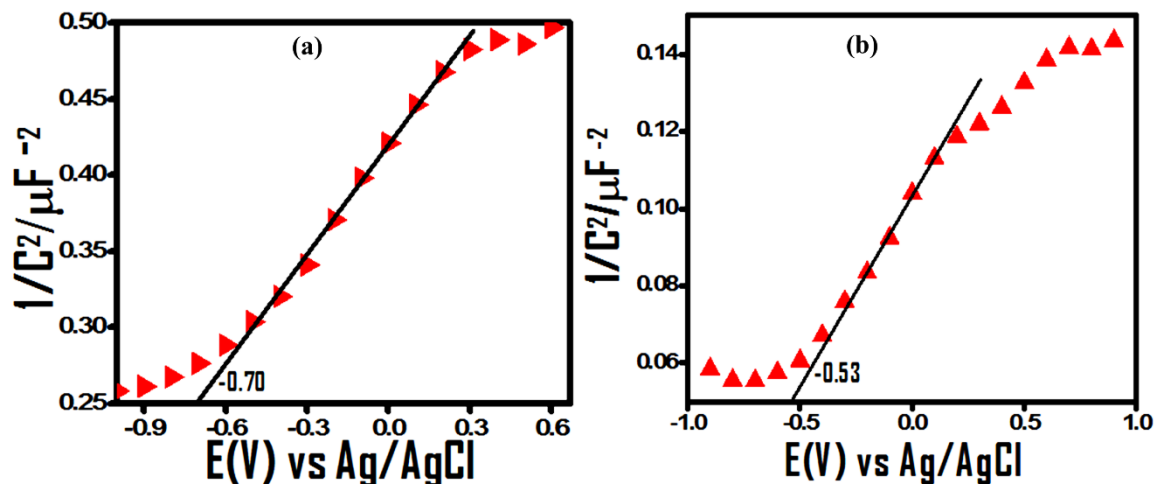


Fig.S7 Mott-Schottky plots showing flat band potentials of (a) PPY and (b) $(\text{PhSe})_2$

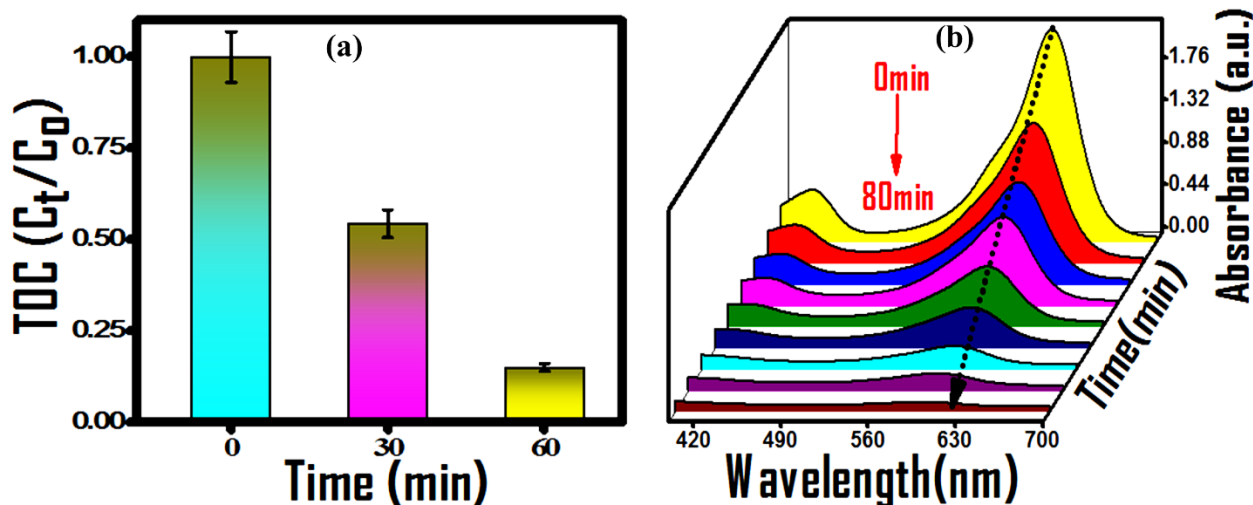


Fig.S8 (a) Evolution of the total organic carbon of M.G solutions as a function of the irradiation time in the presence of the $(\text{PhSe})_2/\text{PPY}$ photocatalyst. (b) 3D UV-Visible plot of M.G dye degradation as a function of irradiation time in the presence of $(\text{PhSe})_2/\text{PPY}$. The blue shift in λ_{max} of the dye molecule is indicative of successive its demethylations.

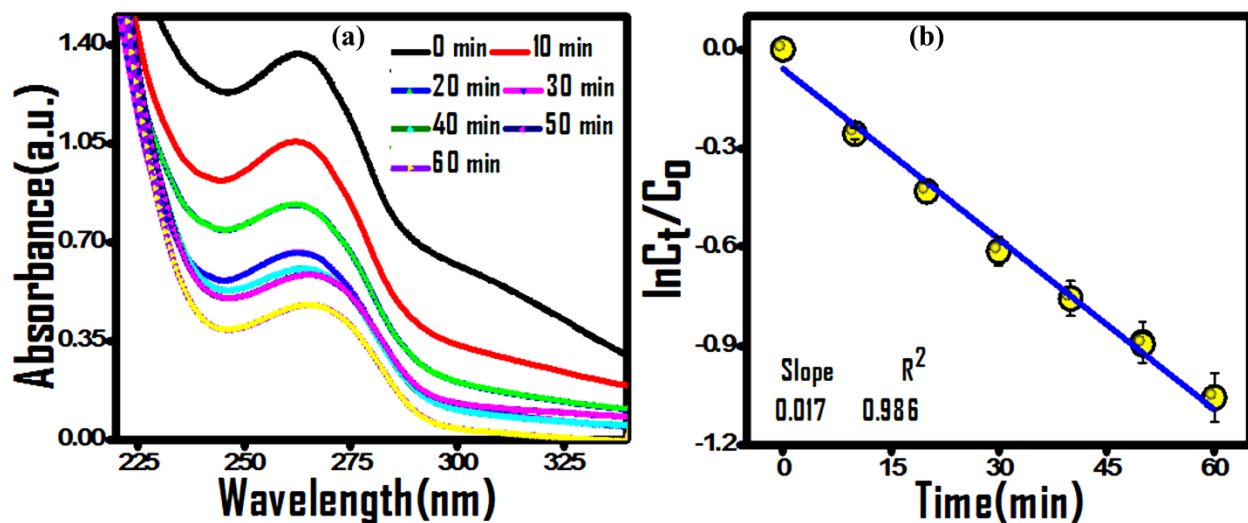
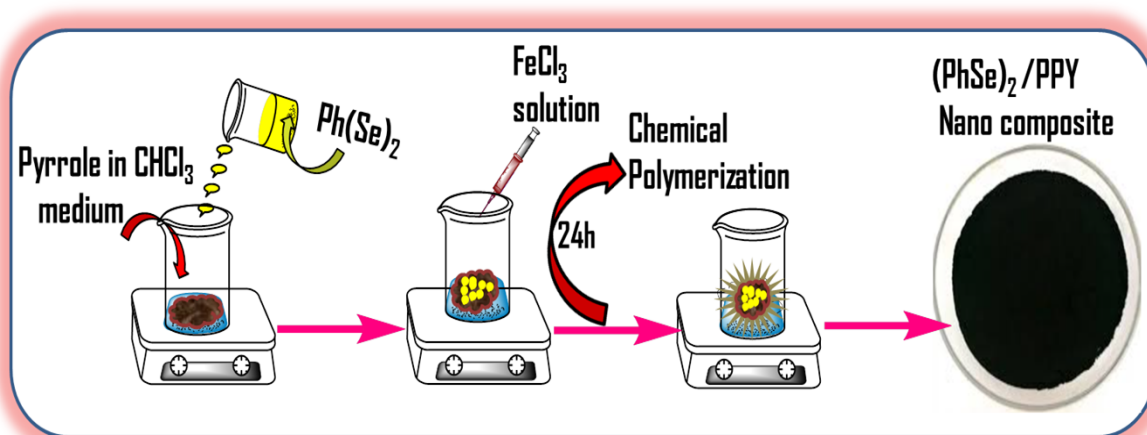
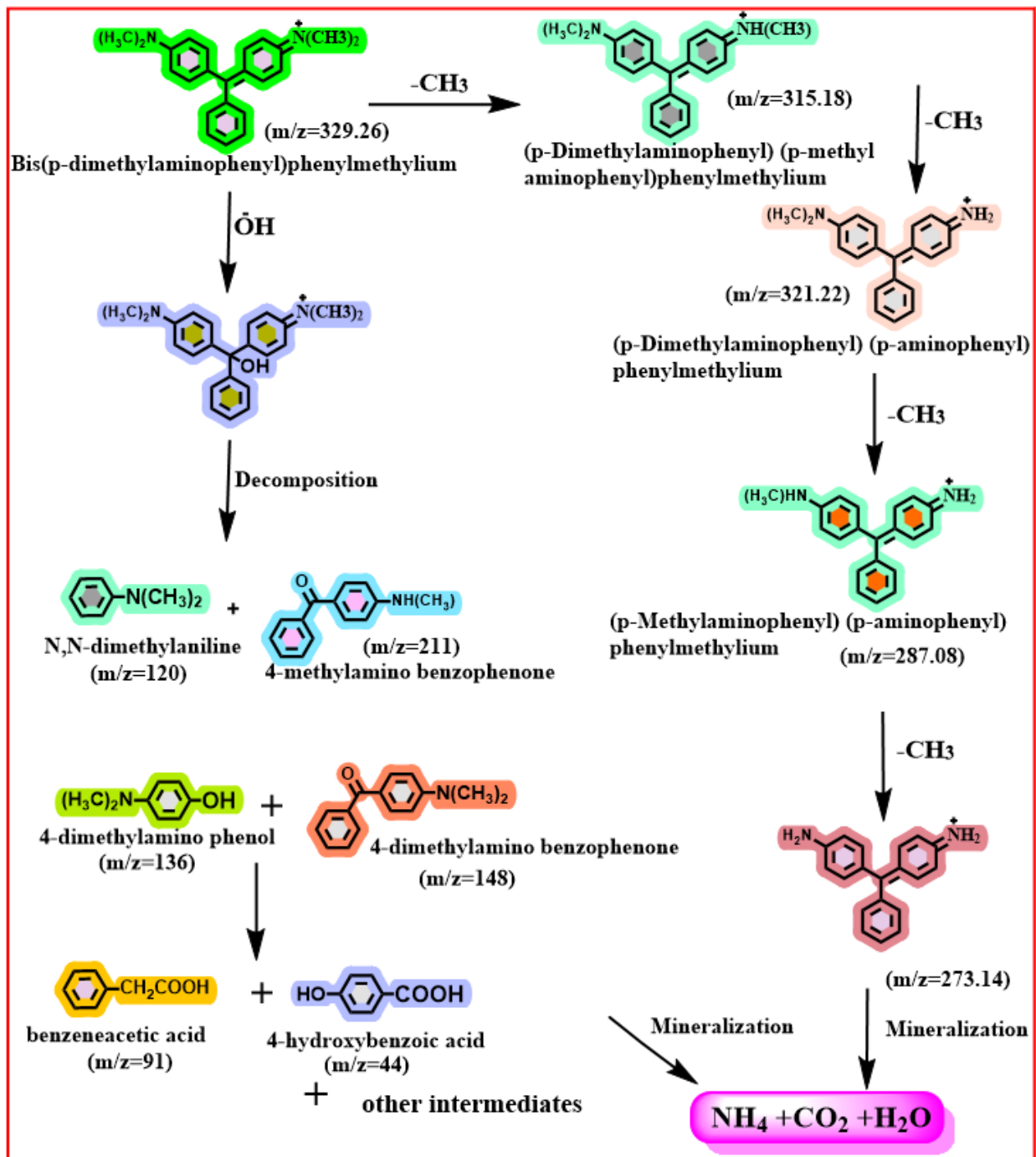


Fig.S9 (a) UV-Visible plot of 20ppm isoniazid solution in contact with 20mg of $(\text{PhSe})_2/\text{PPY}$ photocatalyst at pH 7 as a function of the irradiation time. (b) Corresponding photo-degradation kinetic plot following first order kinetics.



Scheme S1 Schematic steps of the $(\text{PhSe})_2/\text{PPY}$ nanocomposite synthesis via *in situ* Oxidative Polymerization method



Scheme S2 Degradation Pathway of MG dye indicating successive de-methylations and ultimate mineralization.

Table S1 Percentage degradation and rate constant values for the degradation of M.G and Rh.B dyes obtained under different experimental conditions

Dye concentration (20ppm,100mL),(PhSe) ₂ /PPY (5mg-20mg), pH 7				
Dye	Amount of photocatalyst (mg)	% Degradation	Irradiation time(min)	Rate constant (min ⁻¹)
M.G	5	97.69	80	0.027
	10	97.50	15	0.176
	20	97.12	5	0.737
Rh.B	5	96.21	40	0.079
	20	98.48	40	0.104
Dye concentration (50ppm,100mL),(PhSe) ₂ /PPY (20mg), pH 7				
M.G	20	98.4	60	0.082
Rh.B	20	80.7	60	0.029

