Electronic Supplementary Information (ESI)

Synthesis and characterization of Mn/Co/Ti LDH and its utilization as a photocatalyst in visible light assisted degradation of aqueous Rhodamine B

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Contents **Page No**

S1. Structure of Rhodamine B dye

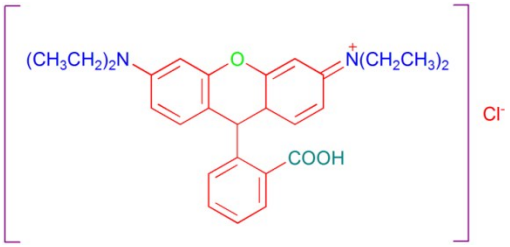

Fig. S1. Structure of Rhodamine B (RhB)

S2. X-ray diffraction parameters of Mn/Co/Ti LDH

Table S1: X-ray diffraction parameters of 2:1:1 Mn/Co/Ti LDH

h	k	l	2θ/deg	FWHM/deg	d-spacing/nm	Relative intensity
0	0	3	13.34	0.856	0.664	75.42
0	0	6	26.68	0.255	0.334	49.43
0	0	9	40.02	0.246	0.225	35.24
1	1	0	28.56	0.238	0.313	27.46
1	0	0	31.65	0.417	0.283	57.27
1	0	1	37.43	0.318	0.241	27.23
0	1	8	45.38	0.257	0.201	33.21
1	1	11	51.72	0.227	0.178	41.13
1	1	3	68.27	0.912	0.139	22.26
1	0	13	76.65	0.942	0.125	12.41

Table S2: Lattice parameters of 2:1:1 Mn/Co/Ti LDH

Parameters of P-XRD analysis	2:1:1 Mn/Co/Ti LDH
Lattice parameter a	0.626 nm
Lattice parameter c	2.01 nm
Lattice parameter c′ (distance between the two consecutive brucite layers)	0.671 nm
Interlayer thickness[a]	0.289 nm
(003/006) peak height ratio	1.53

The X-ray diffraction pattern of 2:1:1 Mn/Co/Ti LDH could be indexed to a typical hexagonal lattice. The lattice parameter ‘c’ depends on the anion size, hydratation and amount of interlayer anions. The lattice parameter ‘a’ depends primarily on the cation–cation distance within the layered framework. The cell parameters ‘a’ and ‘c’ are calculated using the following relations-

$a=2d_{110}$, c [$= (3d_{003}+6d_{006}+9d_{009})/3$] and $c=3c'$.

[a]Interlayer thickness= (c′ — brucite-like sheet thickness); c′= 0.671 and
Brucite sheet thickness= 0.382 nm (calculated using cross-sectional HR-TEM and AFM analyses).

S3. FT-IR spectrum of Mn/Co/Ti LDH

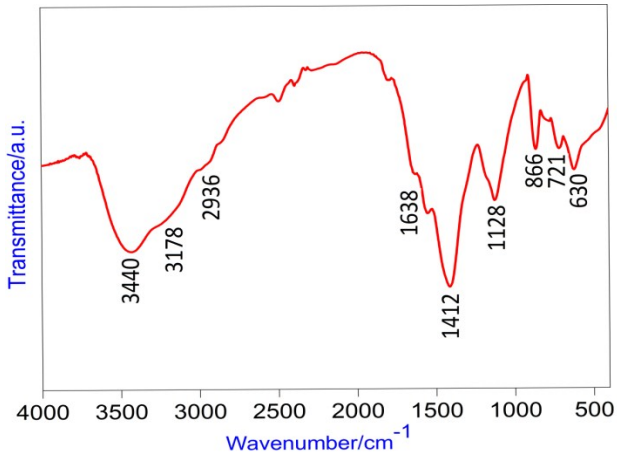

Fig. S2. FT-IR spectrum of Mn/Co/Ti LDH

S4. Electrochemical impedance spectroscopy data of Mn/Co/Ti LDH

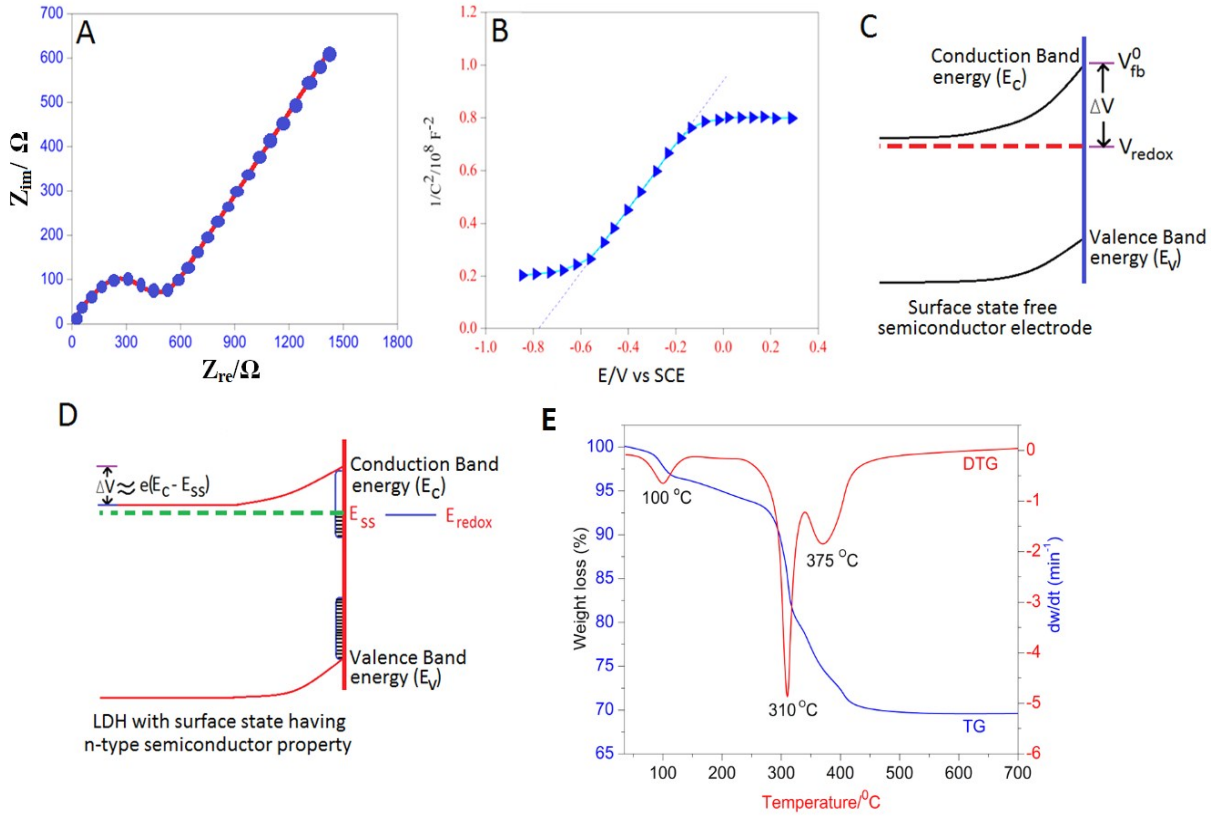

Fig. S3(A). Electrochemical impedance Nyquist plot (D) Mott-Schottky impedance plot of 2:1:1 Mn/Co/Ti LDH (C) Schematic representation of a surface state free semiconductor electrode (D) Schematic illustration of with n-type semiconductor properties (E) TG-DTG curves of the Mn/Co/Ti LDH.

S5. N_2 sorption isotherm and and pore size distribution and DLS measurements of Mn/Co/Ti LDH

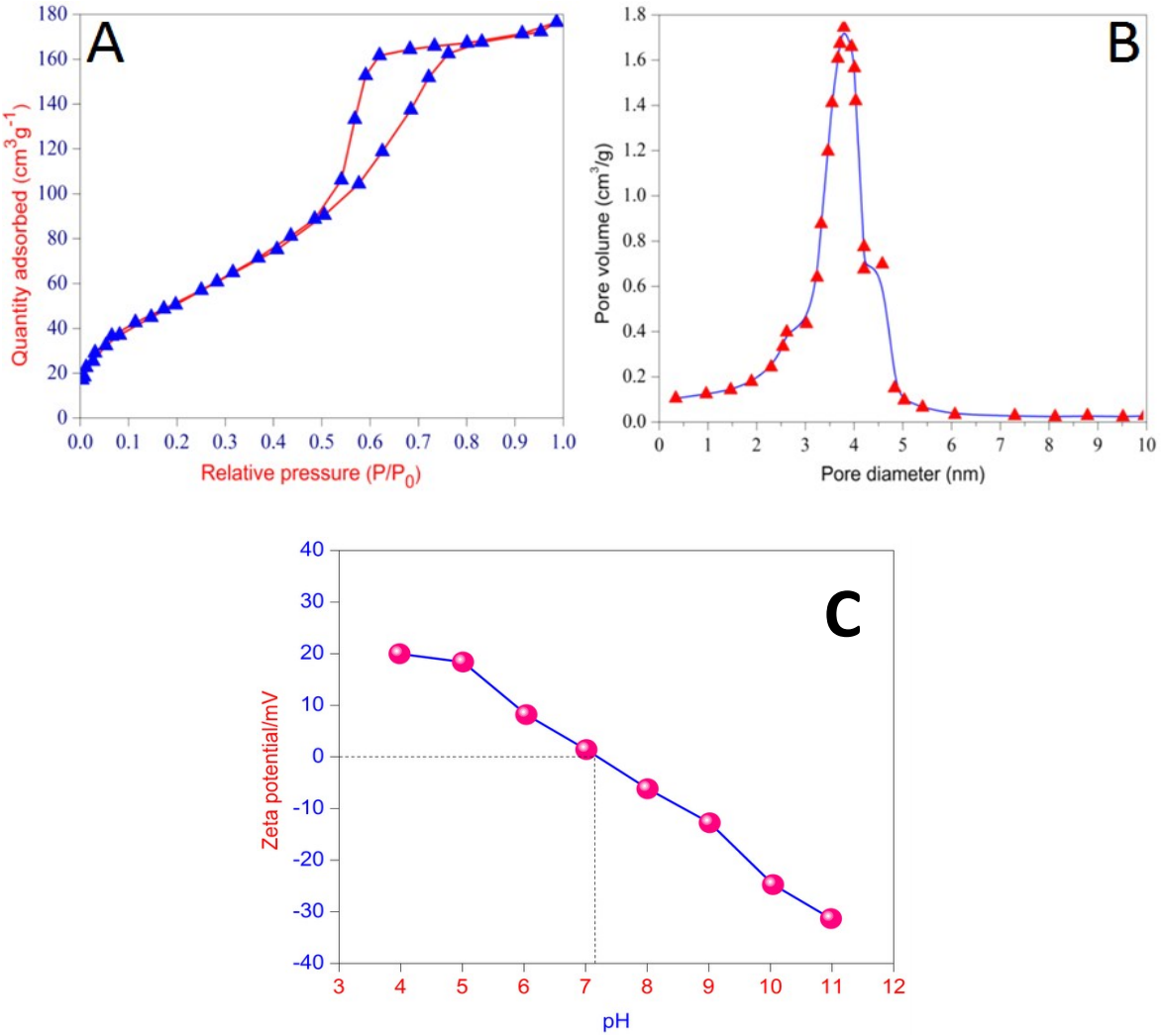

Fig. S4.(A).N_2 sorption isotherm and (B) Pore size distribution curve and **(C)** Determination of zero point charge (zpc) of Mn/Co/Ti LDH

S6. Adsorption-desorption equilibrium between Mn/Co/Ti LDH and Rhodamine B dye

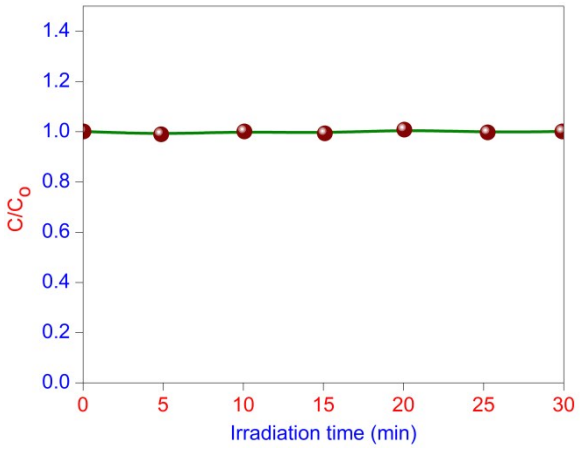

Fig. S5. Adsorption-desorption equilibrium between the LDH and RhB dye

S7. Photodegradation kinetics

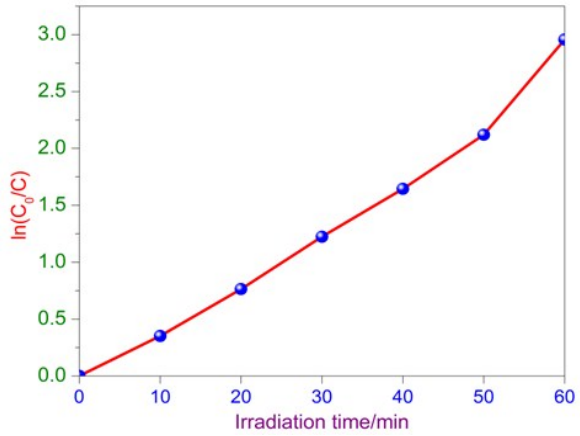

Fig. S6. Plot of ln(C_0/C) vs time for 2:1:1 Mn/Co/Ti LDH (at pH=11; catalyst dose= 15.0 mg in 200 ml of aqueous of $1x10^{-5}$ M RhB)

S8. Recyclability of Mn/Co/Ti LDH

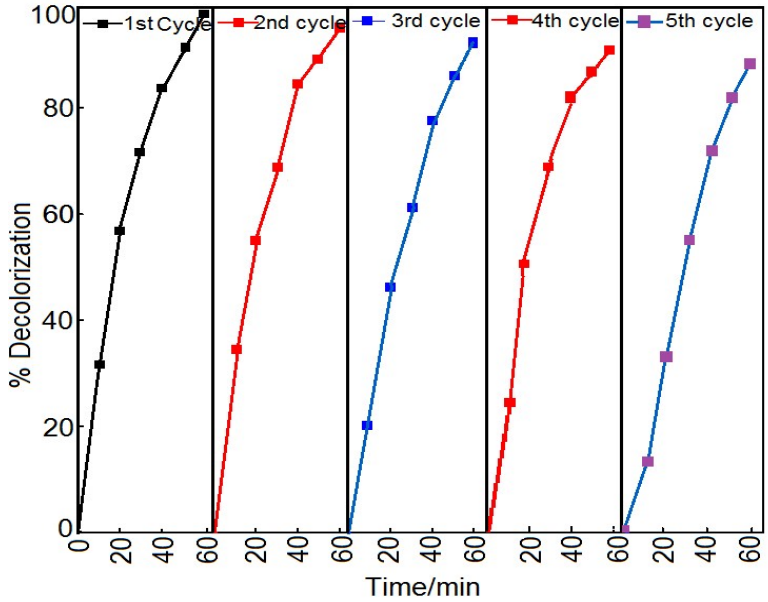

Fig. S7. Number of cycles of RhB photodegradation over 2:1:1 Mn/Co/Ti LDH

S9. FT-IR spectra of 2:1:1 Mn/Co/Ti LDH before and after RhB degradation

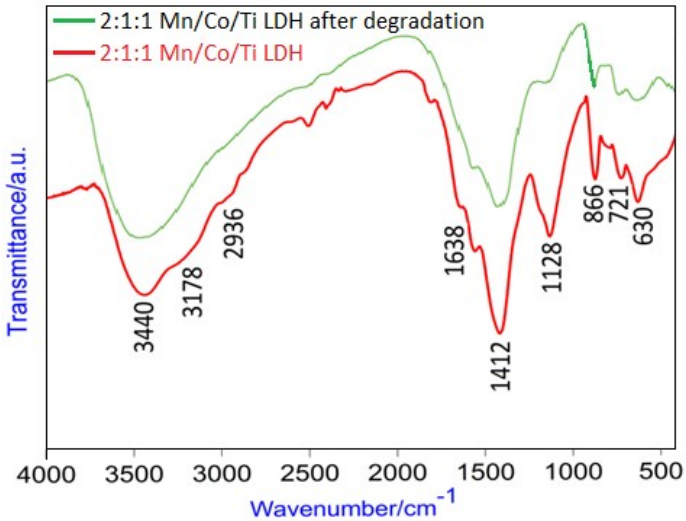

Fig. S8. FT-IR spectra of 2:1:1 Mn/Co/Ti LDH before and after RhB degradation

S10. Comparative FT-IR study of pure RhB, control experiments and colourless end product after degradation

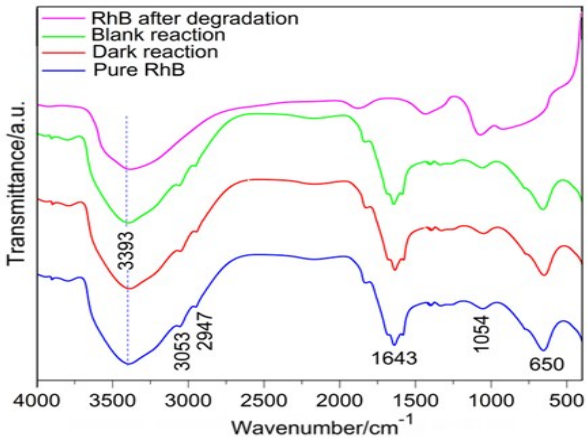

Fig.S9. Comparative FT-IR spectra of pure RhB, control experiments and colourless photodegradation product

S11. Reduction in TOC as a function of time

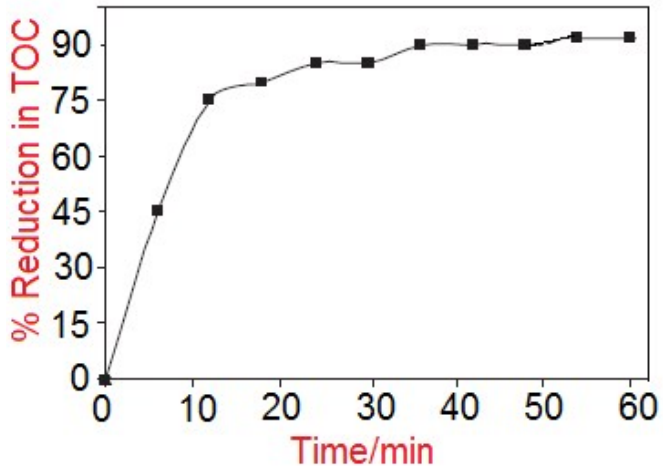

Fig. S10. Percentage reduction in TOC as a function of time at different optimized conditions (conditions: volume of solution: 200 ml, initial dye concentration: 1 x 10^{-5} M, pH of solution: 11.0)

S12. GC-MS of the colourless degradation product of RhB

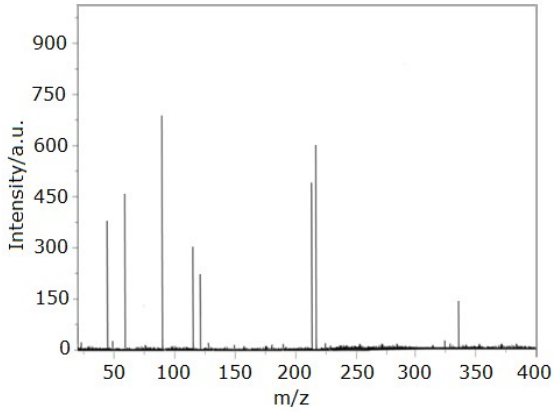

Fig. S11. GC-MS of the colourless degradation product of Rhodamine B dye