Title: Rapid Photocatalytic Degradation of Cationic Organic Dyes using Li-doped Ni/NiO nanocomposites and their Electrochemical Performance

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Electronic Supplementary Information

Synthesis of Ni/NiO NCs

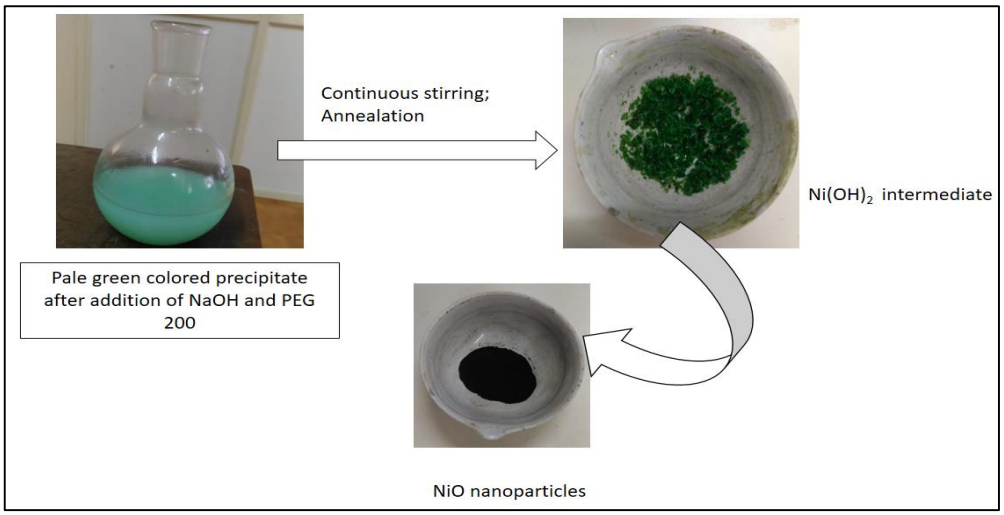

Fig. S1 Steps involved in the synthesis of Ni/NiO NCs

Fourier-transform infrared (FT-IR) spectroscopy studies

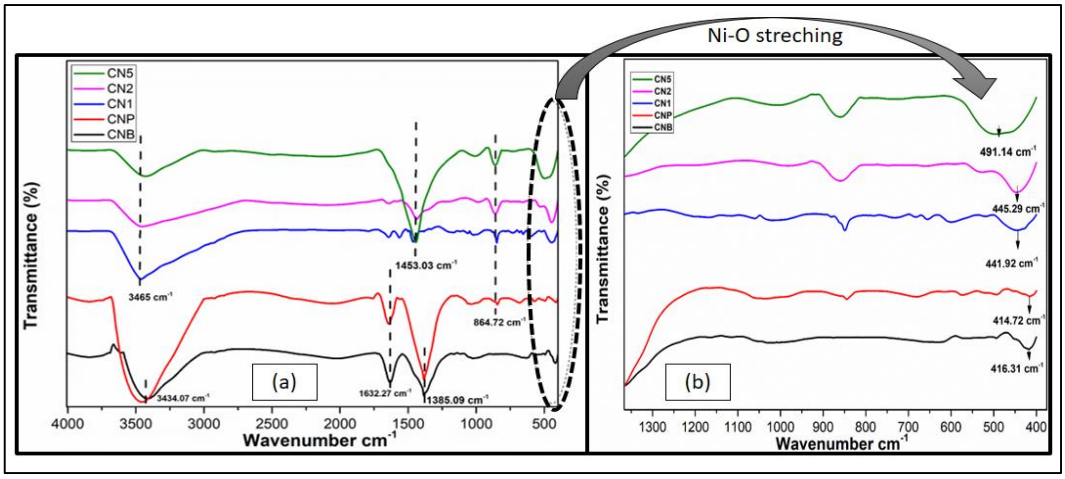

Fig. S2 (a) FT–IR spectra of the as prepared NPs **(b)** Expanded view

The absorption bands observed at ~3450 cm^{-1} is due to the –OH stretching mode while bands at 1632.27 and 1385.09 cm^{-1} are caused by O-H bending modes of H_2O molecules absorbed during the synthesis. In the PEG-200 assisted nanoparticles, 864.72 and 1453.03 cm^{-1} can be attributed to CH_2 bending and C-C stretching vibration frequencies respectively due to the surfactant added.

BET surface analysis

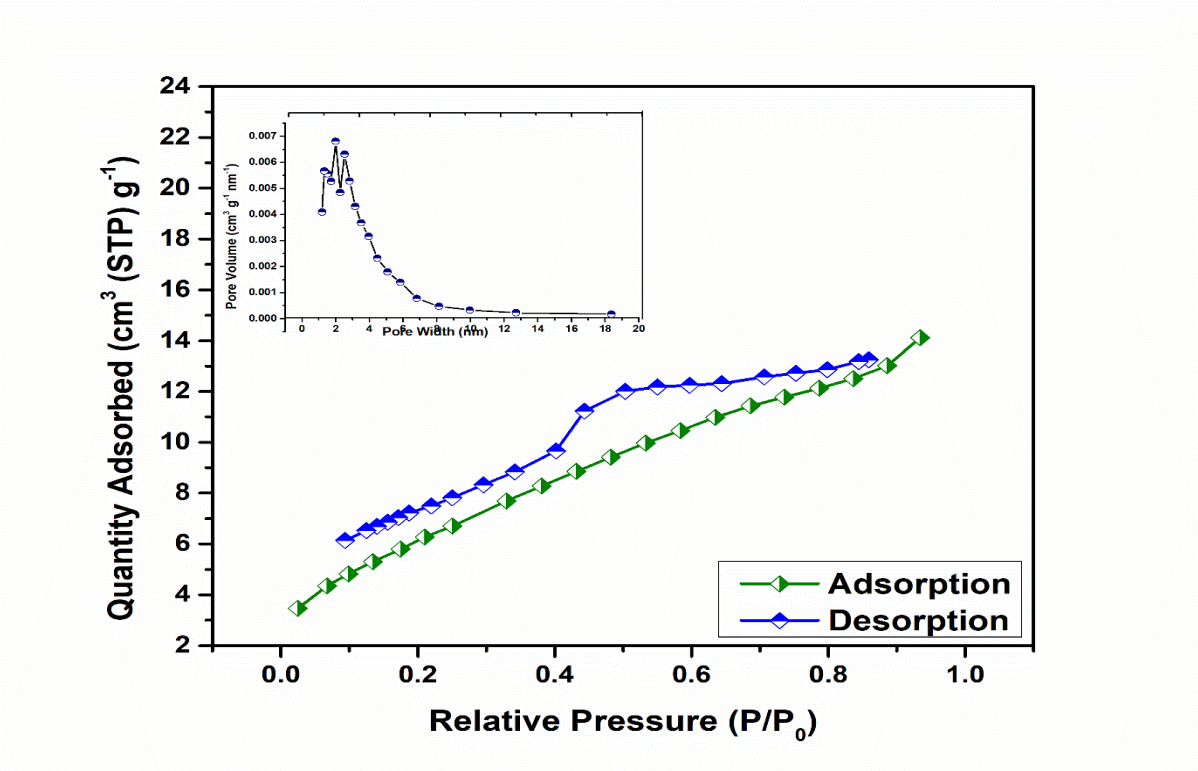

Fig. S3 N_2 adsorption-desorption isotherms and BJH pore size distribution curve (inset) for CN1 sample.

Photocatalytic activity

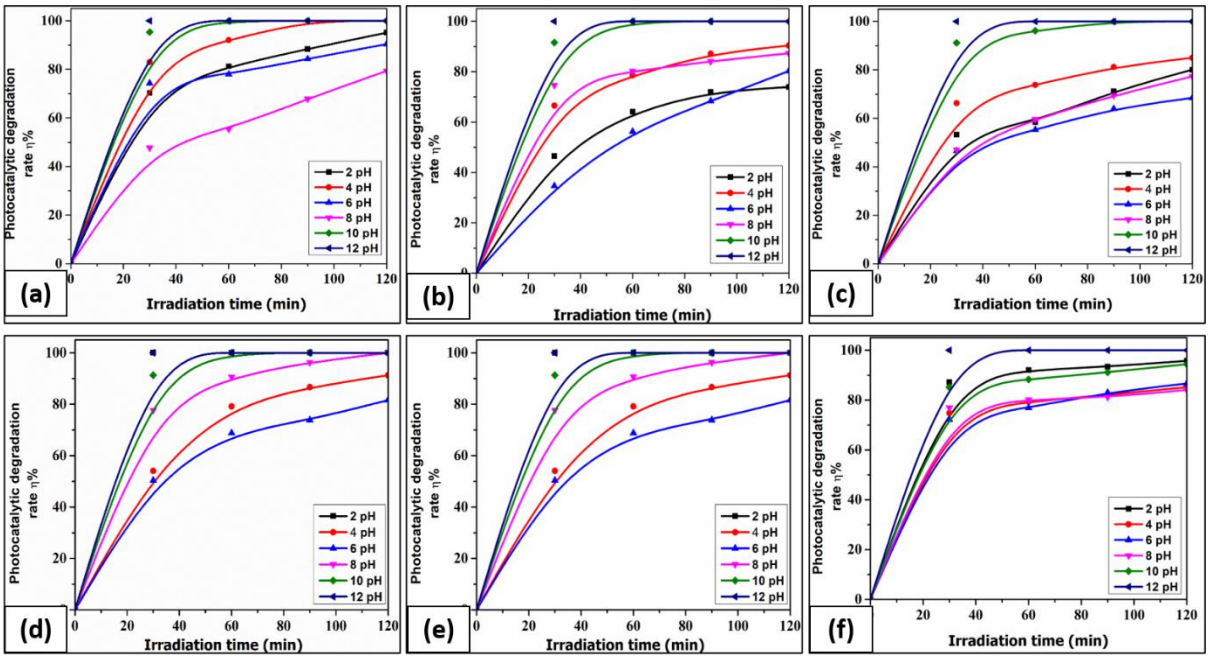

Fig. S4 Photocatalytic degradation of CV by (a) CN1 (b) CN2 (c) CN5 and MV2B by (d) CN1 (e) CN2 (f) CN5 as a function of pH

Table S1 First order parameters for CV and MV2B dyes at different catalyst concentration

	CV			**MV2B**		
CN1						
Catalyst load (mg)	R^2	k (min^{-1})	$t_{1/2}$ (min)	R^2	k (min^{-1})	$t_{1/2}$ (min)
0.5	0.99945	0.02674	25.91623	0.9489	0.01407	49.3248
1	0.98465	0.02613	26.52124	0.9841	0.00947	73.2840
2	0.99437	0.02206	31.41432	0.9092	0.00817	84.9449
3	0.99419	0.01936	35.79545	0.8694	0.00453	153.2009
CN2						
0.5	0.9272	0.01730	40.0578	0.9867	0.00987	70.2128
1	0.9952	0.00717	96.6527	0.9753	0.00927	74.7573
2	0.8387	0.00807	85.8736	0.7708	0.00897	77.2575
3	0.9872	0.00487	142.2998	0.9418	0.00657	105.4795
CN5						
0.5	0.9998	0.01593	43.5028	0.9904	0.01380	50.2174
1	0.9795	0.01200	57.7500	0.9027	0.01130	61.3274
2	0.9125	0.00900	77.0000	0.9705	0.00403	171.9603
3	0.9155	0.01020	67.9412	0.9392	0.00507	136.6864

Electrochemical performance

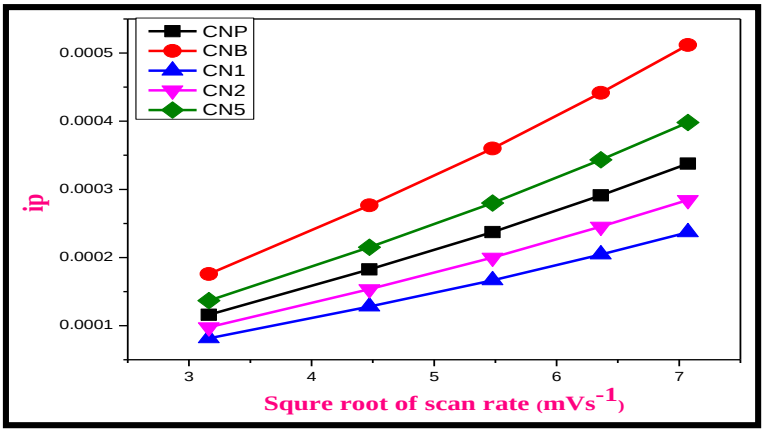

Fig. S5 Plot showing relationship between cathodic peak current and square root of scan rate

Table S2 Specific capacitance values for CN1 electrode at different scan rates using CV plot

Scan rate (mVs^{-1})	Specific capacitance (Fg^{-1})
10	362.4
20	329.3
30	302.7
40	281.8
50	258.2

The specific capacitance of CN1 electrode at different scan rates was obtained from the following equation

$$C_{sp} = \frac{S}{m \times \Delta V \times k}$$

where, S is the area under the CV curve, m is the weight of active material , ΔV is the voltage window and k is the potential scan rate.

Table S3 The diffusion co-efficient and EIS fitted circuit values

Electrode	***D*** **($cm^2\ s^{-1}$)**	**R_{ct} (Ω)**	**C_{dl} (mF)**
CNB	1.730×10^{-6}	182.26	0.95
CNP	4.022×10^{-5}	116.6	3.82
CN1	8.486×10^{-5}	69.82	6.531
CN2	6.715×10^{-5}	75.67	4.976
CN5	3.591×10^{-6}	126.34	2.36