Electronic Supplementary Material (ESI) for RSC Advances.

Supporting information for

A comparative photocatalytic activity of sol-gel derived rare earth metal (La, Nd, Sm and Dy)-doped ZnO photocatalyst for degradation of dyes

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3. Results and discussion

3.4. TGA analysis

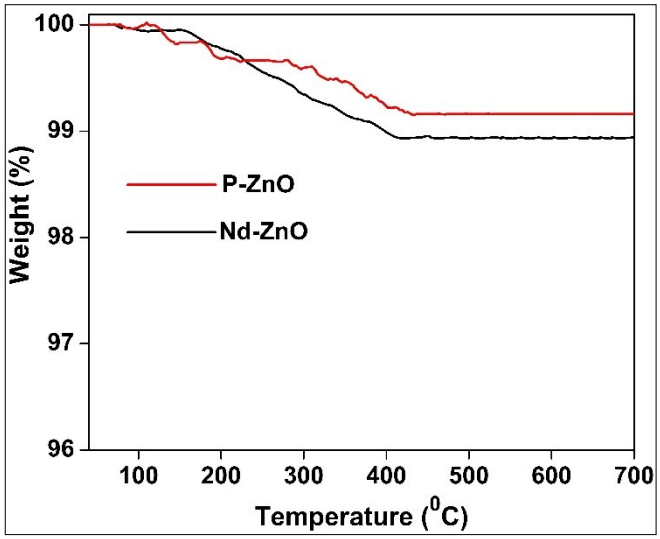

Fig. S1 Thermogravimetric analysis of P-ZnO (red-line) and Nd-ZnO (black-line).

3.6. Photocatalytic activity

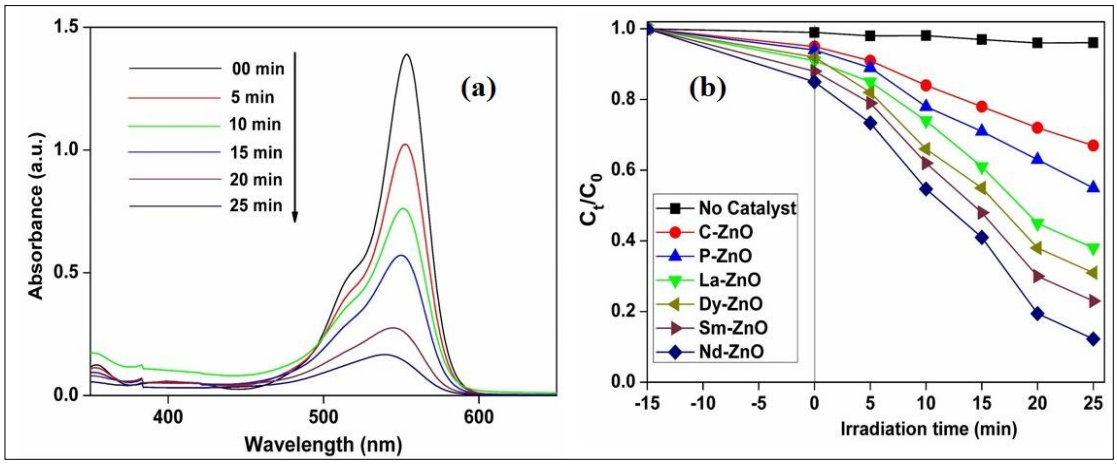

Fig. S2 Change in absorption spectra of RhB in the presence of Nd-doped ZnO (a) and change in concentration of RhB calculated by following the decrease in λ_{max} at 553 nm in the presence of different samples under UV-light irradiation (b); catalyst used 2g/L and pH=10.

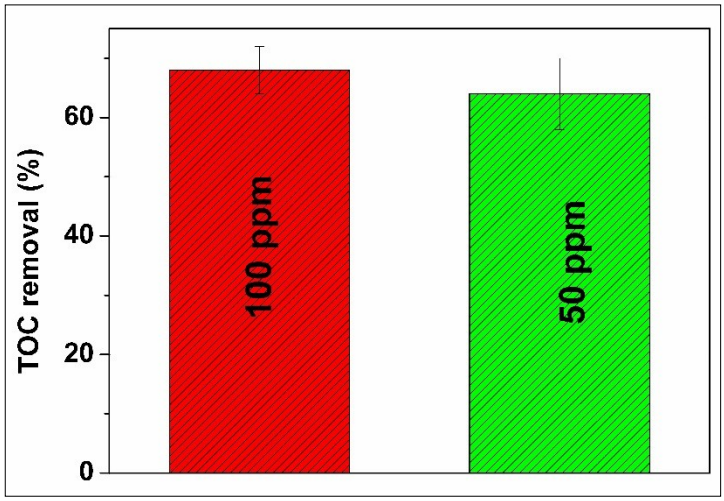

Fig. S3 TOC removal % of MB at different concentrations in the presence of Nd-ZnO; Conditions: catalyst loading = 4g/L, pH=10 and irradiation time = 180 min, Error bars correspond to standard deviation of three experiments.

3.6.1. Effect of pH on degradation of MB

The effect of pH on degradation of MB was also tested with undoped ZnO so as to compare the result with Nd-doped ZnO nanoparticles. The conditions in this experiment are similar as those reported in the case of Nd-doped ZnO nanoparticles in the main manuscript. The results reported in **Fig.** indicate that optimum pH value for MB degradation over undoped ZnO is also 10 as we observed in the case of Nd-doped ZnO nanoparticles. Low degradation efficiency was observed at acidic pH, indicating the dissolution of ZnO at low pH values. Similar results of higher degradation in alkaline medium was also reported by Kazeminezhad et al.[1]

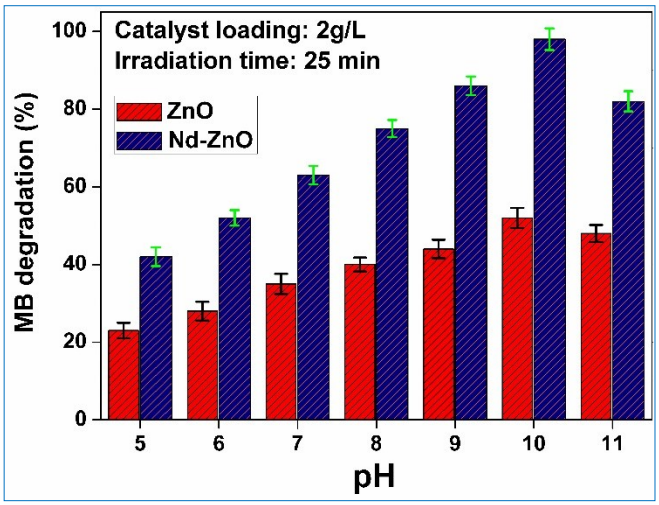

Fig. S4 Effect of reaction pH on degradation of MB in the presence of undoped and Nd-ZnO under UV-light irradiation. Error bars showing the % error in the three repeated experiments.

3.6.2. Effect of catalyst dosage on degradation of MB

The amount of catalyst during degradation of pollutants also plays the important role in enhancing the photocatalytic activity. The amount of catalyst dosage of pure ZnO over MB

degradation was studied by varying the loading content from 1 g/L to 3 g/L under UV light irradiation. It was found that 2 g/L catalyst showed the excellent photocatalytic activity towards the degradation of MB. The increase in photocatalytic activity at 2g/L is probably due to the presence of more active sites, which, in turn, facilitates the adsorption of MB on the surface. The degradation efficiency is slightly reduced beyond 2g/L.

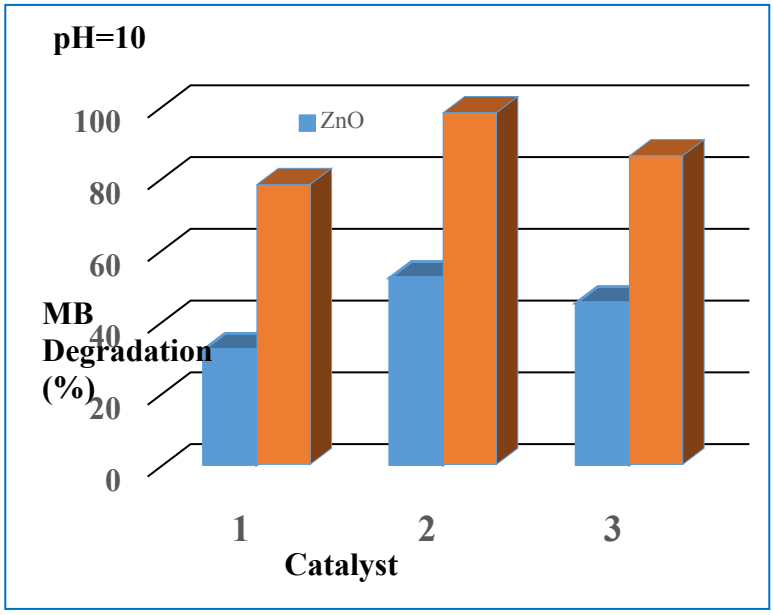

Fig. S5 Effect of catalyst loading of undoped and Nd-doped ZnO on degradation of MB.

3.6.3. Effect of initial MB concentration

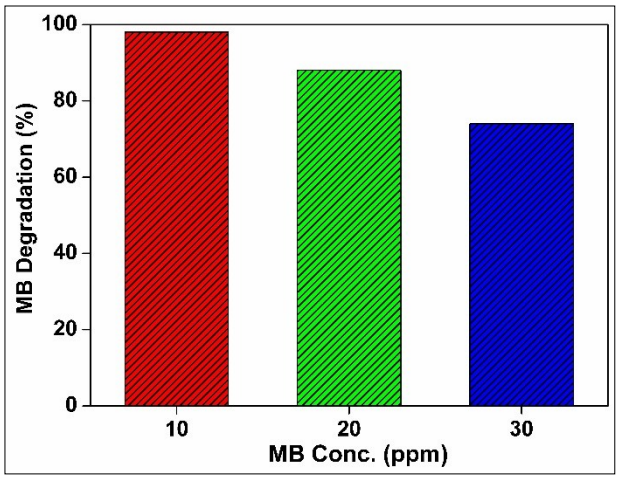

Fig. S6 Effect of initial concentration of MB on its degradation in the presence of Nd-doped ZnO nanoparticles; Conditions; catalyst dosage 2g/L, pH=10 and irradiation time=25 min.

3.6.4 Effect of oxidants on degradation of MB

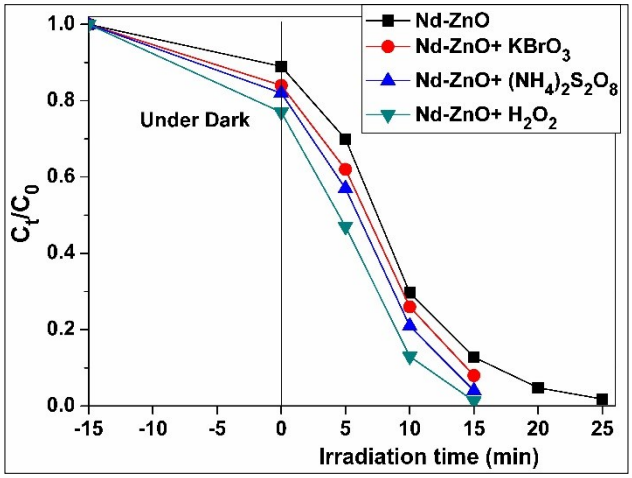

Fig. S7 Effect of oxidant on degradation of MB. Conditions; catalyst dosage 2g/L, pH=10 and MB conc. 10 ppm.

3.6.5. Effect of Inorganic anions on degradation of MB

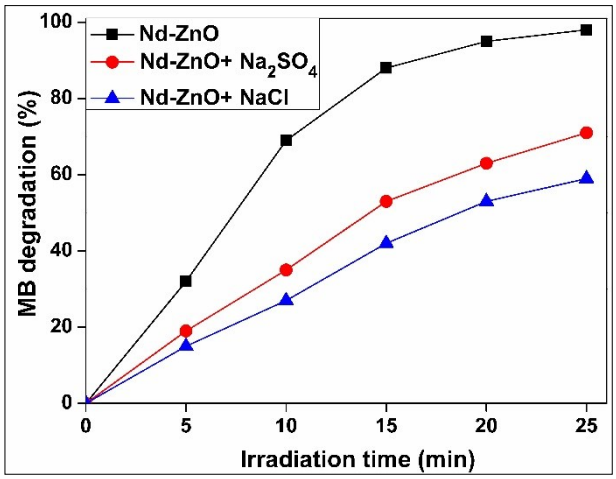

Fig. S8 Effect of inorganic anions on degradation of MB. Conditions; catalyst dosage 2g/L, pH=10 and MB conc. 10 ppm.

3.6.6. Reusability of the catalyst

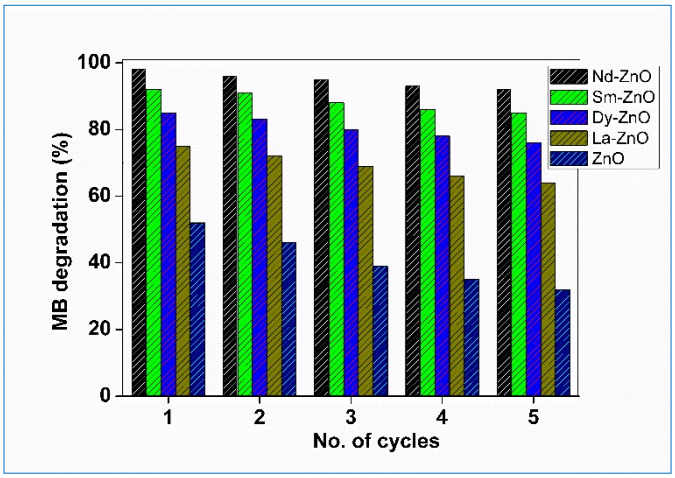

Fig. S9 Reusability test of prepared catalysts on degradation of MB under UV-light irradiation.

Table S1 Pseudo first-order rate constants of MB degradation over different samples.

Catalyst	K (min^{-1})
C-ZnO	0.018
P-ZnO	0.032
La-ZnO	0.053
Dy-ZnO	0.075
Sm-ZnO	0.099
Nd-ZnO	0.158

Reference

1 I. Kazeminezhad and A. Sadollahkhani, *J. Mater. Sci: Mater. Electron*., 2016, **27**, 4206–4215