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$\begin{array}{c cccc} Chemical & rGO: 1 mg & 10\% adsorbed and & 1.2 & 1 \\ reduction with & [MB]: 1.3 ppm & degraded at the same \\ hydrazine & Light: 100 W Hg lamp & time in 90 min \\ \hline \\ Electrochemical & rGO: 60 mg & 40\% degraded in 90 & N/A & 2 \\ exfoliation from & [MB]: 350 ppm & min after adsorption in \\ graphite electrode & Light: 15 W UV lamp & 4 hr \\ \hline \\ Chemical & rGO: 50 mg & 7\% degraded in 100 & 12276 & 3 \\ reduction with & [MB]: 15000 ppm & min after adsorption of \\ hydrazine & Light: 100 W UV lamp & 12\% in 20 min \\ \hline \\ Chemical & rGO: 20 mg & 8\% degraded in 180 & 1.5 & 4 \\ reduction with & [MB]: 3.2 ppm & min after adsorption of \\ hydrazine & Light: Sunlight & 50\% in 60 min \\ \hline \\ Microwave & rGO: 10 mg & 19\% degraded in 150 & 8 & 5 \\ irradiation & [MB]: 10 ppm & min after adsorption of \\ Light: 250 W Hg lamp & 1% in 30 min \\ \hline \\ Photochemical & rGO: 10 mg & 35\% adsorbed and & 6.5 & 6 \\ reduction & [MB]: 10 ppm & degraded at the same \\ & Light: UV lamp & time in 120 min \\ \hline \\ Photochemical & rGO: 10 mg & 30\% adsorbed and & 7 & 6 \\ reduction & [MB]: 10 ppm & degraded at the same \\ & Light: 300 W Xe lamp & time in 120 min \\ \hline \\ Photochemical & rGO: 60 mg & 99\% degraded in 6 hr & 0.1 & This \\ without toxic & [MB]: 50 ppm & after adsorption of \\ & uight: 95 W UV lamp & 87\% in 4 hr \\ & (x 2) & \end{array}$		conditions		[MB] (ppm)	
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Table S1. Adsorption and photocatalytic degradation of MB dye by rGO.



Fig. S1 EDX elemental analysis of GO, rGO-80, rGO-120, rGO-160 and rGO-180.



Fig. S2 (A) Removal of MB dye in the absence of photocatalyst (B) Time-dependent UV-Vis absorption spectra of MB dye in the absence of photocatalyst ([MB] = 50 ppm; light intensity $= 60 \text{ W} \cdot \text{m}^{-2}$; pH = 6).



Fig. S3 Dark adsorption of MB dye by GO, rGO-80, rGO-120, rGO-160 and rGO-180 (catalyst loading = 20 mg; [MB] = 50 ppm; light intensity = $60 \text{ W} \cdot \text{m}^{-2}$; pH = 6).



Fig. S4 Dark adsorption of MB dye by 10 mg, 20 mg, 30 mg, 40 mg, 50 mg, 60 mg and 70 mg of rGO-160 ([MB] = 50 ppm; light intensity = $60 \text{ W} \cdot \text{m}^{-2}$; pH = 6).



Fig. S5 Dark adsorption of MB dye by rGO-160 in 50 ppm, 75 ppm, 100 ppm and 125 ppm of MB solution (catalyst loading = 60 mg; light intensity = 60 W·m⁻²; pH = 6).



Fig. S6 Dark adsorption of MB dye by rGO-160 at pH 3, 6 and 11 of MB solution (catalyst loading = 60 mg; [MB] = 50 ppm; light intensity = 60 W·m⁻²).



Fig. S7 Time-dependent UV-Vis absorption spectra for the photocatalytic degradation of MB dye from time, t= 0 to t=6, by different photocatalysts, where (A) GO, (B) rGO-80, (C) rGO-120, (D) rGO-160, and (E) rGO-180. (catalyst loading = 20 mg; [MB] = 50 ppm; light intensity = 60 W·m⁻²; pH = 6).



Fig. S8 Time-dependent UV-Vis absorption spectra for the photocatalytic degradation of MB dye from time, t= 0 to t=6, by rGO-160 with different catalyst loading, where (A) 10 mg, (B) 20 mg, (C) 30 mg, (D) 40 mg, (E) 50 mg, (F) 60 mg, and (G) 70 mg. ([MB] = 50 ppm; light intensity = 60 W·m⁻²; pH = 6).



Fig. S9 Time-dependent UV-Vis absorption spectra for the photocatalytic degradation of MB dye from time, t= 0 to t=6, by rGO-160 with different initial MB concentration, where (A) 50 ppm, (B) 75 ppm, (C) 100 ppm, and (D) 125 ppm. (catalyst loading = 60 mg; light intensity = $60 \text{ W} \cdot \text{m}^{-2}$; pH = 6).



Fig. S10 Time-dependent UV-Vis absorption spectra for the photocatalytic degradation of MB dye from time, t= 0 to t=6, by rGO-160 with different light intensity, where (A) 30 W·m⁻² and (B) 60 W·m⁻² (catalyst loading = 60 mg; [MB] = 50 ppm; pH = 6).



Fig. S11 Time-dependent UV-Vis absorption spectra for the photocatalytic degradation of MB dye from time, t= 0 to t=6, by rGO-160 at different pH, where (A) pH 3, (B) pH 6, and (C) pH 11 (catalyst loading = 60 mg; [MB] = 50 ppm; light intensity = 60 W·m⁻²).

References

- 1. S. Chandra, P. Das, S. Bag, R. Bhar and P. Pramanik, *Mater. Sci. Eng. B*, 2012, **177**, 855-861.
- 2. Y. Zhao, X. Wei, Y. Wang and F. Luo, Chem. Phys. Lett., 2014, 607, 34-38.
- 3. S. Xu, L. Fu, T. S. H. Pham, A. Yu, F. Han and L. Chen, *Ceram. Int.*, 2015, **41**, 4007-4013.
- 4. J. Kaur, K. Anand, R. Thangaraj and R. Singh, *Indian J. Phys.*, 2016, **90**, 1183-1194.
- 5. M. J. S. Mohamed and D. K. Bhat, AIMS Mater. Sci., 2017, 4, 158-171.
- 6. B. Xue and Y. Zou, J. Colloid Interface Sci., 2018, **529**, 306-313.