SYNTHESIS OF GRAPHENE OXIDE FOR TEXTILE DYE DEGRADATION UNDER VARIOUS PHOTO CATALYTIC CONDITIONS

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ABSTRACT
Dyeing industry consumes large quantities of water and produces large volumes of wastewater from different steps in the dyeing and finishing processes. The effluent discharged from this sector is a cause of major environmental pollution. In the present study Graphene-Oxide was synthesized and its photocatalytic performance was evaluated for de-colorization of Methylene Blue (MB) dye under sunlight and ultra-violate light condition.

Key Words: Wastewater, Methylene Blue, Graphene-Oxide, Photocatalytic Degredation.

1. INTRODUCTION
Textile is one of the fastest growing industries in Bangladesh. The polluted effluent discharged from this sector into sewage or neighboring water receiving bodies is a cause of major environmental and health concern.Advanced technologies for wastewater treatment are required to eliminate pollution and may also increase pollutant destruction or separation processes, such as advanced oxidation methods (catalytic and photo catalytic oxidation), chemical precipitation, adsorption on various media, etc.It has been observed that, nanoparticles or nano-composites with their high surface area and catalytic activity are most effective in this regard [1].Graphene, also called as 'super carbon', [2] has many unique properties including large specific surface area (2630 m^2g^{-1}) [3]. and excellent chemical stability.In the present study, Methylene Blue was selected as a model organic pollutant and its photocatalytic degradation was studied in the presence of Graphene-Oxide under sunlight and UV light.

2. MATERIAL AND METHOD
The chemicals and reagents used in this work were all of analytical grade and were used without further purification. Modified Hummer's method was used to synthesize GO nano-particles [4].The surface morphology of the GO samples was observed with FESEM-JEOL (FEG-XL 30S).The photo degradations experiments were carried out with GO nano-particles to degrade MB under sunlight and UV light. The sample suspension was formed by adding varying amounts of GO to 100 ml of aqueous solution containing MB. Before photoreaction, the suspension was magnetically stirred in the dark for half an hour to establish an adsorption desorption equilibrium. The various aqueous suspensions were illuminated by UV and solar light. The absorbance spectrum in each experiment was determined from 200 to 800 nm with a UV-Visible Spectrophotometer (Shimadzu-UV-1601) and the degradation of MB was monitored by recording the absorbance at λ_{max} 664 as a function of illumination time. The photo-degradation efficiency of MB was determined by using the equation shown below:
Photo-degradation efficiency (%)= $[(C_0 - C_t) / C_0] \times 100\% = [(A_0 - A_t) / A_0] \times 100\%$,where, C_0 is the initial concentration of MB, C_t is the concentration of MB at time t and A_0 is the initial absorbance of MB, A_t is the absorbance of MB at time t. The experimental flow chart of MB photo degradation is shown in figure 1.

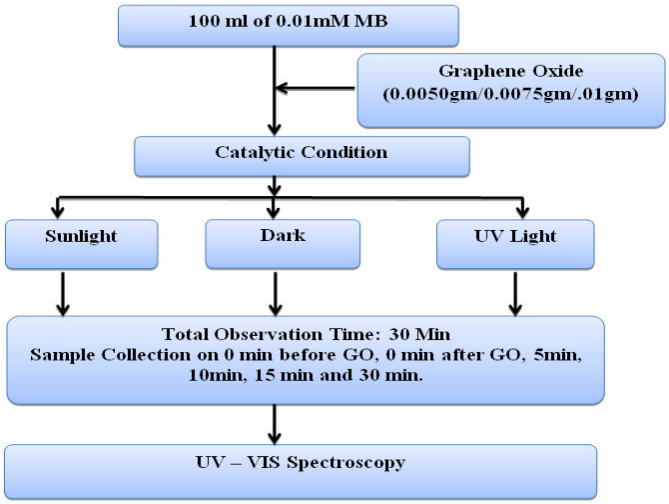

Figure 1. Experimental flow chart of MB photo degradation under Sunlight / UV Light using 0.0050 gm/ 0.0075 gm / 0.01 gm of GO.

3. Experimental results and discussion

From the SEM micrograph shown in figure 2. It can be observed that Graphene Oxide has layered structure, which affords ultrathin and homogeneous Graphene films. A series of experiments were performed to examine the effect of the GO content and light source.

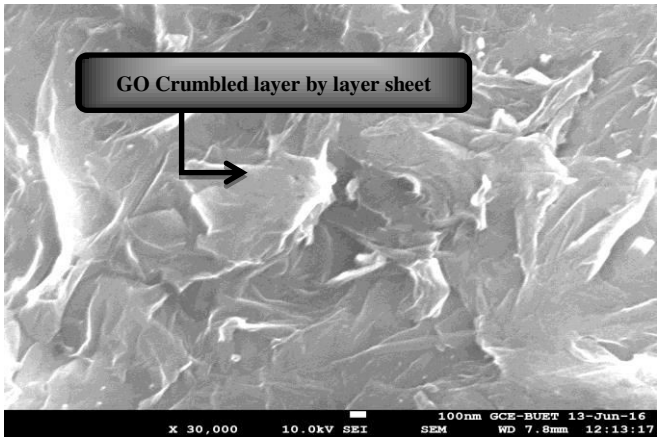

Figure 2. Morphological SEM pictures of GO.

The photo decomposition curves of MB under various reaction conditions are shown in figure 3. It can be seen that the photodecomposition of MB is greater under UV than sunlight.

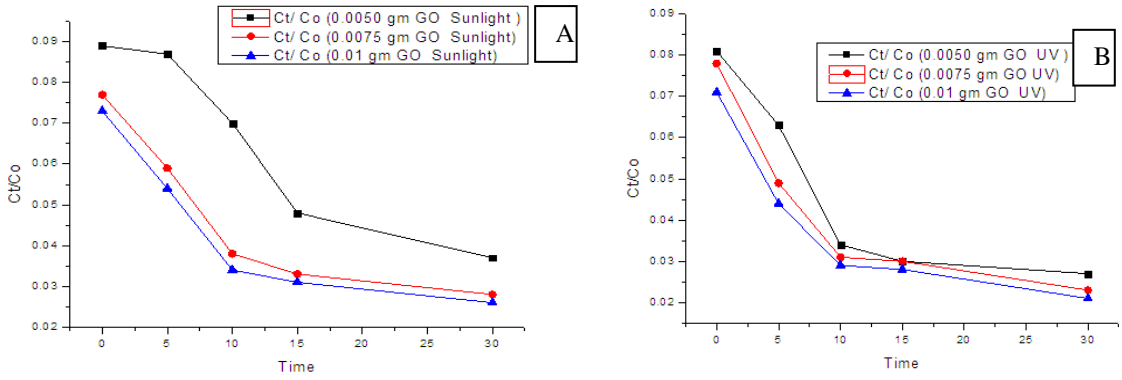

Figure 3. Decolorization of 0.01mM MB with 0.0050 gm /0.0075gm /0.01gm Graphene-Oxide (GO) under (A) Sunlight and (B) UV light.

The photo-degradation efficiency of MB under solar and UV light are shown in figure 4.It can be seen that the photo decomposition efficiency of MB varies with varying amounts of GO. Increasing amount of GO also increase photo degradation efficiency and vice versa.

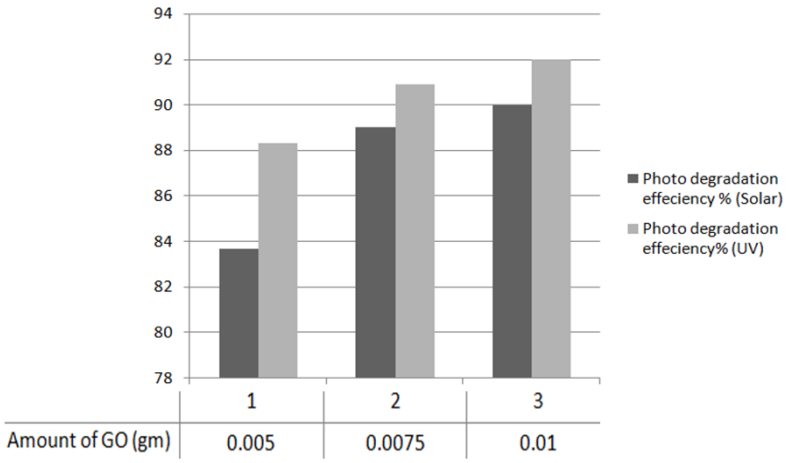

Figure 4. Photo-degradation efficiency of MB under Sunlight and UV light using 0.0050 gm / 0.0075gm /0.01gm Graphene-Oxide (GO).

4. Conclusion

The photo decomposition behavior of Methylene Blue (MB) was investigated using Graphene- Oxide (GO) under sunlight and UV-light condition. UV-light condition gives better degradation (up to 92 %) than sunlight.From the study it also can be said that increasing the amount of GO shows better degradation.

5. REFERENCES

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