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Application of immobilized photocatalyst for the degradation of Textile waste water

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Abstract
This paper summarizes the degradation of textile waste water by the immobilized photocatalytic treatment. The percentage degradation is measured for the different concentration of dye-water synthetic waste water solution.

Keywords–wastewater, photocatalyst, azo dyes, textile industry.

1. INTRODUCTION
Textile industry is one of the most important and rapidly developing industrial sectors in various parts of the world. It has a major environmental impact, since it consumes considerably high amounts of processed water and it discharges highly polluted water in large amounts. Textile mills are trying to control their discharge and therefore have started installing treatment plants. For the treatment of textile industry wastewater, Biological treatment, Chemical treatment and combinations of these are used. Plants utilizing biological treatment rather than chemical processes claim that their preference is due to less excess sludge production, lower operational costs and better COD removal in biological treatment. Sewage treatment, or domestic wastewater treatment, is the process of removing contaminants from wastewater and household sewage, both runoff (effluents) and domestic. It includes physical, chemical, and biological processes to remove physical, chemical and biological contaminants. Its objective is to produce a waste stream (or treated effluent) and a solid waste or sludge suitable for discharge or reuse back into the environment.

2. MATERIALS AND METHODS

2.1. Wastewater samples
The effluent was synthesized by using appropriate amount of azo dye in water and making the solution of 1,2,3,4,6,8,10 ppm.

Fig No.1Untreated sample

2.2. Wastewater treatment by using Photocatalytic treatment method

The photocatalytic treatment includes the application of immobilized photo catalyst for the degradation of industrial waste water. In this process the immobilized reactor is used for the experiment on which photocatalyst coating is done and the experiment is performed in the presence of sunlight. The experiment is done in different sets with different concentration of azo dyes.

2.3.Setup:

Fig No.2Experimental set up for photocatalytic treatment

Components of experiment set-up:-

- Photocatalytic reactor (Capacity→ 5-8L)
- Azo Dye (100gm)
- Photocatalyst (100gm)-Aeroxide

Experiment is carried out by preparing an experimental set up as shown above that includes a Photocatalytic reactor and a recycle system. Catalyst loading is done on the surface of Photocatalytic reactor with a photocatalyst named as Aeroxide.The solution is prepared of different concentration of azo dyes i.e. 1, 2, 3,4,6,8 and10 ppm.The solution in the reactor is recycled in the presence of sunlight for about 4 hours.After every 60 minutes some amount of the processed sample is taken out.COD analysis is done for the respective processed samples. Initial data and the final analysed data are compared for analysingpercentage degradation

2.4. Analytical methods:

The waste water samples are collected in the fixed time interval of 60 min. and COD analysis is done in order to analyse the change in COD with respect to time. The COD analysis is done and it is observed that the COD of the wastewater sample reduces with time and overall degradation percentage decreases as the concentration of dye in water is increased.

Below table shows the COD(mg/l) readings for1,2,3,4,6,8 and 10 ppm.at fixed time interval of 60 min.

Time(min)	1 ppm	2 ppm	3ppm	4 ppm	6 ppm	8 ppm	10 ppm
0	869.4	960	1012	1217	1748	2141	2302.4
60	762	840	902.4	1019.2	1321.4	1920	1869
120	588	702	780	890	980	1240	1514.6
180	250	309	401	502.4	540	920	1102.9

Table 1

3. RESULTS AND DISCUSSION

3.1. The below graph shows the percentage degradation at the time interval of 60min. at 1,2,3,4,6,8 and 10 ppm.From the below graph it is observed that maximum degradation in each set of experiment, takes place within time interval, 120-180 min i.e. after 2 hours.

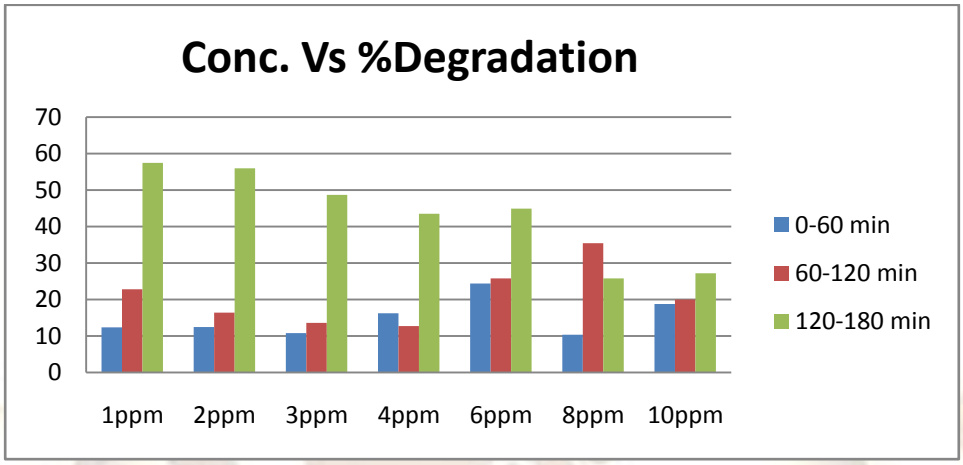

Fig No.3

3.2. The below graph shows the overall degradation percentage in 4h at 1,2,3,4,6,8and 10ppm.From the below graph it is observed that the overall degradation percentage decreases as the concentration of dyes in water increases.

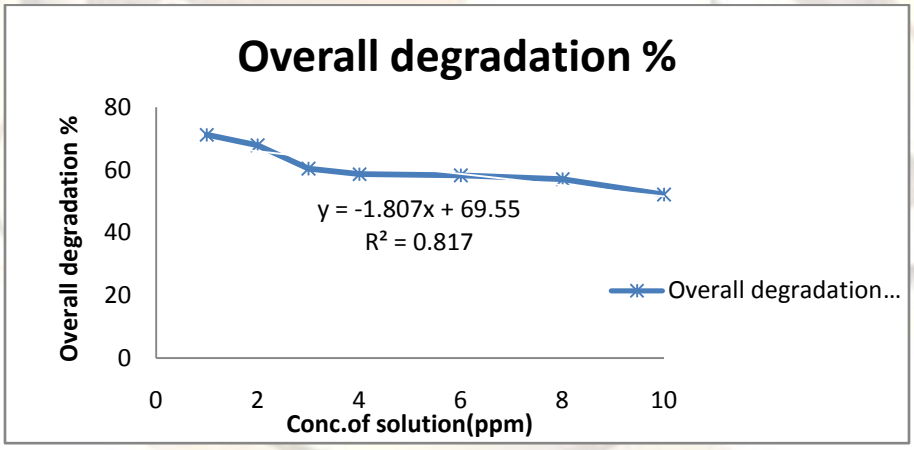

Fig No.4

3.3. The below graph shows the COD reduction with respect to time(min.) for 1,2 and 3ppm .From the below graph it is observed that COD of the processed samples decreases with time and the rate of COD reduction decreases as the concentration of azo dye in water increases.

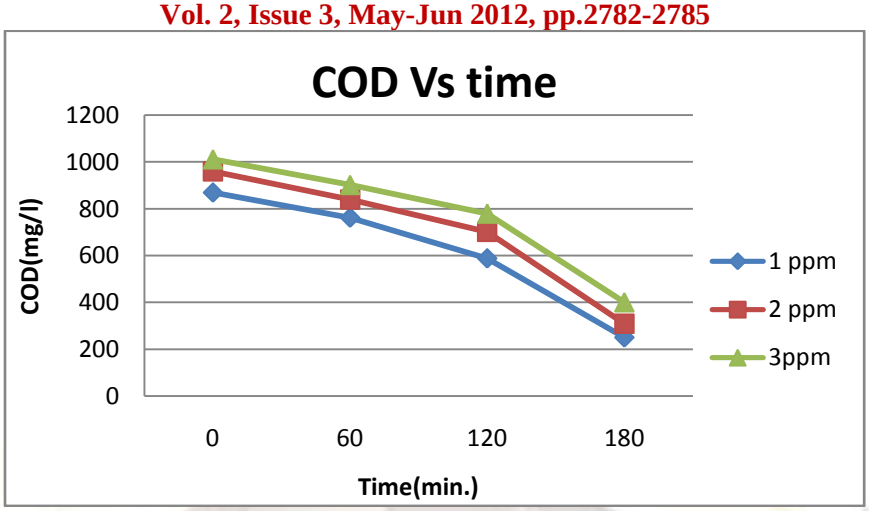

Fig No.5

4. CONCLUSIONS

This paper concludes that the overall degradation percentage of azo dyes in textile wastewater by Photocatalytic treatment on using Aeroxide as catalyst is 61%.

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