International Journal of Scientific Engineering and Research (IJSER)
ISSN (Online): 2347-3878
Impact Factor (2020): 6.733

Assessment of Treatibility of Textile Waste Water by using Titanium Dioxide (TiO_2) Nanomaterial

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Abstract: ***The textile industry requires a huge quantity of fresh water for different processes carried out in an industry which leads to generating a large quantity of wastewater. This wastewater contains dyes, chemicals, and other things. This wastewater needed to treat properly before being discharged into the environment or may cause harmful effects on the Environment directly or indirectly. Though we have some Physiochemcial, and biological processes to treat wastewater we need to find other alternatives. Various Researcher work has been carried out on removing the color of dyestuffs using the Photocatalysis process. Many photocatalysts have been used in treating textile wastewater in which titanium dioxide shows promising results titanium dioxide was used with another photocatalyst to treat. Some research work shows that titanium dioxide shows in reducing other parameters such as COD, BOD, and other parameters. The purpose of this research work Titanium dioxide helps reduce COD parameters and find the optimum dose and optimum time for Textile wastewater using Titanium dioxide as a photocatalyst alone under an artificially provided Ultraviolet ray's tube.***

Keywords: Titanium dioxide, Photocatalysis, Ultraviolet rays, chemical oxygen demand

1. Introduction

Textile industry is vast and fast growing industry in world. it is also one of the pollution creating industry in world. Textile industry requires large quantity of fresh water for there different processes carried out in industry which leads to Generates large quantity of waste water discharge. This discharge comprises of various dyes and chemicals which are harmful if discharge into the Environment [4].

The discharge of colored wastewater into the environment is highly undesirable, not only due to its visual impact but also because of the potential harm caused by the breakdown products [1]. This can lead to esthetic pollution, eutrophication, and disruptions in aquatic ecosystems. The textile industry's effluent contains harmful chemicals, such as dyes, which can be toxic, carcinogenic, mutagenic, or teratogenic to a variety of aquatic organisms and fish species. To keep up with rapidly changing customer demands [1]. The textile dyeing and finishing industries employ a variety of dyestuffs. Various physio-chemical and biological treatments are used for treatmne for textile waste water with some drawbacks [2].

New developed technology Advanced oxidation process is used for treating water and waste water experiments are carried. It can be used for removing color in textile waste water. Some researchers also predict that it can be used for reduce other parameters. Different types of photocatalyst were used in which Titanium dioxide shows promising results. Tio2 is easily available, low cost, high oxidation strengths etc [2]. Many researcher work on removing dyestuffs or color but some researcher works shows that COD, BODand other parameters can be reduce. We gone find out it regarding COD is reduced then we gone check for maximum efficiency.

Find its optimum dose and time for titanium dioxide.

2. Literature Review

From the Literature review, it was found that, the photocatalysis process can effectively treat the Textile waste water. Various experimentations have been done on textile waste water treatment by photocatalysis process. During this experimentation, many researchers have focused on removal of Dye from textile waste water by using photocatalysis process. The focus has been made in color and turbidity removal **[**4]. Very few researchers have focused on the overall treatment of textile waste water. In this research work, the overall treatment for textile waste water is focused. The treatment performance is checked by observing the removal efficiencies of waste water parameters such as BOD, COD, and Turbidity.

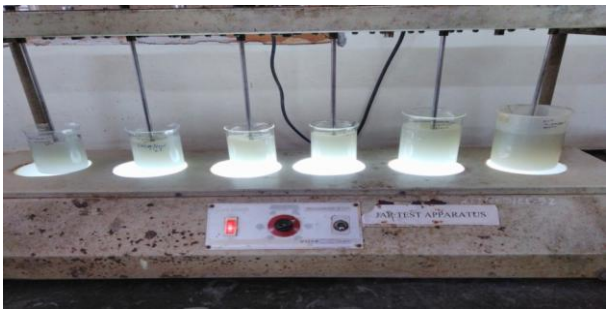
With the reference to literature review most of the research work carried out using titanium dioxide in exposure to the UV light or Sun light in different way such as coating, or mixing with other photocatalysis, etc. we gone use only use titanium dioxide photocatalyst in closed box exposed to UV light with some dose and exposure time. Present study is to check treatability of titanium dioxide.

3. Materials and Methodology

- Waste water-samples are collected from the textile industry in Kolhapur after primary treatment.
- Titanium dioxide-Titanium dioxide is taken in powder form as making it easy to use.
- Ultraviolet tube-UV light is used for Photocatalysis process. This tube is attached to closed rectangular box so UV rays should not be come outside and Avoid contact with Skin as UV rays carcinogenic if exposed for long time.
- Magnetic stirrer-magnetic Stirrer is used to mix the Titanum dioxide uniformly distributed in the beaker.

Samples are collected are taken into 500 ml beaker. Samples are mixed with different dosage of titanium dioxide such 0.2g, 0.4g, 0.6g upto 1.6g per 500ml textile waste water and making solutions. Then this solution is mixed with magnetic stirrer at uniform speed so that powder should be uniformly distriburted in beaker. This beaker is kept in closed rectanglu-

lar box with UV light in it exposing for 24 hr and 48 hr to undergo Photocataylatic process. When the process is completed then supernatant of textile waste water is collected then taken for test Chemcial Oxygen demand (COD).



Mixing of TiO2 powder

Samples kept under UV box for UV light exposure

Titanium dioxide powder

4. Results & Discussions

With increase in dose the COD removal increase but after some point it start increasing slightly. Initial cod of Textile waste water waste was 2320mg/lit to 400mg/lit for 1.4g/500 ml for 24 hour with efficiency of 82% and for 48 hour exposure 1.2g/500ml shows maximum efficiency of 79% with COD reduce to 480mg/lit.

For second sample collected initial COD of Textilewaste water was 1640 mg/lit. For 24 hr exposure COD get reduce to 320mg/lit for 1.4g/500ml with 80% efficiency. In case of 48 hour exposure 1.2g/500ml shows maximum efficiency of 75% COD reduce to 400mg/lit.

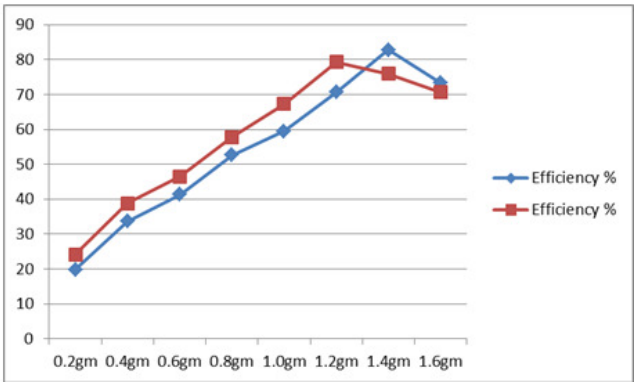
For third sample collected from Textile industry initial COD

Is 1300mg/lit after 24 hr exposure 1.4g/500ml to COD 300mg/lit Shows maxmum efficiency of 76% and for 48 hour exposure at 1.2g/500ml shows maximum efficiency of 75% cod reduce to 320mg/lit.

5. Table, Graph, and Image

- Textile waste water intial COD-2320 mg/lit

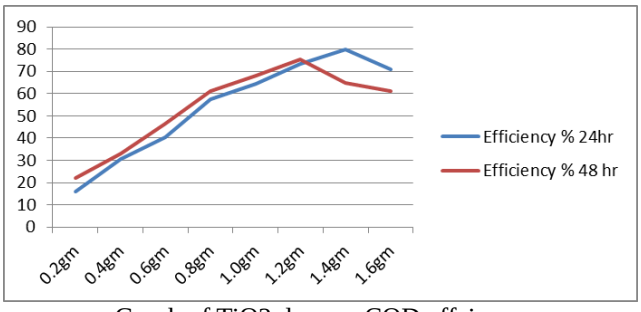
Dosage	24 hr	Efficiency%	48 hr	Efficiency%
0.2gm	1820	19.82	1760	24.10
0.4gm	1540	33.62	1420	38.79
0.6gm	1360	41.37	1240	46.55
0.8gm	1100	52.56	980	57.75
1.0gm	940	59.48	760	67.24
1.2gm	680	70.68	480	79.23
1.4gm	400	82.75	560	75.86
1.6gm	640	73.27	680	70.68



Graph of TiO2 dose Vs COD efficiency

2] Intial COD of textile waste water-1640mg/lit

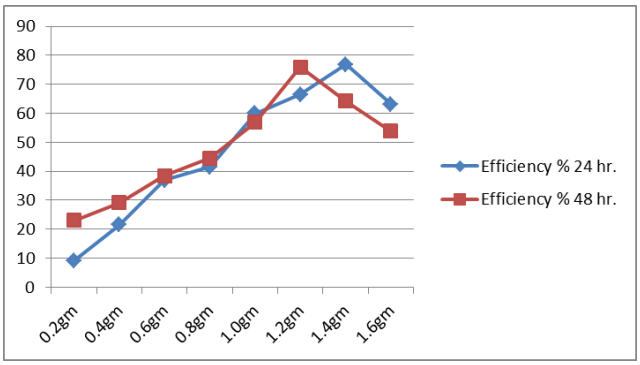
Dosage Gram	24 hr.	Efficiency 24%	48 hr.	Efficiency 48 %
0.2gm	1380	15.85	1280	21.95
0.4gm	1140	30.48	1100	32.92
0.6gm	940	40.24	880	46.34
0.8gm	700	57.31	640	60.97
1.0gm	580	64.43	520	68.24
1.2gm	440	73.17	400	75.60
1.4gm	320	80.04	580	64.63
1.6gm	480	70.73	640	60.97



Graph of TiO2 dose vs COD effciency

3] Intial COD of textile waste water-1300 mg/lit

Dosage Gram	24 hr.	Efficiency % 24 hr.	48 hr.	Efficiency % 48 hr.
0.2gm	1180	9.2	1000	23.07
0.4gm	1020	21.53	920	29.23
0.6gm	820	36.92	800	38.46
0.8gm	760	41.53	720	44.61
1.0gm	560	60	560	56.92
1.2gm	440	66.53	320	75.92
1.4gm	300	76.92	460	64.16
1.6gm	480	63.07	600	53.84



Graph of TiO2 dose vs COD efficiency

6. Conclusion

From observation it is seen that Titanium dioxide shows reduction in COD of Textile industry waste water. For different dosages of TiO2 the COD goes on decreasing up to certain value & again if dosage is increased beyond certain limits the COD of wastewater was increasing. Also the TSS increase in dosage up to certain extent. Observations shows that COD removal efficiency of TiO2 at 1.4gm/500ml shows up to 75-85% for 24 hours and also shows at 1.2mg/500ml efficiency is between 70-80% for 48 hours. Hence better results can be obtained at time duration of 24 hours with dosage of 1.4mg/500ml of waste water. We need carry out more experiments and to maximum benefits and less harmful solution. TiO2 has been found to be effective in removing certain pollutants, such as dyes and organic compounds, but it may not be able to remove all types of pollutants present in textile wastewater. TiO2 requires a certain level of light intensity to be effective, which may not be possible in all treatment environments. Treatment of textile wastewater using TiO2 is cost effective and promising technology for treating textile wastewater, but it has some limitations that need to be considered when implementing it as a treatment method.

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