TREATMENT OF PHARMACEUTICAL WASTEWATER BY UV/NaOCl

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ABSTRACT: Pharmaceutical industry is growing with a fast pace which causes environmental pollution on a serious note. Advanced oxidation processes (AOPs) are one of the best methods to treat wastewater of pharmaceutical industries. In the present work, UV/NaOCl (UV/sodium hypochlorite) advanced oxidation process is studied for treatment of pharmaceutical wastewater at laboratory scale. Reactor having two UV lamp of 6W each was used. The experimental results showed that the removal efficiency of COD was 53.3% and the optimized pH was 3.5. The efficiency to remove COD was studied from 0 to 90 mins.

***Keywords*:** Advanced oxidation process, COD, Pharmaceutical wastewater, UV/NaOCl

1. INTRODUCTION

At present the developing worry in condition is the nearness of pharmaceutical mixes. They have numerous unfriendly consequences for living beings. The treatment for pharmaceutical wastewater is troublesome as there are distinctive assortments of items accessible in assembling forms. Regular treatment is hard to regard pharmaceutical wastewater as its waste structure is unpredictable. Some integral strategies ought to be utilized to treat such kind of wastewater with the goal that poisons are evacuated proficiently and one can release wastewater into condition or can be utilized again for different purposes. Pharmaceutical wastewater contains incorporated natural issues which are competent for debasement.

Following are the wellspring of pharmaceutical wastewater which are moved in water and soil :

- The treatment plant of civil sewage
- The gushing from assembling plants
- Farms of creature
- Treatment plants of emergency clinic squander

A different operation produces different kind of products which results in various kind of wastewater in batch process. For example, ketoprofen, gemfibrozil, clofibric corrosive, diclofenac, fenoprofen, carbamazepine, carbamide, flurbiprofen and so on. These all are from various classes of pharmaceutical.

Complete treatment of pharmaceutical wastewater is beyond the realm of imagination. The utilization propelled treatment can lessen the impacts of wastewater in condition. Propelled oxidation forms (AOPs) are a standout amongst the best treatment techniques to treat diverse wastewater. It very well may be utilized to treat wastewater of pharmaceutical too. There are two phases in AOPs: 1) Strong oxidant's arrangement (hydroxyl gathering) and 2) The oxidants respond with natural contaminants in water. AOPs are characterized as: "Close encompassing temperature and weight water treatment forms which include the age of hydroxyl radicals in adequate amount to impact water sanitization". There are numerous AOPs: UV/O_3, UV/H_2O_2, Fenton's procedure, $UV/H_2O_2/O_3$, UV/TiO_2, Photo Fenton, $UV/TiO_2/H_2O_2$ and so forth.

By and large, pharmaceutical wastewater is mind boggling in nature. They contain high natural fixation and salts are additionally present in huge sum. It additionally has microbial harmfulness. Every one of these attributes of pharmaceutical wastewater makes it troublesome for debasement. Diverse ww is created as there are distinctive crude materials and assembling forms. Generally, bunch process is utilized for assembling pharmaceutical items.

COD (mg/l)	BOD_5 (mg/l)	TN (mg/l)	TP (mg/l)	SS (mg/l)	pH
1000-10000	500-2500	500-1500	50-250	200-500	1-8

Table 1**:** Common pharmaceutical wastewater properties

(Ref: Y Guo, P S Qi and Y Z Liu "*A Review on Advanced Treatment of Pharmaceutical Wastewater" Earth and Environmental Science 63,012025*, 2017)

2. EXPERIMENTAL

For this examination a reactor was made comprising 2 UV lights of 6W each. A magnetic stirrer was utilized for stirring. Speed was set to 500 rpm. Before beginning the procedure the pH of the wastewater was changed in accordance with 2, 2.5, 3, 3.5 and 4 by including 1N NaOH as NaOCl can work proficiently in acidic pH. The NaOCl was 8% v/v in concentration. At that point different measurements of NaOCl were added to from 2 ml/L to 16 ml/L for the enhancement of the NaOCl dose. At that point different execution of the analyses were finished keeping pH fixed with changing portions and the other way around that is keeping measurements fixed with fluctuating pH. For example, the pH of wastewater was changed in accordance with 2.5 and 2 ml/L of NaOCl was fixed. 500 ml of sample was taken and depicted doses of NaOCl were added. Treated samples were taken after at regular intervals and afterward COD was estimated. Moreover the investigations were done at 2, 3, 3.5 and 4 pH. pH was fixed at 3.5. After that diverse NaOCl portions were tried and ideal measurements were discovered to be 10 ml/L.

3 RESULT AND DISCUSSION

Distinctive sets depicted above were tried and the accompanying outcomes were found. COD evacuation was found upto 53.3%. Here are demonstrated the after effects of the ideal state of NaOCl portion, pH and time.

Table 2 Results ar NaOCl = 8 ml/L and pH = 3.5

Sr. No.	Time (min)	COD of Raw sample (mg/l)	COD of Treated sample (mg/l)	% Removal of COD
1.	0	48000	48000	0
2.	15	48000	44800	6.7
3.	30	48000	36800	23.3
4.	45	48000	35200	26.7
5.	60	48000	30400	36.7
6.	75	48000	28800	40
7.	90	48000	28800	40

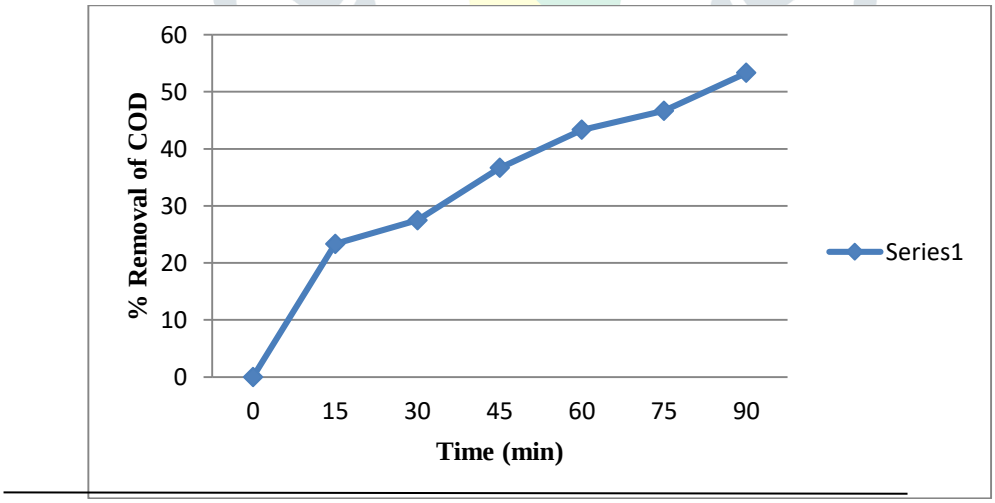

Figure : 1 Results ar NaOCl = 8 ml/L and pH = 3.5

Table 3 Results at NaOCl= 10 ml/L and pH 3.5

Sr. No.	Time (min)	COD of Raw sample (mg/l)	COD of Treated sample (mg/l)	% Removal of COD
1.	**0**	48000	48000	0
2.	**15**	48000	36800	23.3
3.	**30**	48000	34800	27.5
4.	**45**	48000	30400	36.7
5.	**60**	48000	27200	43.3
6.	**75**	48000	25600	46.7
7.	**90**	48000	22400	53.3

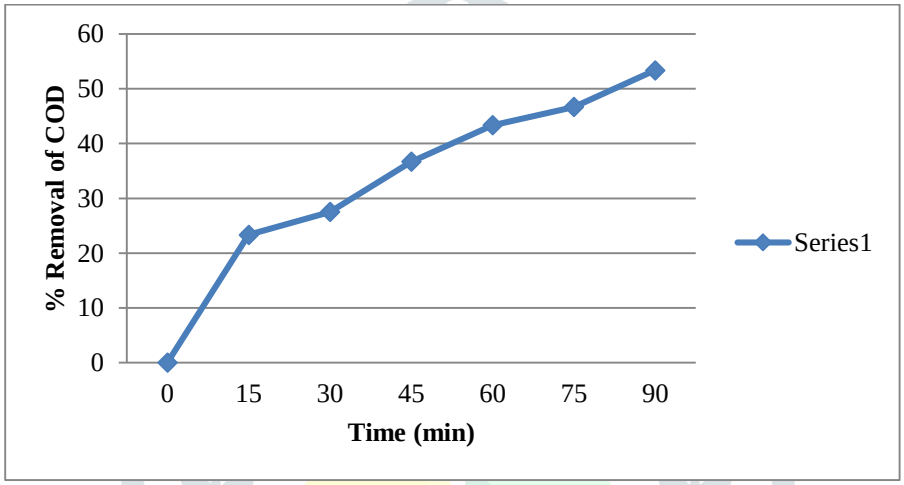

Figure: 2 Results at NaOCl = 10 ml/L and pH = 3.

Ideal outcomes were seen at NaOCl was 10 ml/L ; pH = 3.5 After that expanding portion of NaOCl indicated decrease in COD.

4 CONCLUSION

After all experiments it is presumed that the COD removal was 53.3% of NaOCl at 10mg/L; pH = 3.5. Ideal time was 90 min.

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