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Study On Treating The Textile Wastewater By Electro Coagulation Process Using Mild Steel As Electrode

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Abstract

Textile Industries are among the most polluting industries which usually use large amount of water and various chemicals for finishing and dying process. Electrocoagulation process recently it gained an immense attention due to its efficiency, The experiment is conducted for improving textile effluent quality via removal of turbidity, color, total dissolved solids and chemical oxygen demand by electro coagulation using mild steel as anode and cathode. Electrocoagulation method is an advanced technology which is able to treat textile waste water having high COD,TDS, and color efficiency before it is treated further or discharged in to water bodies. And this method is considered as effective method to removal of dyes from colored waste water. The electrochemical cell consists of both electrode and cathode placed vertical to each other. DC power supply (0-30 Volts and 0-5A) was used as a power source. The terminals worked in monopolar mode. Effluents were treated for 10 volts, 20 volts and 30 volts for 20 min intervals until it becomes clear. The results are reported in terms of percentage removal of COD, color by varying $p^H$and current density; it was observed that increasing the current density will decolorize and reduce the COD percentage by 80% to 90%.

Keywords: *Textile Industry, Electrocoagulation, Mild Steel, COD, Monopolar.*

INTRODUCTION:

Fresh water is what makes earth special, it is essential for all living organisms, which unreliably makes it almost valuable resource on the planet. Today it is very crucial for many business and communities to require large amount of fresh water to survive but sadly also they create vast amount of contaminated water. Increasing industrialization and urbanization are the causes of environmental pollution Textile industries are one the huge volume of wastewater generating industries, and amongst the high strength wastewater generating industries. Common contaminants in textile wastewater include materials containing biochemical oxygen demand and chemical oxygen demand, suspended solids, color and other soluble inorganic and organic substances. Textile industry can be classified into three categories like cotton, woolen, and synthetic fibers depending upon the used raw materials. Dyes possess certain properties, namely resistance to abrasion, photolytic stability, resistance to chemical and bacterial attack, which make them keep unaltered long time and are recalcitrant in nature, therefore are very difficult to remove from textile industries wastewaters. Water quality test is an important test that needs to be carried out so as to satisfy the water quality requirement for good health of consumers. [11]

Textile manufacturing is one of the largest industrial producers of wastewater approximately 125- 150 L of water are used for 1 kg of textile product. The wastewater from textile processing contains

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processing bath residues from preparation, dyeing, finishing, slashing and other operations. During the dyeing process, the dye is dissolved into the process water and it is still there when the process water later is released as effluent.

METHOD:

This tells us the materials and systems used during this experimental examination, which contains the reactor set up, operational conditions and
exploratory assessment procedure.

Stages of experimental examination:

1. Arrangement of electro-coagulation reactor (mono polar).
2. Experimental study for different working conditions for COD, TDS, TURBIDITY and Colour removal using cathode material (MS).
3. Experimental concentrate for material Industrial Waste Water (Doddaballapura).

Electrochemical cell includes reactor where both anode and cathode were put vertical and relating to each other. DC twofold power supply (EL POWER 0 – 30 Volts and 0 – 5A) was used as a power source to keep up current/voltage over the anodes. The terminals worked in monopolar mode. The electrical supply was set up with the help of copper wire and crocodile cuts. The framework was outfitted with engaging stirrer with hot plate (REMI Magnetic stirrer) so as to keep the electrolyte all around blended.

Electro coagulation:

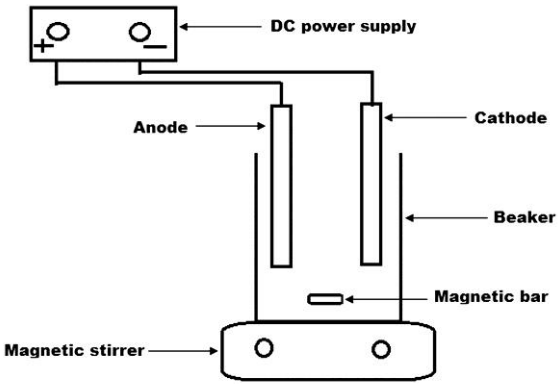

Fig 1: The schematic diagram of the experimental setup

Experimental setup:

COAGULATION PROCESS:

More than the physical chemical process coagulation process is being referred since its gives faster and better results than physical and chemical process .In our experiment we have considered MS electrode of 0.5mm thickness by varying a voltage of 10v, 20v and 30v for a regular interval of 20min and conducted the experiment.

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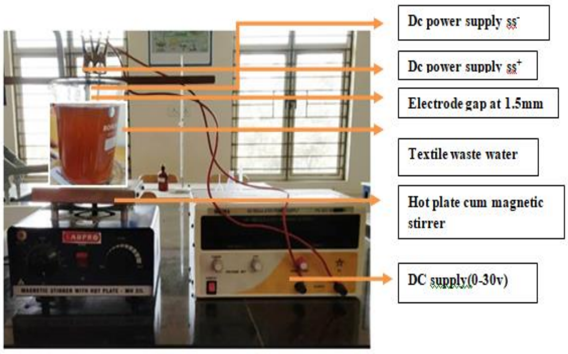

Fig 2: Electro- coagulation Reactor setup.

Considered for the current examination:

- Applied Voltage/current
- Time period
- Ph

Fig 3: Shows the Raw Effluent, Treated Effluent and Settled Sludge

RESULTS AND DISCUSSION:

As per the operational work force no under 15 various types of colors were utilized in the coloring and completing plant. Accordingly following of the sort of colors utilized was unimaginable on the grounds that no record was kept at the factory. When all is said in done the wastewater had a COD of 5600mg/l and were firmly shaded with a straight forwardness constantly less. Introductory estimation of TDS was around 2236 mg/l and dull in shading.

The current thickness was seen by the past examiners to have solid impact on the treatment proficiency of the electro coagulation process. Thus the applied current was changed to look at its impact on TDS, COD and Color evacuation improves quickly with expanding current up to about 30v. Past that, increment in the TDS, COD and shading evacuation with current impressively eases back down. Consequently 30v was considered as ideal current for Electro coagulation process.

Voltage	Time (min)	20	40	60	80	100
10 Volts	pH	4.6	4.9	5.6	4.1	5.3
	TDS Removal (mg/lt)	1113	961	894	715	716
	%TDS Removal	50%	57%	60%	68%	68%

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20 Volts	pH	4.3	4.8	5.1	5.4	
	TDS Removal (mg/lt)	669	603	491	469	
	%TDS Removal	70%	73%	78%	79%	
30 Volts	pH	5.3	5.9	8		
	TDS Removal (mg/lt)	428	380	268		
	%TDS Removal	81%	83%	88%		

Table 1: Impact of applied voltage and contact time on TDS Removal
MS-MS electrode (0.5mm thickness)

Voltage	Time (min)	20	40	60	80	100
10 volts	pH	4.6	4.9	5.6	4.1	5.3
	TDS Removal (mg/lt)	2576	2184	1904	1512	1513
	%TDS Removal	54%	61%	66%	73%	73%
20 volts	pH	4.4	4.9	5.3	4.9	
	TDS Removal (mg/lt)	1232	1115	728	672	
	%TDS Removal	78%	80%	87%	88%	
30 volts	pH	5.3	5.7	8.2		
	TDS Removal (mg/lt)	559	448	449		
	%TDS Removal	90%	92%	92%		

Table 2: Impact of applied voltage and contact time on COD Removal for MS-MS electrode (0.5mm thickness)

Voltage	Time (min)	20	40	60	80	100
10 volts	pH	4.6	4.9	5.6	4.1	5.3
	Colour Removal (mg/lt)	101	86	74	63	64
	%Colour Removal	50%	57%	63%	69%	69%

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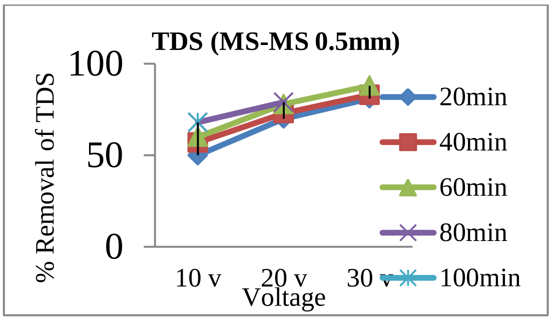
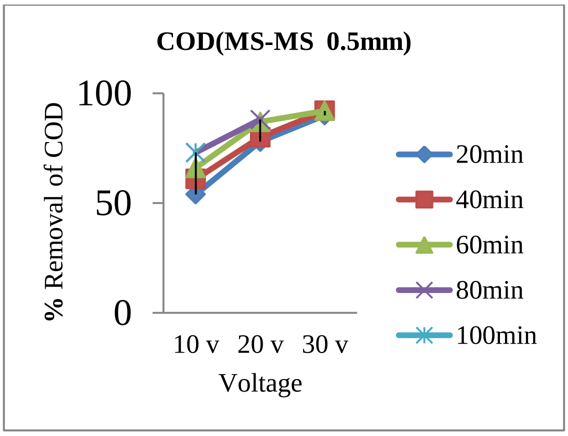
20 volts	pH	4.4	4.9	5.3	4.9	
	Colour Removal (mg/lt)	60	48	42	40	
	%Colour Removal	70%	76%	79%	80%	
30 volts	pH	5.3	5.7	8.2		
	Colour Removal (mg/lt)	35	28	22		
	%Colour Removal	83%	86%	89%		

Table 3: impact of applied voltage and contact time on COD Removal
MS-MS electrode (0.5mm thickness)



Graph1: Applied Voltage on TDS Removal utilizing MS-MS Electrodes

Graph 1 indicates voltage in x-axis and % removal of TDS in y-axis. In this graph the effluents are removed with best result of 88% efficiency. The graph also shows that as the voltage increases the removal efficiency of the effluent also increases



Graph 2: Applied Voltage on COD Removal utilizing MS-MS Electrodes

Graph 2 indicates voltage in x-axis and % removal of COD in y-axis. In this graph the effluents are removed with best result of 92% efficiency. The graph also shows that the voltage increases the removal efficiency of the effluent also increases.

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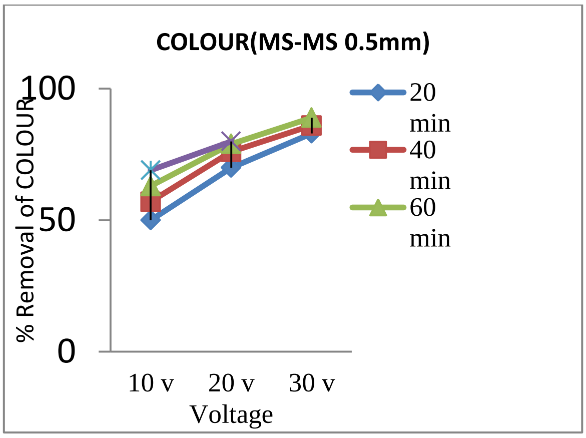

Graph 3: Impact of Applied Voltage on COLOUR Removal utilizing MS-MS Electrodes.

CONCLUSION:

Waste water from textile industry was processed by electrocoagluation process. The suspended solids were removed to the extent of 88% from its initial concentration 2236 mg/l by electrocoagulation. The initial COD of 5600 mg/l was reduced to 449 mg/l in the presence of MS electrodes. When electrodes are placed with an efficient distance of 1.5 cm, best removal efficiency was achieved. The optimum removal of TDS, COD and COLOUR was achieved during 30v for the time duration of 60min.

A monetary assessment of the working expense of the persistent procedure has demonstrated that the procedure appreciates 24% cost advantage over the customary strategy right now rehearsed by the material business. Other than the cost advantage, the water nature of the rewarded material waste water is impressively improved when contrasted with that rewarded by traditional strategy.

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