

COLOR REMOVAL OF TEXTILE EFFLUENT BY ELECTRO-COAGULATION METHOD

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Abstract: *A treatability study of textile wastewater using Aluminum and Stainless Steel electrode with the process of electro coagulation. In the batch reactor experimentally determined on effect of pH, color, and COD. In the result of color in pt-co scale 321 P.C.U to 62 P.C.U in Al + SS electrode and 80.68% efficiency in removal of color and also COD degradation 929 mg/l to 360 mg/l in Al + SS electrode and also pH is 9.50 to 8.30. As a result of this study to primary treatment of textile wastewater by designed electro coagulation can be successful achieved.*

Keywords: *Textile wastewater, Spectrophotometer, Electro coagulation, Aluminum and Stainless steel electrodes.*

Introduction

Textile industries use large quantities of water and chemicals. The textile wastewater characterized by strong color, a broad range of pH, high COD concentration, Suspended particles and toxicity. It is therefore necessary to treat textile effluent prior to their discharge to the receiving water. Many type of technologies have been exploited to clean dyeing wastewater to remove colloidal particles from wastewaters, more effective new technologies have to be used in addition to present treatment technologies. One of these potential technologies is electro coagulation technique.

Electro coagulation has a long history, the first plant was built in London in 1889 for the treatment of sewage where electro coagulation treatment using sacrificial Aluminum and iron electrodes.

The electro coagulation technology includes coagulation and precipitation of contaminants by a direct current electrolytic process followed by the separation of flocculent (settling and floatation) with or without the addition of coagulation including chemicals. The water is pumped through a unit which consists of pairs of metal sheets called electrodes, that are arranged in pairs of two anode and cathode electrode made by aluminum and stainless steel are installed. A direct current 12V electric field is applied to the electrodes to include the electrochemical reaction needed to achieve the coagulation. Treated wastewater is discharge from the system for reuse or disposal or reclamation. When the cathode electrode makes contact with wastewater, the metal is emitted in to the apparatus. Coagulation technologies include coagulation and precipitation of contaminants.

In the electro coagulation process the coagulation the coagulated ions are produced in "in situ" and it involves three successive stages.

- (1). Information of coagulations by electrolytic oxidation of the sacrificial electrodes.
- (2). Destabilization of the contaminants, particles suspension and breaking of emulsion.
- (3). Aggregation of the destabilized phase to form flocks.

Materials and Methods

Textile effluent collected from the Textile industry. After processing textile process collected the sample of effluent.

After collecting the sample we need to check the characteristics of effluent and finding the problem in the effluent.

Experimental instruments

- (1) In the electro coagulation process first of the we need of batch reactor with the Capacity of 2 liters wastewater.
- (2) After we need electrodes. There are two type electrode we taken first is
- (3) Aluminum and second is stainless steel.
- (4) In the electrode size is 10cm length, 6cm width and 0.7cm thickness.
- (5) There are 4 positive electrode and 3 negative electrode connected.
- (6) We need to DC electric supply. It's convert the electric current 240V to 12V.
- (7) After we need ozonation and filtration the sample.
- (8) Take treated sample and check the characteristic.

CHARACTERISTICS OF TEXTILE EFFLUENT

Table 1 Various Parameters of Textile Effluent

Sr. No.	Parameter	Results
1	pH	9.50
2	Color (pt-co scale)	321
3	COD (%)	929
4	Bio-Chemical Oxygen Demand[3days at 27 ⁰ c]	105
5	TDS(ppm)	5150

METHOD

Wastewater was obtained from a tank containing a mixture of exhaust dyeing solutions at a textile industry. The wastewater was first filtered using a screen filter to remove large particles.

The electro coagulation reactor is 2 litter capacity of wastewater. There are two types of electrodes aluminum and stainless steel. Electrode size is 10cm height 6cm width and 0.7cm thickness. There are 4 positive and 3 negative electrode connected. Spacing between two electrodes was 10mm. The electrode were connected to a digital dc power supply(240V to 12V) with electricity. all the runs we performed at normal temperature of 30⁰c.

There are 4 basic type of experiment we try to with different type of electrodes. In the different types

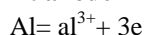
- (1) Aluminum
- (2) Stainless steel
- (3) Aluminum + stainless steel
- (4) Stainless steel + aluminum

In the experiment

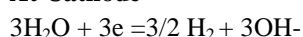
- (1) Aluminium: in first trial we take aluminium electrode to coagulant wastewater. in the experiment the foaming and coagulant and adsorption started. we take a 10 min to each sample with each type of electrode .after 10 min the sample take in beaker and gave to ozonation treatment. After ozonation we take sample to check colour by spectrophotometer.
- (2) Stainless steel: in the same process of aluminium electrode to stainless steel electrode .sample treated and filter zing and give ozonation treatment .after coronation take sample for colour testing
- (3) Aluminium + stainless steel: in this experiment we try to innovative step to first 10 min to coagulant with aluminium electrode and after 10 min stainless steel electrode with single effluent.20min reacting time to require in experiment. And after take a sample and gave ozonation treatment and take the sample for colour testing.
- (4) Stainless steel+ aluminium: in this experiment first we try stainless steel electrode for 10 min coagulant after we take aluminium electrode for 10 min and take the sample in beaker and gave ozonation treatment for 20 min and take this sample for check the colour efficiency.

Reaction in electro coagulation process

At anode



At Cathode



Overall reaction



Source: (kotya .et. al .2003 , Zarwal .et. al 2006)

Results and Discussion:

(1) Effect of color in Aluminum Electrode

In The use of Aluminum Electrode the flocculation was starting immediately and the color particle was removed with flock bubble in the textile wastewater.

The Color is removing after 10 min and giving ozonation treatment and check the color in spectrophotometer in pt-co unit. And color was measured 321 pt-co to 120 pt-co with 60% efficiency. and COD was decrease 929 to 422 mg/l.

(2) Effect of color with Stainless Steel electrode

In this process use of Stainless Steel electrodes the electrode in the wastewater and start the power and the starting the flocculation and color is removing with flock bubble and after 10 min giving ozonation treatment we take the sample with filter and check the color efficiency.

The result in Stainless Steel the color was 321 pt-co to 146pt-co unit with 55% efficiency and COD is also decrease with 929 to 535 mg/l.

(3) Effect of color with Al + SS Electrodes

In the treatment process first 5 min use Aluminum electrode and same water second 5 min use of Stainless Steel electrode. the same process flocculation and color remove with flock bubble and after giving ozonation treatment we check the color efficiency.

The color is measurement in Al + SS electrode 321pt-co to 62 pt-co unit with 80.68% efficiency. And also COD decrease is 929 to 360 mg/l.

(4) Effect of color with SS + Al electrodes

In the process of first 5 min take Stainless Steel electrode with electrolysis and after 5 min same water we take Aluminum electrode and process is same in all electrodes in flocculation and color relive with flock in wastewater. After 10 min giving ozonation treatment we take sample using filters process.

The result in the SS = Al electrode the color was 321pt-co to 135.82pt-co unit with 59% efficiency. and COD decrease 929 to 520 mg/l.

Table 2 Various parameters of the effluent after treatment

	Al	SS	Al + SS	SS + Al
pH	8.50	8.70	8.30	8.68
Color(pt-co)	120	145	62	135
COD(mg/l)	422	535	360	520
BOD _{5day}	69	89	58	87
TDS	3221	3754	2960	3682

After the treatment we take all samples and check the characteristics of all samples.

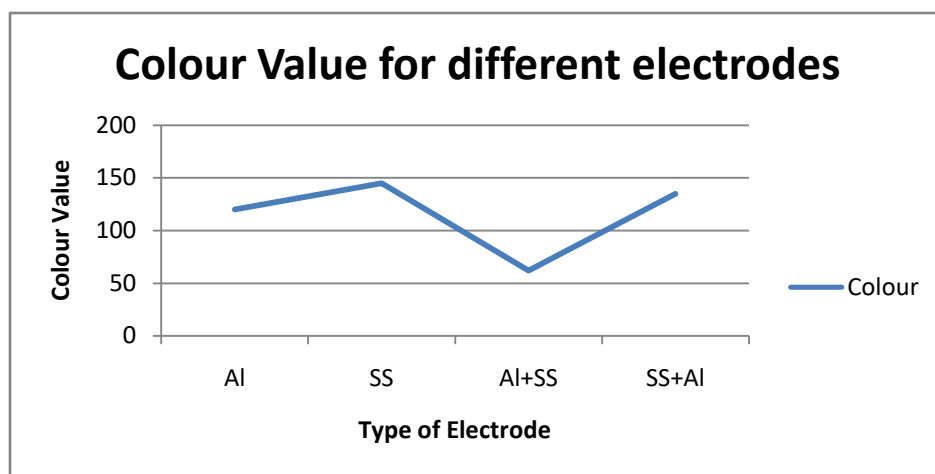


Figure 1 Various types of Electrode vs Colour Value

Conclusion:

Decolonization of textile effluents using electro coagulation was investigated batch reactor using Aluminum and Stainless Steel. In this experiment there are four type electrodes use as Aluminum, Stainless Steel, Aluminum + Stainless Steel, Stainless Steel + Aluminum. And we conclude with color efficiency result is 321 pt-co unit to 120,145,62, and 135 pt-co unit with efficiency 62%, 55%, 80.68%, and 58%. And also COD degradation with 929 mg/l to 422, 535, 360, and 515 mg/l. In this experiment we conclude the Al + SS electrodes are highly effective with color removal treatment and also in COD degradation. So the in textile industry for primary treatment for color removal the electro coagulation is successful experiment with low cost and higher efficiency.

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