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ELECTROCHEMICAL OXIDATION OF ACID BLACK 52 DYE WASTEWATER: POLAR MODE

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ABSTRACT

Wastewater from the dye and dye intermediates industry has nowadays become a major threat to environment because of its toxic and mutagenic properties. In this paper Electro chemical Oxidation is carried out for the degradation of acid black 52 by graphite as anode and cathode. This whole experiment had been carried out in polar mode. First of all the optimum pH was calculated and then the test was performed at optimum pH at varying current value from 300 mA to 1100 Ma and then the detention time was varied between 30 mins to 120 mins.

Keywords: *electro chemical oxidation, polar, acid black 52, dye*

I. INTRODUCTION

Dyes and dyes intermediate uses large amount of water and as a result produces large amount of wastewater which is generally reluctant i.e. non-biodegradable and also mutagenic which is major threat to environment, so treatment of such wastewater using conventional ways will be not possible and certain other advanced methods like coagulation and adsorption will produce hazardous sludge which will be difficult to dispose and filtration (RO) will produce reject water which also must be treated. Other advanced oxidation processes will also be effective but it will need hazardous chemicals which will cumbersome to transport. So Electro chemical oxidation comes in the practice because it will not be required any chemicals. The mineralization of pollutants is achieved by the $OH^{\cdot}$ Species (highly oxidizing in nature) formed by anodic oxidation at the surface of electrode.

$$H_2O \longrightarrow OH_{(ads)} + H^+ + e^-$$

$$OH^- \longrightarrow OH^{\cdot} + e^- \quad [6]$$

There are two types of electrodes i.e. active electrodes and non-active electrodes. Electrodes made up of graphite (carbon), Rubidium oxide, Iridium oxide, titanium oxide possess low oxidation potential that will partly oxidize the waste so it comes in categories of active electrodes and electrodes made up of boron doped diamond, lead oxide, antimony oxide possess high oxidation potential which will completely mineralize the waste so they come under the category of non-active electrodes [4]. Graphite is active element but for some compounds it has higher efficiency in COD and colour removal.

II. MATERIALS AND METHOD

Acid Black 52 wastewater was used for the treatment. A cell was constructed of dimensions 105*150 mm (O.D. * Ht). Volume of the reactor was 1000 ml and working volume has been taken as 700 ml. the anode and cathode used is of graphite which was supplied by Nath Graphites, Mumbai and dimension of plates were 140*40*10 mm (L*B*Th). The distance between plates were kept 20 mm. DC supply used was of Testronix 32A 1 A and 32 V. Magnetic stirrer was used to keep homogenous mix. The range of current used was 300 mA to 1100 mA.

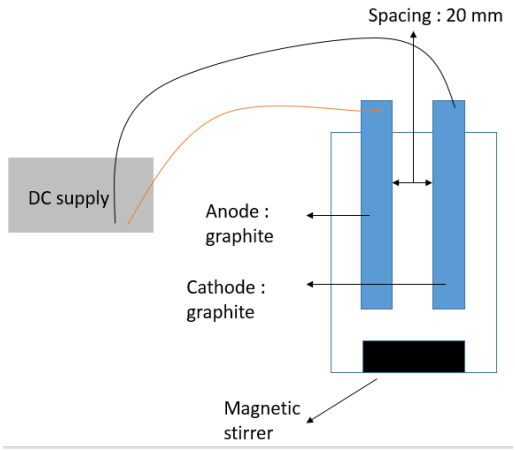

Fig 2.1 schematic diagram of reactor

III. RESULTS AND DISCUSSIONS

First test was performed at pH 6 at different current value such as 300 mA, 500 mA, 700 mA, 900 mA, and 1100 mA for 30 mins. In first test it was observed that COD removed from wastewater at 300 mA was 10.05 % and as the current value had been increased and so as the removal efficiency has been increased. At 1100 mA the removal efficiency was 21.62 %. Colour removed was also been observed, at 300 mA the removal was 25.90 % and as the current value had been increased the efficiency of removal at 1100 mA was 37.79 %.The second test performed was at different reaction times like 60 mins, 90 mins and 120 mins at pH 6 and current value to be 1100 mA. The COD reduction was 48.64 % at 120 mins and colour reduction was 50 %.

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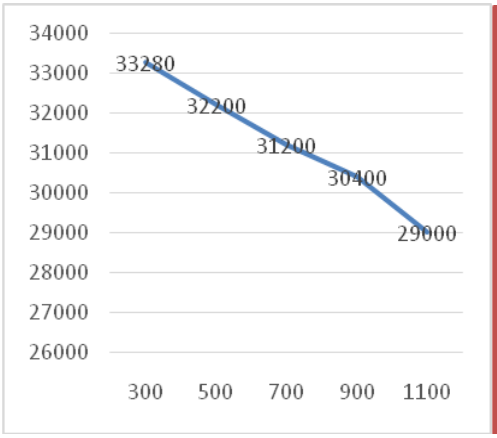

Fig 3.1 COD reduction curve for different current value

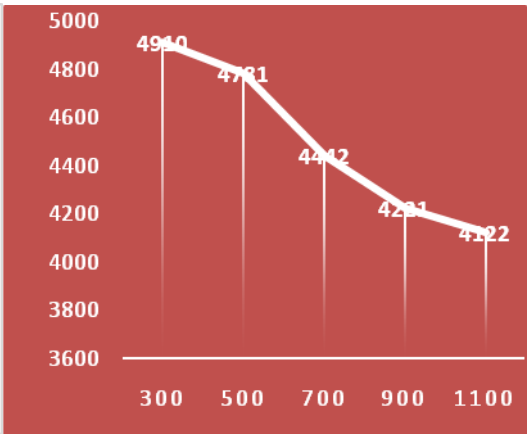

Fig 3.2 Colour reduction curve for different current value

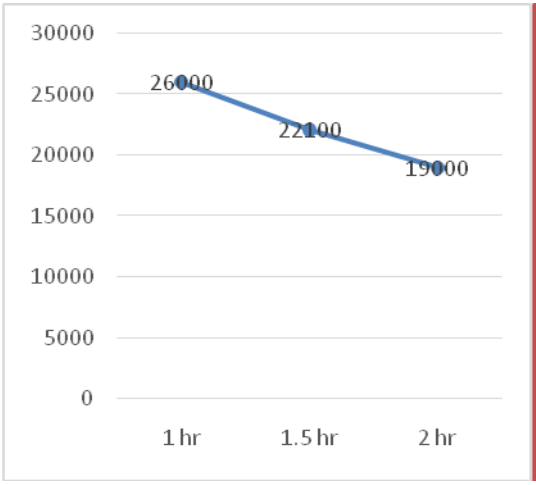

Fig 3.3 COD reduction curve at different reaction times

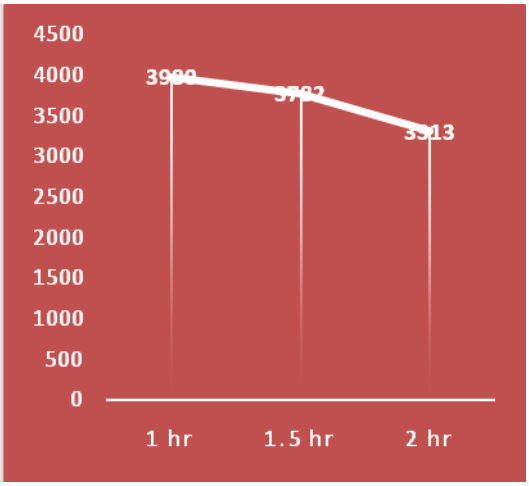

Fig 3.4 Colour reduction curve at different reaction times

IV. CONCLUSION

At lower current values such as 300 mA the reduction is not noticeable but as the current value changes to 1100 mA the noticeable reduction had been noticed. Colour reduction is also not noticeable at 300 mA but as the current value is increased the reduction is noticeable. Reaction time also effects the reduction of COD and colour. The graphite material will not be corroded even after such long time of reaction and also is inexpensive as compared to other materials available.

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