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Treatment of Paint (Emulsion) Industry Wastewater by Electrocoagulation

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Abstract: *Treatment of paint industry (emulsion) wastewaters by electrocoagulation using different electrode materials has been investigated in this paper. Several working parameters, such as pH, current density, operating time, types of electrodes and surface area were studied in an attempt to achieve a higher COD removal capacity. The electrolytic cell used was a 500 ml cylinder glass reactor with working volume 400 ml and equipped by magnetic stirrer without temperature control. The DC power supply was controlled by a voltmeter. The study also revealed that electrocoagulation with Al electrodes was more effective than MS and SS electrodes.*

Key words*: electrocoagulation, paint industry waste water, electrolytic cell, electrodes.*

I. Introduction

India's strong economic growth has propelled the paint industry to double-digit growth over the past few years. Due to increased Government funding for infrastructure, demand for paints both in industrial and decorative segment is set to rise, thereby rendering Indian paint industry to be poised for further growth.
Satisfactory disposal of wastewater, whether by surface, subsurface methods or dilution, is dependent on its treatment prior to disposal. Adequate treatment is necessary to prevent contamination of receiving waters to a degree which might interfere with their best or intended use, whether it be for water supply, recreation, or any other required purpose.

In the electrocoagulation process, the coagulants are generated electrically and wastewater is treated in an electrochemical cell. When the system is connected to an external power source, sacrificial anodes are corroded due to oxidation in the solution and release coagulant cations (usually aluminium or iron) in the cell.

This study, the treatability of paint industry(emulsion) waste water by the EC method was tested, and the COD removal efficiency were determined.

II. Materials And Methods

The wastewater was obtained from a local paint industry. The effect of various process variables such as electrode material, surface area , distance between two electrodes and operating time was investigated. The electrolytic cell used was a 500 ml cylinder glass reactor with working volume 400 ml and equipped by magnetic stirrer without temperature control. Two aluminium plates were used as anode/cathode pair. The distance between two electrodes was 3 cm and 4 cm. The DC power supply was used and be adjusted constant at 240 mA for most test runs.

Fig.1 Experimental set up

For each test run, 400 mL of waste water was put in the reactor. Wastewater samples were taken at different time intervals and filtered before analyzed. The water quality of paint industry waste water , such as the COD, pH, suspended solid and was measured in each experimental run by the standard methods APHA (1992).

III. Results And Discussion

Effect of electrode material

Different types of electrode material such as Aluminium , MS and SS were used for the treatment of paint industry waste water. The effluent was treated with different electrode materials to obtain higher COD removal efficiency. The experimental results showed that higher COD removal efficiency obtained with Al electrodes.

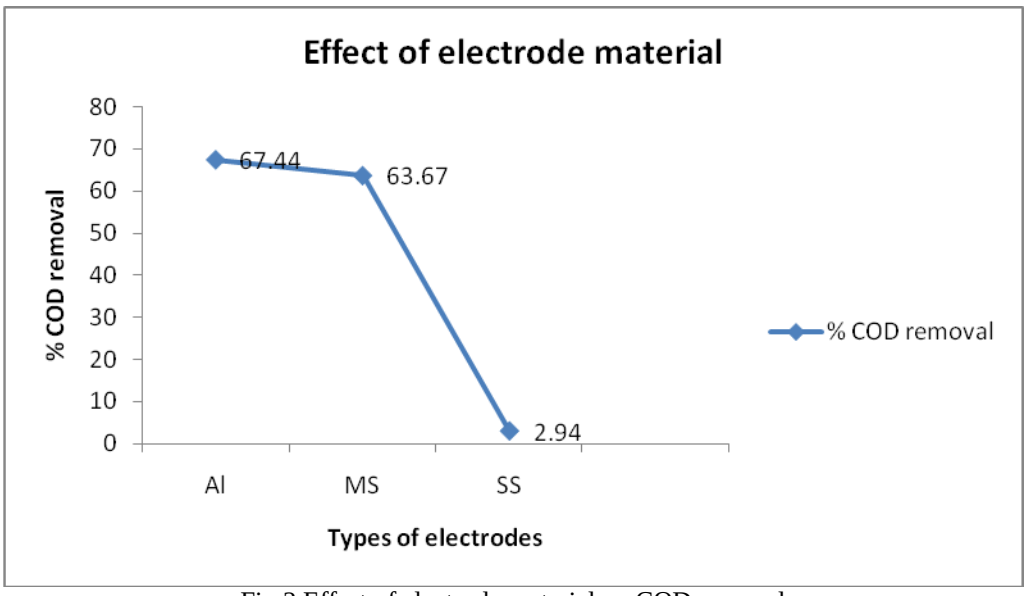

Fig.2 Effect of electrode material on COD removal

Effect of Operating Time

The effect of time was studied at constant current density of 240 mA with two Al electrodes. Figure illustrates the removal of COD as a function of operating time. It is clearly seen from Fig that, the operating time has a significant effect on the pollutant removal. When the operating time changed from 10 to 40 minute, maximum COD removal efficiency was obtained within 20 min.

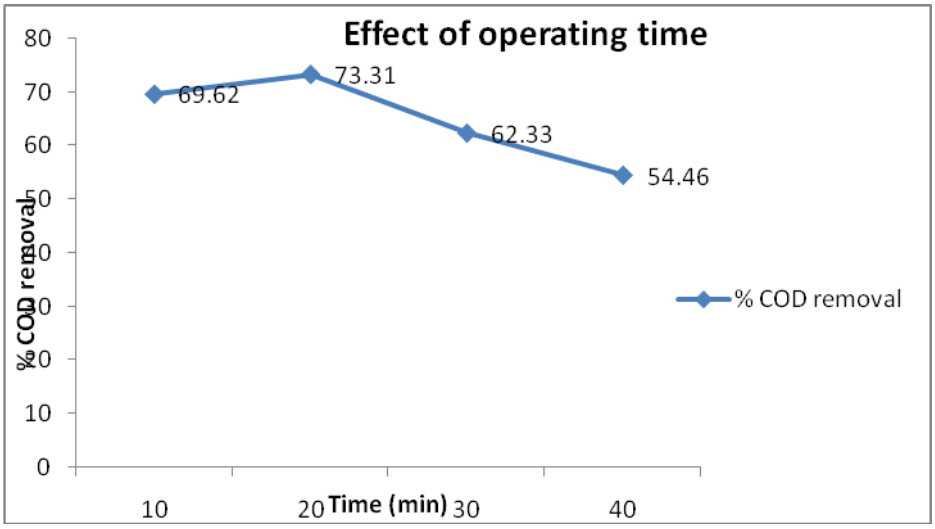

Fig.3 Effect of operating time on COD removal

Effect of ph

The effect of pH on the COD removal as shown in Fig, was investigated with the applied current of 240m A and operating time at 20 minutes. At neutral pH higher COD removal efficiency was obtained.

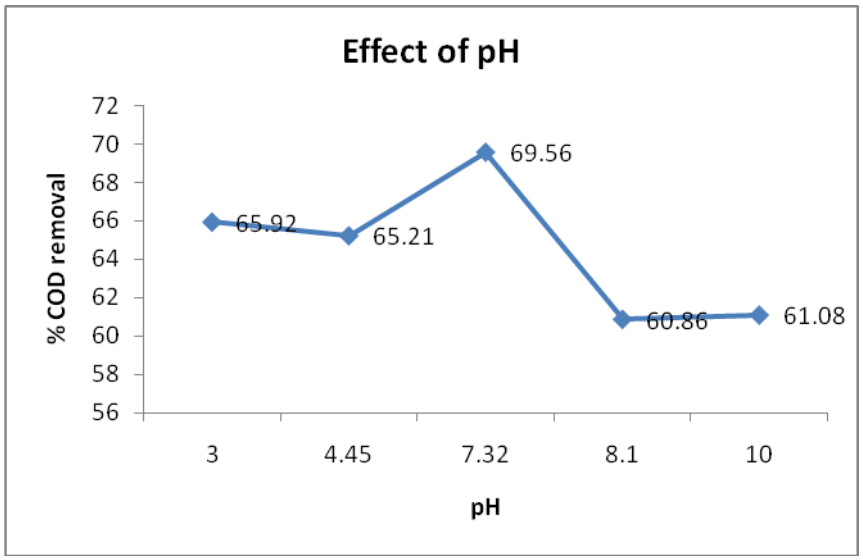

Fig.4 Effect of pH on COD removal

Effect of surface area

The effect of surface area on the COD removal was investigated. Other parameters were kept constant and surface area used was 30cm2, 60 cm2. The higher efficiency was obtained with surface area of 60 cm2.

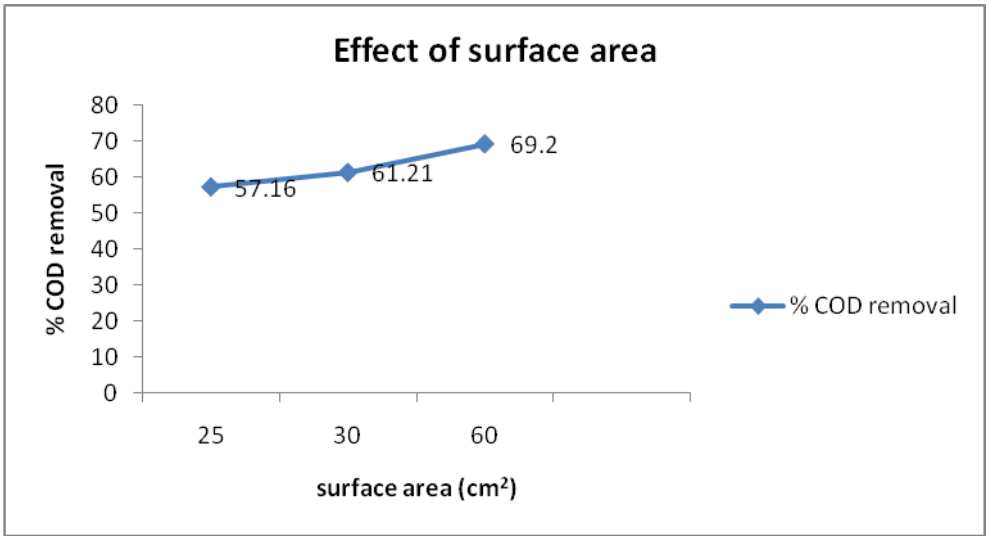

Fig.5 Effect of surface area on COD removal

IV. Conclusion

In this lab-scale study, high COD removal efficiency was achieved using electrocoagulation technique for the treatment of Paint(emulsion) industry waste water.The results show that the COD removal efficiency is as high as 73.31% for EC process with current density of 8 mA/cm2 and retention time of 20 min. Experimental results show that, electrocoagulation technique has the potential to treat the paint (emulsion) wastewater.

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