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"EXPERIMENTAL INVESTIGATION ON EFFECTIVENESS OF NANO PARTICLE IN ELECTROCOAGULATION TECHNOLOGY FOR THE TREATMENT OF PAINT INDUSTRY WASTEWATER"

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Abstract: Treatment of industrial wastewater for meeting the effluent discharge standards is a challenging task. Electrochemical methods, especially electro coagulation (EC) process received great attention due to its ability to treat various industrial wastewaters at a lesser cost. The COD removal efficiencies of the EC process are above 80% for almost all industrial wastewater. Also, the energy requirement for the EC process is very less compared to other removal processes. Moreover, the sludge generated from the EC process can be safely disposed by adopting different methods. The study was experimentally investigated taking into account various factors such as pH (3–7.5), solar power (2v-6v) and distance between the electrodes (2–5 cm), electrolysis time (60 min). Maximum Chemical Oxygen Demand (COD) removal efficiency was 85% and Turbidity observed for the treated wastewater was 9 NTU. Aluminum (Al) electrodes and Titanium dioxide (Nano particle) were used.

Index Terms **–Solar Power, Nano Particle [TiO2], Paint Industry Wastewater, Electro coagulation Technology.**

I. INTRODUCTION

Effluents from many industries are now one of the major sources of water pollution which represent important environmental problems. These pollutants in water cause considerable damage to the aquatic environment and significant source of environmental pollution. It contains several harmful chemicals that are toxic to biological life. A number of conventional treatment techniques have been applied to overcome this problem such as catalytic oxidation, adsorption processes, ion exchange, biological processes, membrane separation processes, advanced oxidation processes, ultra filtration, chemical precipitation, reverse osmosis, photo catalysis, chemical coagulation and electro coagulation. Most of these methods are effective, although they are quite expensive and have many disadvantages and limitations. Electro coagulation (EC) is a promising technique for removal of pollutants from wastewater due to its simple, cheap to operate, easily available equipments and environmental friendly approach. But it has received little scientific attention. This process has the potential to extensively eliminate the disadvantages of the classical treatment techniques. Moreover, the mechanisms of EC are yet to be clearly understood and there has been very little consideration of the factors that influence the effective removal of ionic species particularly heavy metal ions , oil wastes, foodstuff, suspended particles, polymeric wastes, phenol wastes, arsenic, textile and dyes from wastewater by this technique

Many traditional methods/units are used to treat industrial water, coagulation has fewer advantages and disadvantages, so scientists introduced the hybrid method called electro coagulation, which is more effective and reasonable than coagulation. Electro coagulation (EC) has been used effectively as a first treatment in removing and transforming polycyclic aromatic hydrocarbons from industrial effluents. EC is a chemical and physical technique that injects ions into wastewater using consumable electrodes such as Fe or Al the Fe or Al anode is oxidized wastewater treatment electrolysis, yielding corresponding metal ions that instantly hydrolyze to polymeric iron or aluminum hydroxide. These polymeric hydroxides are good coagulants, and the tiny oxygen and hydrogen bubbles created by the anode and cathode may help in particle flocculation in the water

II.METHODOLOGY

1. Characterization of collected paint industry wastewater.
2. Identification & selection of suitable nano particle.
3. Fabrication of solar powered electro-coagulation treatment unit.
4. Experiment analysis on collected industrial effluent with different doses of nano particles.
5. Comparing electro-coagulation technology and its effectiveness with current market status

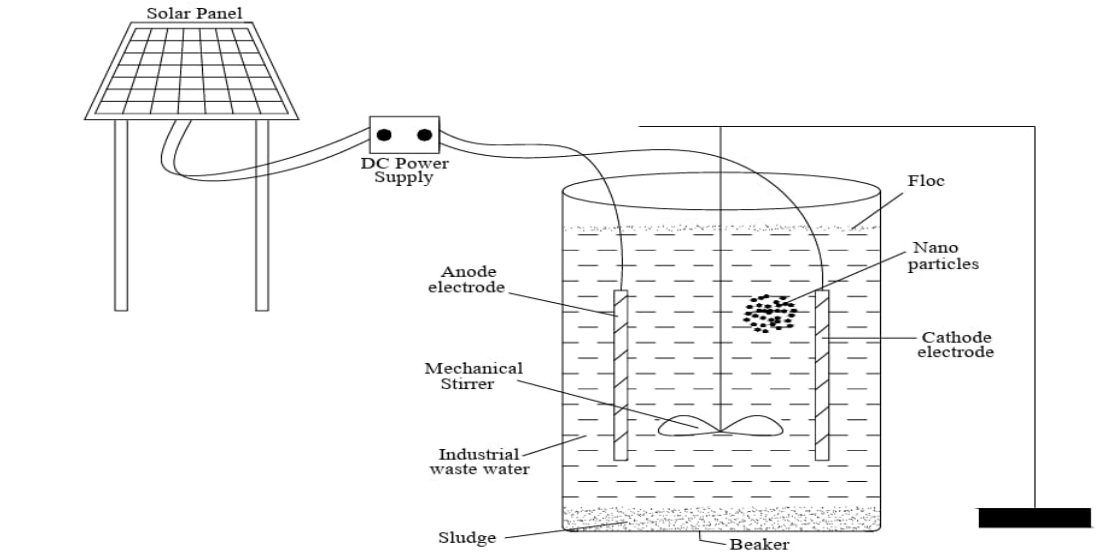
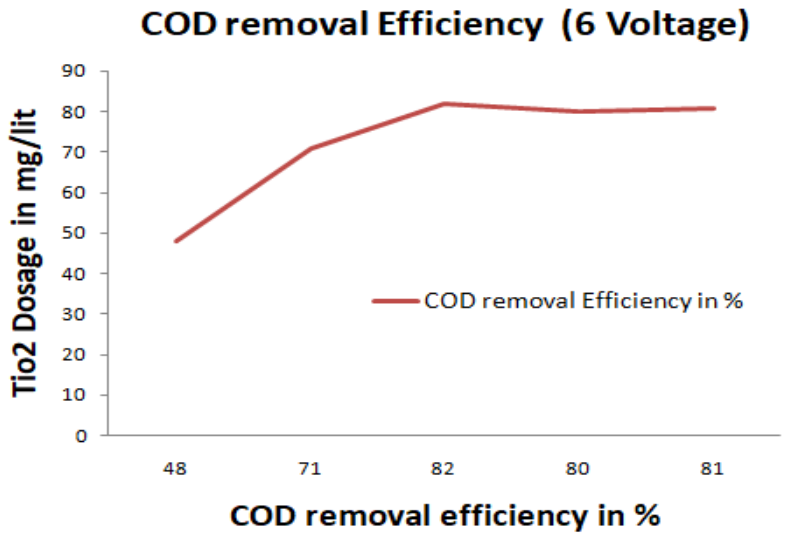


Fig: Experimental Setup

III.RESULTS AND DISCUSSION

Fig: Before and After Treatment



Above graph shows COD removal efficiency in % with different dosage of nano particle. During study period maximum COD removal efficiency was achieved 82% with 60 mg/lit nano particle dosage. Titanium dioxide was used as nano particle to treat paint industry wastewater. To achieve economical treatment solar power was utilized (2 v to 6 v). Maximum treatment was achieved at 6 voltage supply to Aluminum electrodes with increment in dosage of nano particle.

CONCLUSION

Based on laboratory experiments conducted, following observations are made:
1. Maximum COD removal Efficiency was 82% for 60 mg/lit TiO2 Dosage
2. Turbidity observed for the treated wastewater was 9 NTU for 60 mg/lit TiO2 Dosage
3. Maximum COD removal efficiency and turbidity is achieved at 6 voltage solar power supply to electro coagulation unit

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