

# Removal of Cyanide from Wastewater Using Electrocoagulation

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## Extended Abstract

Free cyanide and its related compounds are toxic to human and other living organisms [1]. High concentrations of cyanide can be found in various industrial wastewaters such as coke-oven wastewater [2]. Cyanide has a strong inhibitory effect on biodegradation which makes using conventional biological treatment difficult [2]. Electrocoagulation (EC) could be an alternative process that can be used for cyanide removal from wastewater that contains cyanide [1]. In this research, the ability of Electrocoagulation in removing Cyanide from wastewater was deeply investigated. A stock synthetic cyanide wastewater was prepared with different concentrations using KCN with initial pH was 10. EC experiments were carried out in a batch EC reactor consists of a beaker with 200 ml volume and iron electrodes which were connected by a DC power supply (0 to 30 V). The influence of key operating parameters, such as electrolysis time (t) (5-60 min), current density (CD) (0.625, 0.750, 0.875, 1.125, 1.25 and 1.875 mA/cm<sup>2</sup>), initial cyanide concentration (C<sub>0</sub>) (50, 75, 100, 150 and 200 mg/L), was taken into accounts. SEM morphology was used to investigate the influence of the EC process on the morphology of the surface of the iron anodes before and after the EC process. The weight of the electrodes was measured before and after the experiments and it was found that there is an excellent agreement between the theoretical and the experimental measurements of weight loss of iron electrode. The results showed that at a constant applied density of 0.625 mA/cm<sup>2</sup> and initial concentrations of 100 mg/l, the removal rates increased progressively from 5 to 45 min from 1.2 to 24% respectively. The best current value for cyanide removal by EC process in the interval of current densities investigated in this work was found to be 1.875 mA/cm<sup>2</sup> with a removal efficiency of 99.2%. At lower initial concentrations of cyanide, there is no significant difference in the removal percentage. However, it has been observed that on increasing the initial concentration of cyanide from 50 to 200 mg/L, the removal efficiency decreased from 94.4% to 20%. SEM images indicated that the virgin anode surface was uniform and homogenous except for small scratches, while after a series of EC experiments, the anode surface became inhomogeneous, with several dents. This could be attributed to the consumption of anode material at the active sites where the anode dissolution results in the generation of iron hydroxides (coagulation ions). Our future work will concentrate on the treatment of the sludge generated from the proposed treatment scheme where it represents a major portion of the operational costs and could have negative environmental and public health impacts [3]. Also, modifications of the electrodes by using nanoparticles could represent a vital solution to increase their surface area and system performance [4].

## References

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