A critical review of state-of-the-art electrocoagulation technique applied to COD-rich industrial wastewaters

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Abstract

Electrocoagulation (EC) is one of the emerging technologies in groundwater and wastewater treatment as it combines the benefits of coagulation, sedimentation, flotation, and electrochemical oxidation processes. Extensive research efforts implementing EC technology have been executed over the last decade to treat chemical oxygen demand (COD)-rich industrial wastewaters with the aim to protect freshwater streams (e.g., rivers, lakes) from pollution. A comprehensive review of the available recent literature utilizing EC to treat wastewater with high COD levels is presented. In addition, recommendations are provided for future studies to improve the EC technology and broaden its range of application. This review paper introduces some technologies which are often adopted for industrial wastewater treatment. Then, the EC process is compared with those techniques as a treatment for COD-rich wastewater. The EC process is considered as the most privileged technology by different research groups owing to its ability to deal with abundant volumes of wastewater. After, the application of EC as a single and combined treatment for COD-rich wastewaters is thoroughly reviewed. Finally, this review attempts to highlight the potentials and limitations of EC. Related to the EC process in batch operation mode, the best operational conditions are found at 10 V and 60 min of voltage and reaction time, respectively. These last values guarantee high COD removal efficiencies of > 90%. This review also concludes that considerably large operation costs of the EC process appears to be the serious drawback and renders it as an unfeasible approach for handling of COD rich wastewaters. In the end, this review has attempted to highlight the potential and limitation of EC and suggests that vast notably research in the field of continuous flow EC system is essential to introduce this technology as a convincing wastewater technology.

Keywords COD-rich wastewater · Electrocoagulation · Environmental pollution · Wastewater treatment · COD removal

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