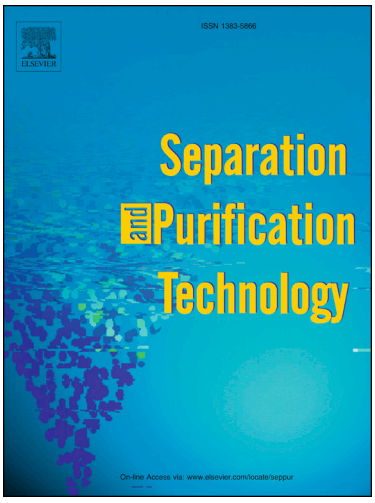

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Characterization and treatment alternatives of industrial container and drum cleaning wastewater: Comparison of Fenton-like process and combined coagulation/oxidation processes

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Abstract

Industrial container and drum cleaning (ICDC) facilities generated complex wastewater which have organic/inorganic compounds, acids, alkalis, metals, dyes, asbestos, PCBs, chemical cleaning solutions or textile auxiliary chemicals. Treatment of such these wastewaters containing all these pollutants is also very difficult. It is required that the wastewater chemical oxygen demand (COD) is below 1500 mg/L to treat in a centralized wastewater treatment facility in Thrace Region, Turkey. In this study the characterization of ICDC industrial wastewater and treatment alternatives of this wastewater using Fenton-like (FL) process, acidic coagulation-flocculation+H_2O_2/UV-C (CF+H_2O_2/UV-C) and acidic coagulation-flocculation+$S_2O_8^{2-}$ (CF+$S_2O_8^{2-}$) processes have been studied. The existing treatment system already has a biological treatment system after coagulation-flocculation system and couldn't be operated effectively in spite of all the efforts. We have studied processes that can be integrated into the coagulation-flocculation (CF) process used in the existing wastewater treatment plant. According to characterization study, COD values were in the range of 4584 – 18125 mg/L. The COD of the wastewater used in treatment experiments were 11853 mg/L. According to the results FL and CF+$S_2O_8^{2-}$ systems were suitable for the COD discharge standards specified for the centralized wastewater treatment plant. The optimum conditions of FL process were 0.8 g/L for $FeCl_3$ and 45 g/L for H_2O_2 and COD was measured as about 1500 mg/L at these doses. The optimum conditions of CF+$S_2O_8^{2-}$ system were determined as 0.64 g/L $FeCl_3$ for CF and 15 g/L H_2O_2 doses. At these dosages the highest COD removal efficiency was achieved to 68% after 5 h. All methods used were suitable for the removal of COD, biochemical oxygen demand (BOD), total organic carbon (TOC), total phosphorus (TP) and of some metals. Considering the integration into the existing treatment system and applicability, it is concluded that the FL process is most favorable.