Degradation of EDTA by in-situ electrogenerated active chlorine in an electroflotation cell

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ABSTRACT

Ethylenediaminetetraacetic acid (EDTA) is a chelating agent widely used for its ability to form stable water-soluble complexes with metals. Yet, it is among refractory and poorly degradable organics. Its degradation is indubitably becoming a major environmental concern. In this work, electrochlorination of EDTA on Ti/RuO_2 anode proved to be effective for such an aim, and thus this electrochemical process may be a promising alternative to conventional EDTA treatments. The effects of NaCl concentration, EDTA concentration, current intensity, and the presence of metallic ions on the EDTA oxidative degradation were investigated. The results herein reported showed that a complete degradation of EDTA was achieved under the following conditions: EDTA concentration, 400 mg.L^{-1}, NaCl concentration, 10 g.L^{-1}; time, 2 h, current intensity 800 mA. In the absence of chloride ions, no degradation was observed, whereas significant extents of degradation were obtained in their presence. Thus, the oxidation of EDTA took place in the bulk solution by the electrolytically generated active chlorine. Increasing the current intensity and NaCl concentration significantly increased EDTA decomposition. Initial pollutant concentration also affected the process efficiency; large amounts of EDTA in the solution slowed down the degradation extent. It was also found that the presence of metallic ions had a negative effect on the oxidation kinetics.

Keywords: Active chlorine; EDTA; Electrochemical degradation; Electrochlorination; Ti/RuO_2 anode

1. Introduction

Ethylenediaminetetraacetic acid **(**EDTA) is a strong and versatile metal sequestering agent, widely employed in industries such as metal finishing, cleaning process, photography, nuclear processes, detergents, paper, textiles, food, etc. [1,2]. Indeed, large amounts of EDTA in forms of complexes or free states are released in wastewaters which unfavorably harm the environment. Because of its capacity to enhance the mobility and the solubility of heavy metals, the removal of the latter species defies all classical treatment techniques. Owing to its easy complexation with metals, the existence of EDTA in the effluents would hamper their treatment by conventional techniques, mainly the precipitation process [3].

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