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Humic acid removal by electrocoagulation using aluminium sacrificial anode under influencing operational parameters

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ABSTRACT

Humic acids (HA) in water can react with active chlorine to produce carcinogenic compounds and their presence is, therefore, considered as a serious problem in water purification plants throughout the world. The present study was undertaken with the aim of investigating the efficiency of using an electrocoagulation (EC) process based on aluminium electrodes at a laboratory scale as a complementary treatment step for HA removal from surface water. A series of experimental assays were performed to determine the optimal operating conditions (electrolysis time, pH, current intensity and initial concentration) involved in the EC mechanism during the HA removal process. The findings revealed that under optimum conditions HA could be removed by up to 72%. Further, high performance liquid chromatography and Fourier transform infrared spectroscopy analyses showed the non-forming products and non-attack points of the HA molecules, respectively. Overall, the results yielded in a pH range (6–7) and low current density (1.78–7.14 mA/cm^2) were promising and indicated that the EC method was effective for the achievement of HA removal from surface waters.

Keywords: Electrocoagulation; Humic acids; Aluminium electrodes; Surface waters; Mechanisms

1. Introduction

Humic substances (HS) are the most abundant natural organic materials in terrestrial and aquatic environments and represent the major portion of soil organic matter [1,2]. They constitute a physically and chemically heterogeneous mixture of biogenic and relatively high-molecular-mass compounds with mixed aliphatic and aromatic natures [3,4]. They are also organic polyelectrolytes that consist of the greatest natural proportion of dissolved organic matter in the watery systems which are usually subdivided into three distinct classes: humic acids (HA), fulvic acids and humins. Those classes still remain not fully

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