



Removal of humic acids by continuous electromagnetic treatment followed by electrocoagulation in batch using aluminium electrodes

D. Ghernaout^{a*}, B. Ghernaout^b, A. Saiba^a, A. Boucherit^a, A. Kellil^a

^aChemical Engineering Department, Saad Dahlab University of Blida, Blida 09000, Algeria

Tel./Fax: +213 (25) 43 36 31; email: djamel_andalus@yahoo.fr

^bAlgerian Waters, Medea Area, Medea 26000, Algeria

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Abstract

This work studied the reduction of humic acids (HA) by continuous electromagnetic (EM) treatment followed by electrocoagulation (EC) in batch of synthetic HA solution using two aluminium electrodes at neutral pH. After continuous EM treatment until the filling of the electrocoagulator, the solution is electrocoagulated. The pH of the HA solutions is adjusted to 12 prior to UV absorbance (300 nm) measurement to enhance HA absorbance since the best dissolution of HA is obtained in neutral or acidic pH. The laboratory tests show that EC process in batch (30 min) is highly efficient for HA removal at pH 7 (96%) and 3 (90%) and less efficient at pH 11 (51%). On the other hand, EM treatment in batch (25 min) increases the induced effect by pH adjusting of HA solution [i.e. UV absorbance decreases at pH 3 (13%) and increases at pH 7 (9%) and 11 (8%)]. However, when EM treatment is in continuous mode and taken alone, it does not have a significant effect on HA removal. When EM treatment is followed by EC in batch, it has an important contribution to increase UV absorbance removal by EC near 100% at pH 7. EM treatment seems to increase the reactivity of HA macromolecules before their removal by charge neutralisation–adsorption in the EC process.

Keywords: Humic acids; Electrocoagulation; Electromagnetic field; Aluminium

1. Introduction

Brown and black biopolymers associated with soil, sediment and particulates in water consist of

material derived from the degradation of animals and plants and are called humic substances (HS). Humic acids (HA) are one of the main components of HS in water [1,2]; they are soluble in dilute alkaline solution but precipitate from an

*Corresponding author.