

Study on mechanism of electrocoagulation with iron electrodes in idealised conditions and electrocoagulation of humic acids solution in batch using aluminium electrodes

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ABSTRACT

This work consists to use distilled water as a solution in electrocoagulation (EC) tests using iron electrodes in order to bear witness to EC mechanisms and concerns EC of humic acids (HA) solution (10 mg L^{-1}) in batch using aluminium electrodes with pH modification and magnetic agitation. The pH of the distilled water is adjusted to three representative values: 2 (acid), 7 (neutral) and 12 (alkaline). Based on the current intensity as a function of applied voltage variation and the pertinent literature, three mechanisms are proposed for acid, neutral and alkaline pH. For pH 2, Mechanism 1 explains $\text{Fe}(\text{OH})_{2(s)}$ formation; for pH 7, Mechanism 2 concerns both the varieties $\text{Fe}(\text{OH})_{2(s)}$ and $\text{Fe}(\text{OH})_{3(s)}$ production; and for pH 12, Mechanism 3 is characterised by $\text{Fe}(\text{OH})_{3(s)}$ apparition. From these results, it can be seen that there is an extremely high dependence of iron species on pH in EC system. Finally, EC process using aluminium electrodes (better than iron ones) is proved highly efficient for HA removal (more than 70%) by charge neutralisation and adsorption (current density 16.6 A m^{-2} during 30 min at pH 7).

Keywords: Electrocoagulation; Mechanism; Iron; Humic acids; Aluminium

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