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On the controversial effect of sodium sulphate as supporting electrolyte on electrocoagulation process: A review

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ABSTRACT

One of the important factors for electrocoagulation (EC) process is the conductivity of the solution to be treated. Essential mechanisms in EC are charge neutralisation by metal (Fe/Al) hydroxocations and aggregation by van der Waals forces since flocculation of pollutants with metal is caused by their adsorption on metal hydroxide aggregates. In order to enhance the EC process efficiency in organic wastewater effluents, sodium sulphate (Na_2SO_4) has been used as a supporting electrolyte (SE) to increase the electric current diffusion in the EC cell. However, literature has reported controversial effect of sodium sulphate on EC process. This review tries to understand the sulphate effect on the EC reactions. Na_2SO_4 has been found less efficient than NaCl as SE in EC process for the removal of humic substances, oil-in-water emulsions, and fluoride. However, for unskimmed milk sample and cutting oil emulsion sulphate anions were found to be quite harmful both for electrical consumption and EC efficiency. These results may be related to the facts that in the sulphate media the 70% of the aluminium is in the form of $Al(OH)_{3(am)}$ and in the chloride media this percentage is around 40% and the adsorption of chloride or sulphate ions onto the surface of the $Al(OH)_{3(am)}$ can reduce the adsorption efficiency. Consequently, metal cations must be well distributed in the wastewater before the metal hydroxide formation to decrease the negative effect of SE in EC process.

Keywords: Electrocoagulation (EC); Supporting electrolyte (SE); Sodium sulphate; Coexisting anions; Chemical coagulation (CC)

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