COMPARATIVE STUDIES ON THE EFFICIENCY OF ALUMINIUM COAGULANTS

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Abstract

An alternative preparation method for PAC (pre-hydrolyzed aluminium chloride with general formula Alₘ(OH)ₙCl₃ₙ₋ₘ) by electrochemical synthesis is presented in this paper. The electrochemically obtained PAC (E-PAC), in which the most effective species of the polymeric Al component were estimated by ²⁷Al RMN method, with properties similar to the properties of a commercially available PAC solution, was successfully generated in a electrochemical reactor. For obtaining as much as Al₁₃ polymer by electrolysis process, optimum preparation conditions was selected and process was carried out in galvanostatic conditions at high electric current densities (i = 1.15 A dm⁻²). Furthermore, the coagulation properties of E-PAC was evaluated in laboratory scale for the treatment of Bega River as raw water source for potable utility of Timisoara town (Romania) and it was compared with the performance of a commercially available PAC solution and classical aluminium sulphate (alum), using the so-called “Jar test” procedure, in accordance with water treatment standards. Various chemical and instrumental methods were evaluated in order to assess the efficiency of the coagulation process in all situations (PAC, E-PAC and aluminium sulphate as coagulants). Also, after settling of samples, the scanning electron microscopy (SEM) coupled with a X-ray energy-dispersion detector (EDAX) was used for imaging and characterization of the Al(OH)₃-rich and Al₁₃-aggregate flocs. The relevant advantage in the use of E-PAC coagulant obtained in our laboratory, produced by an easily controlled electrolysis process, can by concluded from the efficiency of the water treatment by coagulation and lower residual aluminium concentration.

Key words: Al hydrolyzed speciation, coagulation, EDAX, Electrochemical Polyaluminiumchloride (E-PAC), SEM

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