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Novel inorganic-organic composite coagulants based on aluminium

N.D. Tzoupanos, A.I. Zouboulis*

Division of Chemical Technology, Department of Chemistry, Aristotle University of Thessaloniki, GR-54124, Greece
Tel. +30 2310-997794; Fax +30 2310997730; email: nitzou@chem.auth.gr, zoubouli@chem.auth.gr

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ABSTRACT

In this study, the preparation of a novel coagulant is examined, by introducing into PACl a cationic polyelectrolyte (CPE). For this purpose, poly-diallyldimethylammonium chloride (p-DADMAC) was used, a commonly applied cationic polyelectrolyte in water and wastewater treatment. Several possible derivatives of the composite coagulant were prepared, based on different CPE content (Al/CPE ratio, w/w). The products were characterized by means of polymerization degree (aluminium species distribution), chemical bonding (FT-IR spectroscopy), conductivity, turbidity and pH, in order to examine the impact of CPE addition in the properties of PACl. Moreover, their coagulation performance was evaluated for the treatment of contaminated tap water and compared to the respective performance of the combined application of PACl and CPE but as separated reagents. Finally, the kinetics of coagulation-flocculation was studied by aims of a photometric dispersion analyzer (PDA). From the results obtained it was revealed that despite the deterioration of the charge neutralization capability when the two reagents are combined into one, the composite coagulants are more efficient in water treatment due to more effective particles aggregation. The most important advantages of the new coagulants are the significant reduction of CPE dosage (or content) and the lower residual aluminium concentration. Specific attention has to be given to the CPE content, in order to produce an improved coagulant which can achieve efficient charge neutralization combined with enhanced particles aggregation, leading to more efficient and cost-effective treatment.

Keywords: Polyaluminium chloride; Composite coagulants; Cationic polyelectrolyte; p-DADMAC; Preparation; Characterization; Application

* Corresponding author.

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