

A new spectrophotometric method for determination of residual polydiallyldimethylammonium chloride flocculant in treated water based on a diazotization-coupled ion pair

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Abstract

Polydiallyldimethylammonium chloride (polyDADMAC) is a water-soluble cationic polyelectrolyte used for water treatment. Its residues in treated water are contaminants as they react with chlorine to produce a carcinogenic compound. Commonly-used techniques for quantification of the polycation, such as colloidal and potentiometric titration as well as ¹H NMR, have poor sensitivity and detection limits. This paper describes a more sensitive UV spectrophotometric method for quantitative determination of residual polyDADMAC in treated water, through formation of an ion pair with (4-hydroxy-1-naphthylazo) benzene-sulphonic acid (dye). The ion pair, which is a colloidal solid material, was characterised by FTIR, ¹³C NMR and ¹H NMR techniques. The colloid materials formed with different concentrations of polyDADMAC were dissolved in either N,N-dimethylformamide or 1,4-dioxane, followed by determination with UV spectrophotometry. The wavelength of maximum absorption (λ_{\max}) was found to be dependent on the solvent used, with 1,4-dioxane showing a better linear range of 0.1–1.8 mg·ℓ⁻¹ polyDADMAC. Varying the pH of the solutions had no significant effect on λ_{\max} .

Keywords: Polydiallyldimethylammonium chloride, flocculant, UV spectrophotometry, (4-hydroxy-1-naphthyl-azo) benzene-sulphonic acid, treated water