Sequential injection spectrophotometric determination of V(V) in environmental polluted waters

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Abstract

A fast and robust sequential injection analysis (SIA) methodology for routine determination of V(V) in environmental polluted waters is presented. The determination was based on the oxidation of dopamine (DP) by V(V) in acidic medium followed by coupling of the formed intermediary with 4-aminoantipyrine (4AAP) to yield a violet product (λ=565 nm).

The operation mode of the SIA system allowed the implementation of a stopped flow procedure in which the reaction zone was stopped for 180 s in the reaction coil before reaching the spectrophotometric detector, with the aim of increasing the sensitivity.

Linear calibration plots were obtained for V(V) concentrations between 0.50 and 5.0 $mg \cdot \ell^{-1}$. The developed methodology exhibits a good precision, with relative standard deviation (rsd) < 2.0% (n=15) and the detection limit was 0.39 $mg \cdot \ell^{-1}$.

The presented SIA methodology was applied to the determination of V(V) in 10 water samples and in a wastewater reference certified sample.

The determination of V(V) by the developed automatic procedure involved the consumption of 1.9 mg of 4AAP and 2.9 mg of DP and the production of 2.35 mℓ of effluent.

Keywords: sequential injection analysis (SIA), vanadium (V), environmental polluted water, spectrophotometric