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Simultaneous determination of total dissolved nitrogen and total dissolved phosphorus in natural waters with an on-line UV and thermal digestion

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Abstract

A flow injection method combined with an on-line UV and thermal digestion for simultaneous determination of total dissolved nitrogen (TDN) and total dissolved phosphorus (TDP) in natural waters was established in this study. A novel flow manifold made the proposed system compact and automatic. The conversion rates of various nitrogen and phosphorus compounds to their nitrate and phosphate forms with different digestion models and different concentrations were well investigated using the flow injection technique. The reagent concentrations for colorimetric analysis were optimized based on a univariate experimental design. The detection limits were $0.8 \mu\text{mol}\cdot\text{L}^{-1}$ and $0.2 \mu\text{mol}\cdot\text{L}^{-1}$, and linear analytical ranges were up to $300 \mu\text{mol}\cdot\text{L}^{-1}$ and $25 \mu\text{mol}\cdot\text{L}^{-1}$ for TDN and TDP, respectively. The sample throughput was $\sim 5 \text{ h}^{-1}$. The recovery of spiked natural water samples varied from 86.8% to 102.6% for TDN and 88.0% to 102.0% for TDP. The present approach was successfully applied for the determination of TDN and TDP in natural water samples and was found to have good agreement with reference methods. The outcomes of present study indicated that the proposed method is suitable for routine analysis as well as for potential on-line monitoring.

Keywords:

Simultaneous determination, Total dissolved nitrogen, Total dissolved phosphorus, Flow injection analysis, UV and thermal digestion

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