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Bimodal optoelectronic flow-through detector for phosphate determination

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ABSTRACT

A miniature flow-through detector useful for bimodal, photometric and fluorimetric, determination of phosphates has been developed. This optoelectronic device made of four light emitting diodes (LEDs) integrated in the form of 85 μL optical cell is easily applied in flow analysis manifolds. These LEDs play the roles of light source for photometric measurements, fluorescence inductors and detector of absorbance and fluorescence. For photometric mode of determinations phosphomolybdenum blue method has been applied. The fluorimetric method of phosphate determination is based on quenching of rhodamine fluorescence by the heteropolyacid. The developed detector used in simple three-channel flow injection analysis (FIA) system allows photometric or fluorimetric determination of phosphate in the wide range of concentration. The detection limits found for photometric and fluorimetric modes of FIA measurements are $5.5 \text{ mg}\cdot\text{L}^{-1}$ and $10.4 \text{ }\mu\text{g}\cdot\text{L}^{-1}$, respectively. The potential utility of the flow-through detector for the needs of food and clinical analysis has been demonstrated.

Highlights

- Bimodal flow-through analytical detector made of four LEDs has been developed.
- This optoelectronic device can operate as photometric or fluorimetric detector.
- The detector allows phosphate determination in ppb-ppm range of concentrations.

Keywords:

Phosphate, Photometry, Fluorimetry, Flow analysis, Optoelectronic detector

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