

Spectrophotometric method for the determination of phosphorus in natural waters using the bismuth-phosphomolybdate complex

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Abstract

A very simple, easy and sensitive spectrophotometric manual determination method of phosphorus for the P-PO_4^{3-} ion in natural waters, based on formation of the blue bismuth-phosphomolybdate complex (BiPMo), was developed. Ascorbic acid is used for the reduction of bismuth-phosphomolybdic acid to bismuth-phosphomolybdate complex. Beer's law is obeyed for the concentration range to $0.6 \text{ mg}\cdot\ell^{-1}$ (aqueous solution) and to $1.2 \text{ mg}\cdot\ell^{-1}$ P (IBMK). The effect of foreign ions on absorbance was examined. Ions do not affect the spectrophotometric determination of phosphorus using the BiPMo complex at concentrations usually found in natural waters.

The limit of detection (blank + 3 S.D.) was $0.0059 \text{ mg}\cdot\ell^{-1}$ (aqueous solution) and $0.0050 \text{ mg}\cdot\ell^{-1}$ (IBMK) using the bismuth-phosphomolybdate complex (BiPMo). The P-PO_4^{3-} in river water, mineral water and spring water was determined by this method. The results obtained by the proposed method are compared with those of the phosphoantimonylmolybdenum blue method. The method of standard addition was also applied to the determination of phosphorus in natural waters.

Keywords: spectrophotometry, phosphorus determination, natural waters, bismuth-phosphomolybdate complex