Research Note:

THE MOLYBDENUM-BLUE METHOD FOR THE DETERMINATION OF PHOSPHORUS IN BRAY NO 2 EXTRACT OF SOILS, USING 1-amino-2-naphthol-4-sulphonic acid REDUCING AGENT

A J VAN VUUREN, Fedmis (Pty) Ltd

Object

Determination of rate of formation of, and optimum wavelength of the molybdenum-blue complex in the presence of Bray No 2.

Reagents

(a) Bray No 2: Dissolve 1,134 g NH_4F, acidify with 10 cm^3 conc HC1 and dilute to one litre.

(b) Ammonium molybdate reagent: (i) Dissolve 31,4 g $(NH_4)_6\ Mo_7O_{24}.4H_2O$ in ca 200 cm^3 deionized water, (ii) Dilute 252 cm^3 conc H_2SO_4 with 400 cm^3 deionized water. Cool and add 3,4 cm^3 conc HNO_3. Add to (i) and dilute to one litre.

(c) Reducing reagent: weigh out separately: (i) 0,75 g 1-amino-2-naphthol-4-sulphonic acid, (ii) 42 g anhydrous sodium sulphite, (iii) 70 g anhydrous sodium metabisulphite. Grind (i) with a small portion of (iii). Dissolve the remaining salts in ca 900 cm^3 deionized water. Dissolve the sulphonic acid in this mixture and dilute to one litre. Store in a brown glass bottle.

(d) Standard phosphorus solution: A suitable solution was made up from Analar KH_2PO_4.

Method

A suitable volume of standard phosphorus solution was pipetted into 15 cm^3 Bray No 2, and diluted to 50 ml with water; 2 cm^3 ammonium molybdate reagent and 2 cm^3 reducing reagent were added successively with mixing.

Kinetic Data

The rate of development of the blue complex was studied by using a Vitatron digital spectrophotometer at 6900 Angström with a 1 cm glass cell. A phosphate concentration of 9,751 x 10^{-5} moles P dm^{-3} (3,02 ppm P) in the final solution was used (Refer to Figure 1).

Optimum Wavelength

This determination was carried out on a Beckman scanning spectrophotometer, fitted with a 1 cm silica cell, scanning three concentrations of phosphorus.

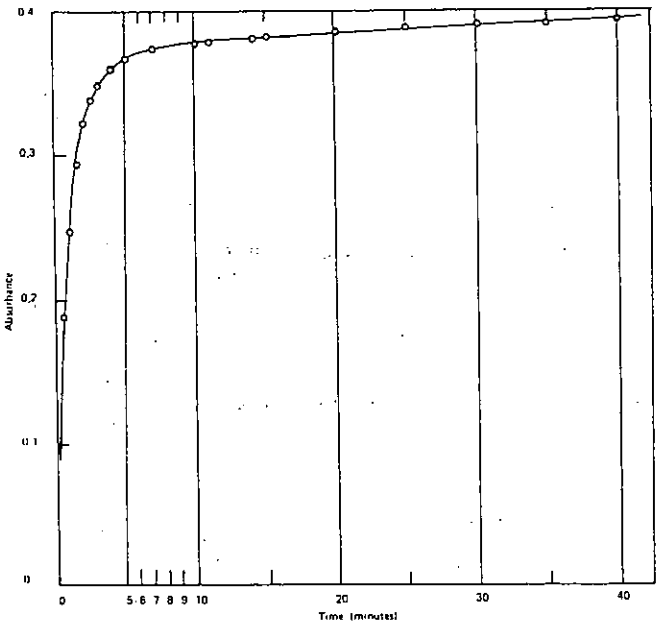

FIG 1 Rate of development of the blue complex

All scans were started exactly five minutes after adding the reducing reagent in order to reach maximum absorption of light between 8 and 10 minutes. This was done to ensure no change in absorbance due to increase in molybdenum blue concentration during this period (Refer to Figures 2a & 2 b).

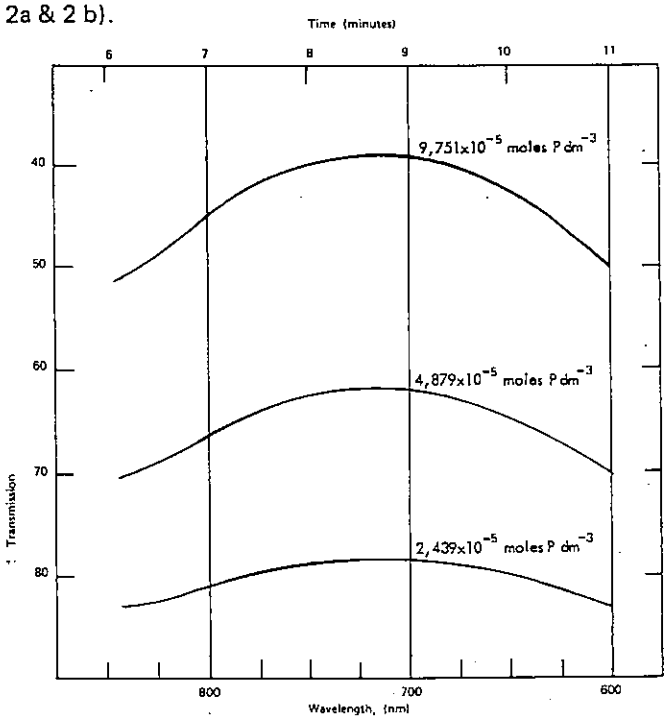

FIG2a Wavelength scan to determine peak absorbance (valleys in transmission) for the molybdenum blue complex