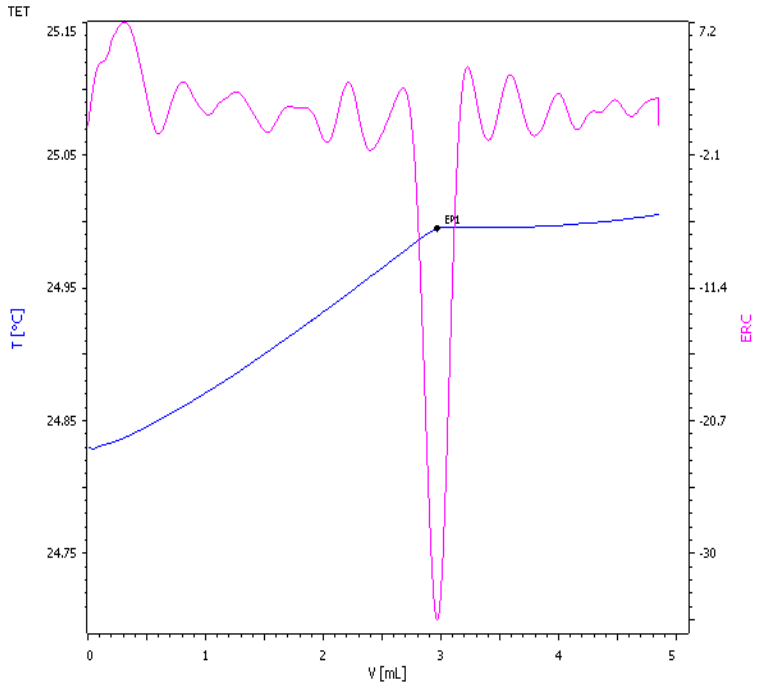
Titration Application Note H-147

Potassium in fertilizers

Rapid and reliable determination by thermometric titration



Potassium is a primary macronutrient for plants, as it plays an important role in water regulation as well as plant growth. In NPK fertilizers, potassium is present besides nitrogen and phosphorus, which are the other two primary macronutrients. Knowing the quality and content of a NPK fertilizer allows an optimal fertilizer management for a planned culture, saving costs and increasing profitability.

Traditionally potassium is determined gravimetrically or by flame photometry. In this Application Note, an alternative method is presented, where potassium is determined a precipitation titration. Various solid and liquid NPK fertilizers with potassium contents between 10 and 27% were analyzed. After the removal of any present ammonia, the potassium can be determined reliably in about 5 minutes.

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Method description

Sample

Two liquid NPK fertilizers

Four solid NPK fertilizers

Sample preparation

To remove any present ammonia, approximately 10 g of liquid NKP fertilizer or approximately 5 g solid NPK fertilizer is weighted into a 250 mL glass beaker and filled to about 100 mL with deionized water. The glass beaker is heated to approximately 300 °C for 30 min while constantly stirring. The sample solution is allowed to cool down and is then transferred to a 100 mL volumetric flask. Solid NPK fertilizer solutions are filtrated into a 100 mL volumetric flask and the filter paper is rinsed well with deionized water. Afterwards, 2 mL 20% NaOH is pipetted to the solution and the flask is then filled up to the mark with deionized water

Configuration

859 Titrotherm	2.859.1010
800 Dosino	2.800.0010
Dosing unit 50 mL	6.3032.250
Thermoprobe HF	6.9011.040

Solutions

Titrant c(STPB)= 0.3 mol/L	51.6 g STPB is weighed into a 500 mL volumetric flask and dissolved in approximately 250 mL deionized water. The flask was then filled to the mark with deionized water.

Analysis

0.5 to 6.0 mL sample solution is pipetted into the titration vessels and is made up to a total volume of approximately 30 mL with deion. water. The sample is titrated with c(STPB)= 0.3 mol/L until after the exothermic endpoint.

Parameters

Mode	TET
Start volume	0 mL
Pause	60 s
Stirrer	15
Dosing rate	1 mL/min
Filter factor	40
Damping until	0.2 mL
Stop volume	10 mL
Evaluation start	0.2 mL
Reaction type	Exothermic
EP criterion	-10

Result

Sample no. (n = 5)	Potassium / %	s(abs) / %
Liquid NPK fertilizer 1	9.94	0.07
Liquid NPK fertilizer 2	11.48	0.07
Solid NPK fertilizer 1	26.85	0.13
Solid NPK fertilizer 2	13.70	0.49
Solid NPK fertilizer 3	14.13	0.10
Solid NPK fertilizer 4	12.98	0.15

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