

Application Note AN-H-148

Potassium in potash

Rapid and inexpensive determination by thermometric titration

Potash refers to various water-soluble potassium salts, such as potassium chloride or potassium carbonate. Potash is mainly used as fertilizer, providing potassium—an essential nutrient—to plants. Additionally, it is used in the chemical industry and to produce medicine.

Potash is commonly mined from ore, deposited after ancient inland oceans evaporated. The potassium salt is then purified in evaporation ponds. At the end of this process, the potash is typically obtained as potassium chloride.

Historically, potassium is determined by precipitation with sodium tetraphenylboron (STPB). The disadvantage of this gravimetric method is the long waiting time until a result is obtained. Currently, the potassium content in potash is typically determined by flame photometry (F-AES) or ICP-OES. However, these techniques have high investment and running costs.

By applying the gravimetric precipitation reaction as a thermometric titration, it becomes possible to rapidly and inexpensively determine the potassium content in potash within minutes.

SAMPLE AND SAMPLE PREPARATION

This application is demonstrated on different potash samples as well as pure potassium chloride. No sample preparation is required.

EXPERIMENTAL

The analysis is carried out with an OMNIS Titrator equipped with a dThermoprobe (Figure 1). The titration is based on the precipitation of potassium with sodium tetraphenylboron (STPB).

An appropriate amount of sample is weighed precisely into the titration vessel. Deionized water is added to dissolve the sample, which is then titrated until after the exothermic endpoint with standardized STPB.



Figure 1. OMNIS Titrator setup for the thermometric titration. Data evaluation is performed with the OMNIS software.

RESULTS

Reproducible titration curves with clear exothermic endpoints are obtained. One exemplary titration curve is shown in Figure 2. Table 1 shows a summary of the results for different potash samples. As can be seen, all values agree well with the expected potassium content.

Table 1. Results of the thermometric titration of potassium in potash expressed as potassium chloride and pure KCl (n = 3). The expected potassium content of the potash samples is given in parentheses next to the sample name.

	Potassium / % KCl	SD(rel) / %
KCl	99.95	0.31
K419 (95.98%)	95.98	0.24
K422 (95.09%)	94.96	0.10
K423 (98.89%)	98.93	0.11

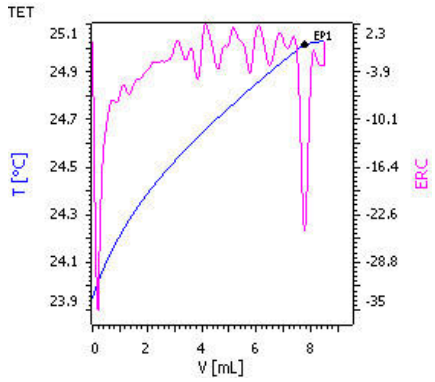


Figure 2. Titration curve of thermometric determination of potassium in potash by precipitation titration with STPB.

CONCLUSION

Thermometric titration is a very fast and accurate method to determine the potassium content in potash within minutes. Additionally, it provides an inexpensive alternative analysis method in comparison to F-AES or ICP-OES.

Internal reference: AW TI CA1-0155-112014

CONTACT

Metrohm SA
1 Bridle Close
2052 Woodmead
sales@metrohm.co.za

CONFIGURATION



OMNIS Titrator with magnetic stirrer, without function license

Innovative, modular potentiometric OMNIS Titrator for stand-alone operation or as the core of an OMNIS titration system. Thanks to 3S Liquid Adapter technology, handling chemicals is more secure than ever before. The titrator can be freely configured with measuring modules and cylinder units and can have a stirrer added as needed. Thanks to various software function licenses, various measuring modes and functionalities are possible.

- Control via PC or local network
- Connection option for up to four additional titration or dosing modules for additional applications or auxiliary solutions
- Connection option for one rod stirrer
- Various cylinder sizes available: 5, 10, 20 or 50 mL
- Liquid Adapter with 3S technology: Secure handling of chemicals, automatic transfer of the original reagent data of the manufacturer

Measuring modes and software options:

- Endpoint titration: "Basic" function license
- Endpoint and equivalence point titration (monotonic/dynamic): "Advanced" function license
- Endpoint and equivalence point titration (monotonic/dynamic) with parallel titration: "Professional" function license



dThermoprobe

High-sensitivity digital temperature sensor for thermometric titration with OMNIS.

The Thermoprobe has a short response time and a high resolution, which enables precise recording of even the smallest temperature changes.

This sensor can be used in aqueous and nonaqueous solutions which do not contain any HF, for determinations such as:

- Acid number (TAN) in accordance with ASTM D8045
- Total base number (TBN)
- Free fatty acids
- Ca/Mg determination
- Phosphate



Cylinder unit OMNIS special, 10 mL

Intelligent 10 mL cylinder unit for one OMNIS Titrator, Titration Module or Dosing Module. This cylinder unit is especially recommended for the following solutions:

- Aqueous alkaline solutions
- Titrant 5
- Silver nitrate solutions
- Nonaqueous alkaline solutions
- Permanganate solutions
- EDTA solutions

Includes dosing tubing and antidiffusion tip.

OMNIS

A WHOLE NEW LEVEL OF PERFORMANCE

Function license Thermometric Titrator

Function license "Thermometric Titrator" for the OMNIS Titrator

Contains the function modes

- Thermometric Titration (TET)
- MEAS U/T/pH
- Liquid Handling
- Titration only with internal buret of an OMNIS Titrator