

Application Note AN-T-216

Assay of lithium nitrate

Reliable and fully automated determination by potentiometric titration

Lithium nitrate is an oxidizing agent used in the manufacture of red-colored fireworks and flares. In addition, the lithium nitrate trihydrate compound absorbs heat well and can be used for thermal energy storage at its melting temperature of 30 °C.
Lithium nitrate is a hygroscopic substance and therefore the purity needs verification before it is used for synthesis or other applications.

The purity can be easily determined using a fully automated titration system. The assay is done by a precipitation titration between lithium and fluoride in an ethanolic solution. The benefit of titration is that the lithium nitrate does not need to be diluted after dissolving in ethanol as with other techniques such as ICP-MS.

SAMPLE AND SAMPLE PREPARATION

The application is demonstrated on lithium nitrate with a purity of >98%. No sample preparation is needed.

EXPERIMENTAL

This analysis is carried out on an automated system consisting of an OMNIS Advanced Titrator and an OMNIS Sample Robot S equipped with a fluoride ion selective electrode.

After weighing the sample into the sample beaker, all further steps are automatically carried out by the system. The assay is performed by a precipitation titration with ammonium fluoride in an ethanolic solution.



Figure 1. OMNIS Sample Robot, OMNIS Dosing module, and OMNIS Advanced Titrator equipped with fluoride ion selective electrode for the assay of lithium nitrate.

RESULTS

With this method a purity of 100.85% (n = 5, SD(rel) = 0.45%) is determined. This value corresponds to the theoretical value of > 98%.

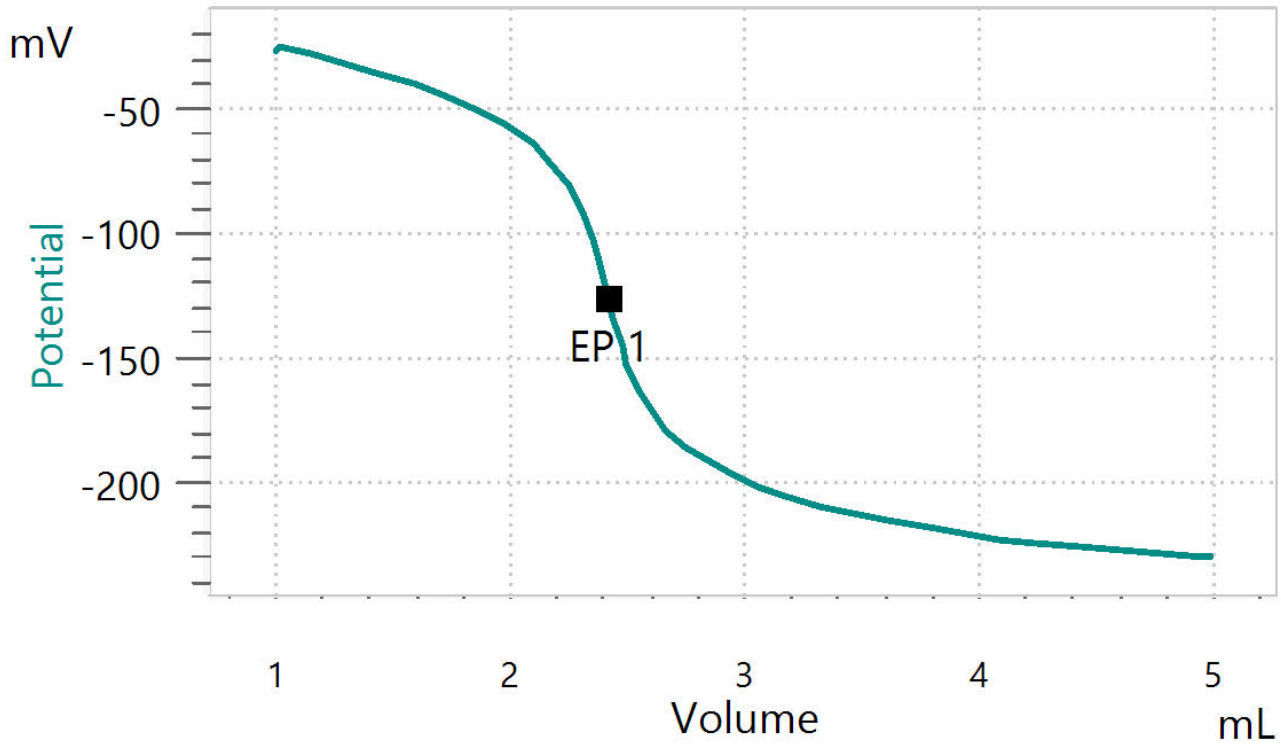


Figure 2. Example titration curve of the assay of lithium nitrate.

CONCLUSION

Titration is a precise and reliable method to determine lithium nitrate. In comparison to other techniques such as ICP-MS, it is not necessary to dilute the lithium nitrate sample, greatly increasing the accuracy of the analysis.

Using an OMNIS Sample Robot allows the fully automated measurement of up to four samples simultaneously. The OMNIS System offers the opportunity to customize the system according to your needs, and expand it for other required titration applications.

Internal reference: AW I CH1-1303-052020

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CONFIGURATION



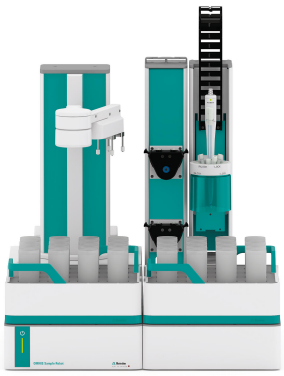
OMNIS Advanced Titrator with magnetic stirrer

Innovative, modular potentiometric OMNIS Titrator for stand-alone operation or as the core of an OMNIS titration system for endpoint titration and equivalence point titration (monotonic/dynamic). 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 rod stirrer added as needed. If required, the OMNIS Advanced Titrator can be equipped for parallel titration via a corresponding software function license.

- 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 from 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



OMNIS Sample Robot S Pick and Place

OMNIS Sample Robot S with a "Peristaltic" (2-channel) pump module and a Pick&Place module in addition to extensive accessories for the direct transition to fully automatic titration. The system provides space in two sample racks for 32 sample beakers of 120 mL each. This modular system is supplied completely installed and can thus be put into operation in a very short time.

The system can also be extended upon request to include two additional peristaltic pumps and another Pick&Place module, thus doubling the throughput. If additional workstations are required, then this Sample Robot is already able to be expanded to become an L-sized OMNIS Sample Robot, thus enabling samples from seven racks to be processed in parallel on up to four Pick&Place modules and quadrupling the sample throughput.



Combined dF-ISE with Pt1000

Combined digital fluoride-selective electrode with crystal membrane for OMNIS Software with integrated Pt1000 temperature sensor. This ISE is suitable for:

- Ion measurements of F-
- Automated ion measurements
- Titrations

Reference electrolyte: c(KCl) = 3 mol/L
The electrode is stored in the reference electrolyte.
dTrodes can be used on OMNIS Titrators.