Application Note AN-T-215

Assay of lithium hydroxide and lithium carbonate

Precise and reliable determination by potentiometric titration

Lithium salts (e.g., lithium carbonate and lithium hydroxide) are used in many applications such as the production of electrolyte and cathode materials in lithium ion batteries. Furthermore, lithium hydroxide is used for the production of lithium stearate, an important lubricant for cars and airplanes. In addition, it is utilized as an air purifier due to its ability to bind carbon dioxide.

While the majority of lithium carbonate is used for aluminum production, it is also used for the glass and ceramic industry. Lithium carbonate lowers the melting point of these materials. Thus, the electricity costs are cheaper to produce them. Additionally, it is a treatment of mental illnesses such as depression or bipolar disorder.

For all of these applications, it is important to know the quality of the pure lithium salts used in the various production processes. This Application Note presents an easy method for the assay of lithium hydroxide and lithium carbonate on an automated OMNIS system.

SAMPLE AND SAMPLE PREPARATION

Lithium hydroxide and lithium carbonate can be directly analyzed without any sample preparation. For the assay of lithium hydroxide, it is of importance that the water is free from carbon dioxide, otherwise this would interfere with the titration.

EXPERIMENTAL

Both assays are carried out on an automated system consisting of an OMNIS Sample Robot S and an OMNIS Advanced Titrator equipped with a dEcotrode plus.

After the sample is weighed into the beakers, the dilution and titration of the sample is automatically done by the system. The sample is titrated with hydrochloric acid until after the equivalent point.

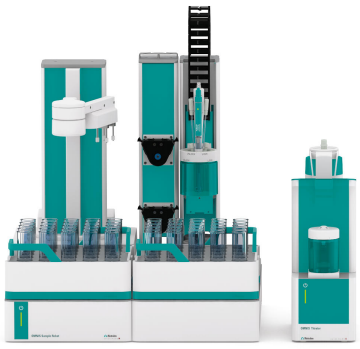

Figure 1. Sample Robot and OMNIS Titrator Advanced equipped with dEcotrode plus for the assay of lithium hydroxide and lithium carbonate.

RESULTS

For both assays, reproducible results with relative standard deviations below 0.4% (n = 5) are obtained.

Additionally, carbonate impurities within the lithium hydroxide sample can be detected.

Table 1. Results of the assay of lithium hydroxide and lithium carbonate.

n = 5	Purity of LiOH in %	Purity of Li_2CO_3 in %
Mean	99.20	100.78
SD(abs)	0.24	0.34
SD(rel)	0.24	0.34

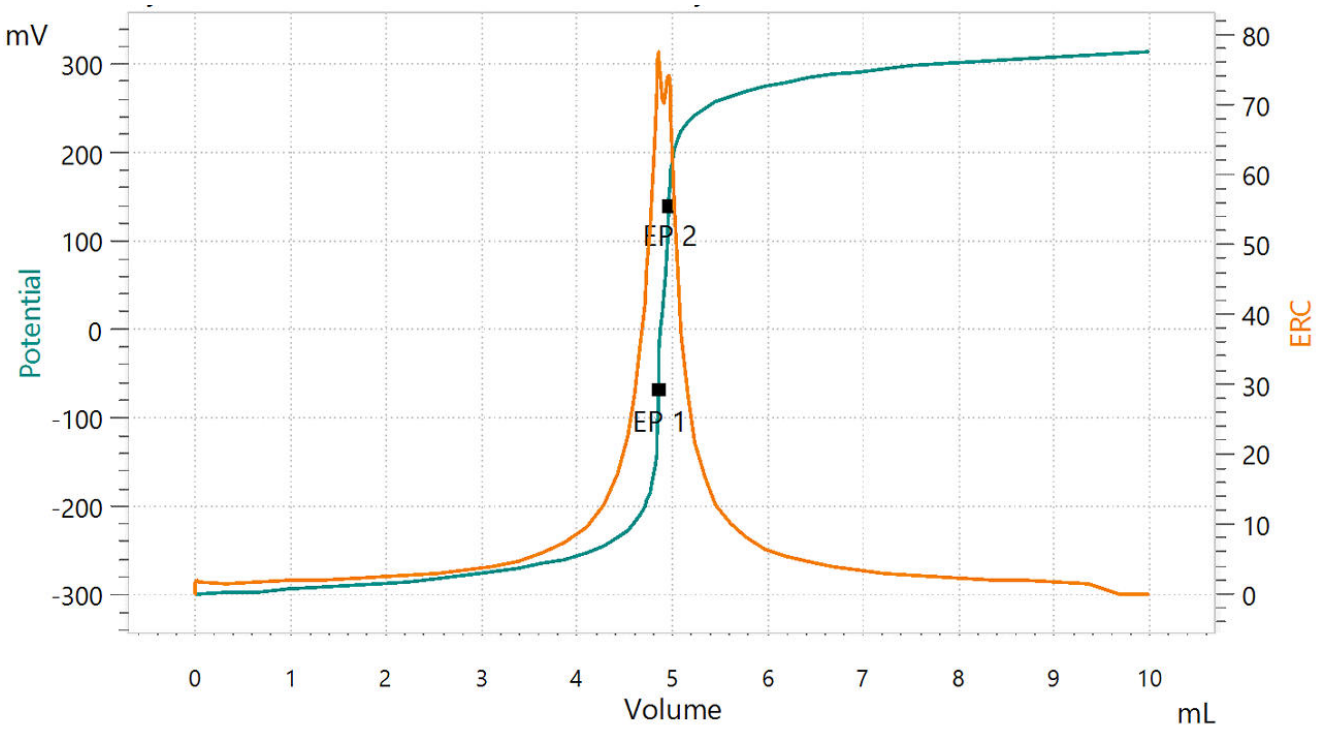

Figure 2. Titration curve of the assay of lithium hydroxide. The second equivalence point corresponds to lithium carbonate impurities.

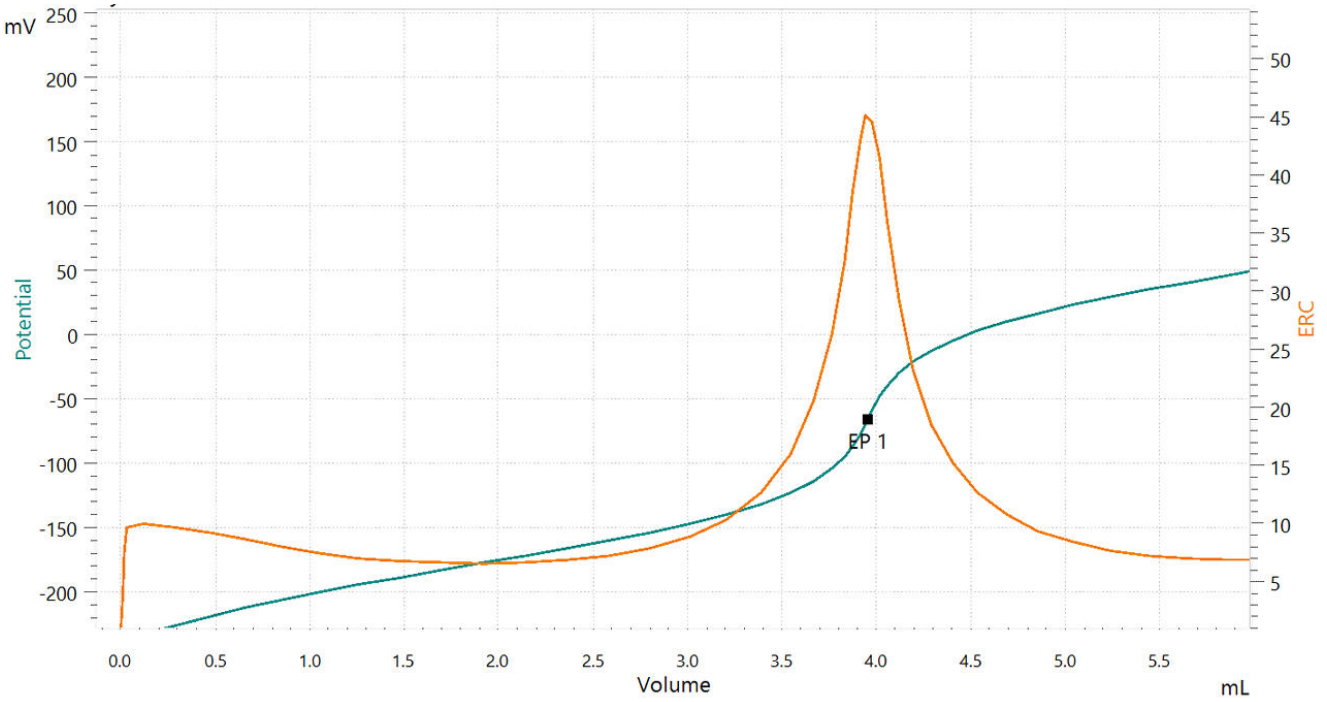

Figure 3. Titration curve of the assay of lithium carbonate.

CONCLUSION

Titration is a precise and reliable method for the assay of lithium hydroxide and lithium carbonate.
Using an automated OMNIS system allows you to analyze up to four samples simultaneously. The OMNIS system can be customized according to your needs, and expanded for other titration applications required for quality control.

Internal reference: AW TI CH1-1302-042020

CONTACT

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CONFIGURATION

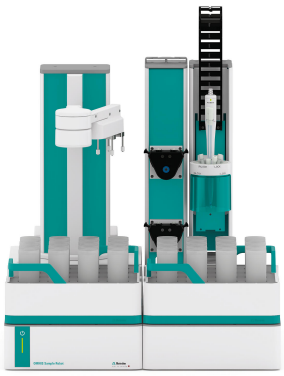
OMNIS Advanced Titrator without stirrer

Innovative, modular potentiometric OMNIS Titrator for endpoint titration and equivalence point titration (monotonic/dynamic). Thanks to 3S Liquid Adapter technology, handling chemicals is safer than ever before. The titrator can be freely configured with measuring modules and cylinder units and can have a stirrer added as needed. If required, the OMNIS Advanced Titrator can be additionally equipped for parallel titration with 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
- Can be supplemented with magnetic stirrer and/or rod stirrer
- Various cylinder sizes available: 5, 10, 20 or 50 mL
- Liquid Adapter with 3S technology: Safe 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.

dEcotrode Plus

Digital, combined pH electrode for OMNIS.
The electrode is suitable for aqueous acid/base titrations.
The fixed ground-joint diaphragm is insensitive to contamination.
Reference electrolyte: c(KCl) = 3 mol/L, storage in storage solution.
dTrodes can be used on OMNIS Titrators.