AN-T-181

Lithium in brine

Reliable and inexpensive determination by potentiometric titration

Summary

Lithium is a soft metal which is used for many applications, such as production of high-temperature lubricants or heat-resistant glass. Furthermore, lithium is used in large quantities for battery production. It is obtained from brines and high-grade lithium ores. Depending on the lithium concentration, extraction may or may not be economically viable.

This Application Note demonstrates a method to determine the lithium concentration in brines by potentiometric titration. Lithium and fluoride precipitate in ethanol as insoluble lithium fluoride. Using ammonium fluoride as titrant and a fluoride ion selective electrode (ISE), determination of lithium via potentiometric titration is possible.

This method is more reliable, faster, and less expensive than the determination of lithium in brine by other more sophisticated techniques such as atomic absorption spectroscopy (AAS).

Configuration

2.907.0020 - 907 Titrando

High-end titrator for potentiometric and volumetric Karl Fischer titration with two measuring interfaces and Dosino dosing units. up to four dosing device systems of the 800 Dosino type; dynamic (DET), monotonic (MET) and endpoint titration (SET), enzymatic and pH-STAT titrations (STAT), Karl Fischer titration (KFT); "iTrode" intelligent electrodes; Measurement with ion-selective electrodes (MEAS CONC); Dosing functions with monitoring, liquid handling; four MSB connectors for additional stirrers or dosing device systems; USB connector; For use with OMNIS Software, tiamo software, or Touch Control; Complies with GMP/GLP and FDA regulations such as 21 CFR Part 11, if required;

6.00500.600 - Combined F-ISE with Pt1000

Combined fluoride-selective electrode with crystal membrane with integrated Pt1000 temperature sensor.This ISE is suitable for: Ion measurements of F- (10-6 mol/L to sat.); Automated ion measurements; Titrations; Reference electrolyte: c(KCl) = 3 mol/LThe electrode is stored in the reference electrolyte.

Sample and sample preparation

Two samples with ~20% (m/m) and ~40% (m/m) lithium chloride are analyzed. No further sample preparation is required.

Experimental

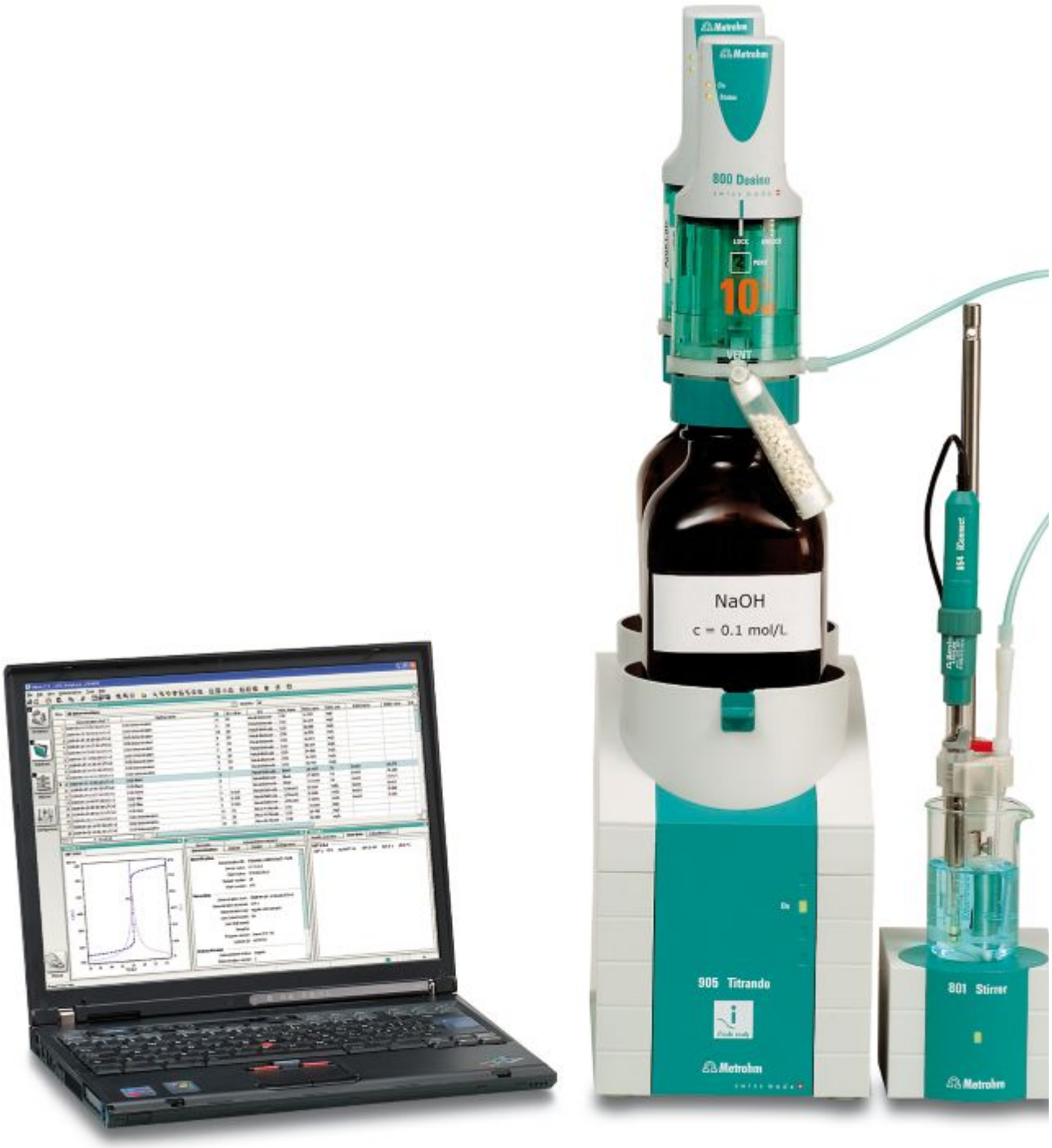

Figure 1. 905 Titrando with tiamo. Example setup for the analysis of lithium in brine.

The analysis is carried out with an automated system consisting of ***tiamo***™ in combination with a 905 Titrando. A fluoride ion selective electrode (ISE) in combination with a Long Life ISE reference electrode is used for the indication of the titration.

After transferring an appropriate amount of sample into the titration vessel, enough ethanol is added to cover the diaphragm of the electrode. The titration is carried out using ammonium fluoride until after the first equivalence point is reached.

Calcium will interfere with the analysis and has to be analyzed separately.

Results

For both samples this method gave reliable and reproducible results.

Table 1. Results of the lithium determination in brines.

n = 3	Assay of LiCl brine 1 in %	Assay of LiCl in brine 2 in %
Mean	41.3	14.85
SD(abs)	0.7	0.11
SD(rel)	1.6	0.7

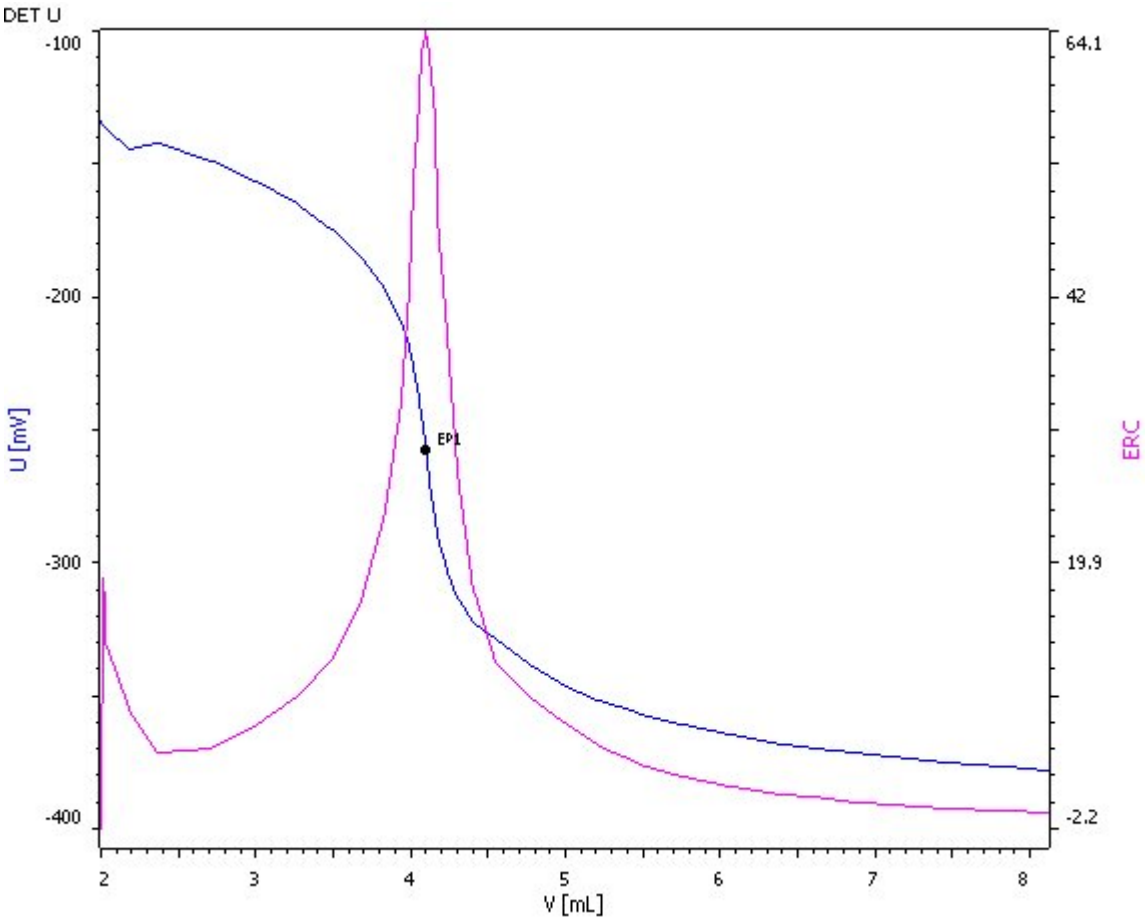

Figure 2. Example curve of the lithium determination in brines.

Conclusion

Using ethanol as solvent, ammonium fluoride as titrant, and the fluoride ISE for indication, the determination of lithium in brine can be performed reliably and cost-efficiently.

Therefore, this method provides an inexpensive and simple approach to determine if an extraction of lithium from brine is economically feasible or not.

Metrohm USA
9250 Camden Field Pkwy
33578 Riverview, FL
info@metrohmusa.com
tel:866-METROHM