

Application Note AN-T-102

Standardization of hydrochloric acid with TRIS

Correct titer improves the accuracy of results

Titrants are normally bought ready to use. However, the certified value is only valid at a defined temperature because the titrant density varies with temperature. With time and especially after opening the bottle of your titrant, the properties thereof will change because of evaporation of water and uptake of carbon dioxide. Due to these facts, it is necessary to determine the accurate concentration of your titrant solution on a regular basis using a primary standard. To correct the mentioned variation, a socalled «titer factor» is applied.

In case of hydrochloric acid as titrant, the primary standard to use is TRIS (Tris(hydroxymethyl)aminomethan). TRIS is inert, does not sublimate, and reacts with hydrochloric acid according to a defined chemical reaction.

The titer can be easily and quickly assessed by using the Metrohm brand of autotitrators. Predefined calculation formulas implemented in Metrohm titrators or software, respectively, as well as the automatic storage of the titer factor, makes standardization a simple task.

SAMPLE AND SAMPLE PREPARATION

High purity TRIS is used for the standardization of hydrochloric acid. TRIS is dried in a drying oven for several hours and allowed to cool down to ambient temperature in a desiccator.

EXPERIMENTAL

An appropriate amount of TRIS standard is added accurately to a beaker and dissolved with deionized water. The solution is titrated against hydrochloric acid until after the equivalence point is reached.

The sample size must be chosen according to the buret volume (equivalence point between 10–90% of buret volume).

If a small cylinder unit (2 or 5 mL cylinder unit) is used for titration, it is recommended to make a stock solution and use an aliquot thereof for titration. This increases the accuracy for these burets.



Figure 1. 905 Titrando with tiamo. Example setup for the titer determination of hydrochloric acid.

RESULTS

A six-fold determination exhibited a mean titer value of 1.0069 with an absolute standard deviation of 0.0037 and a relative standard deviation of 0.37%.

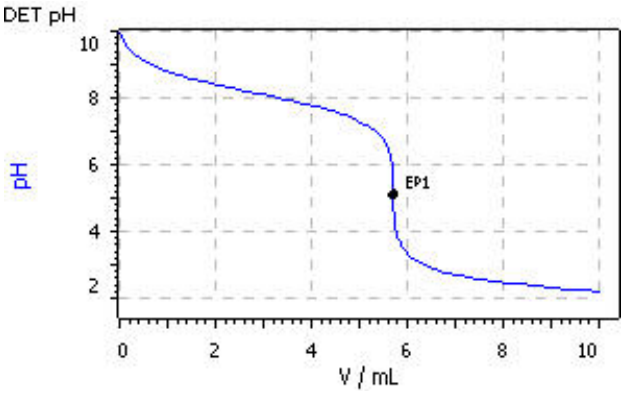


Figure 2. Example curve of a titer determination of hydrochloric acid with TRIS as primary standard.

CONCLUSION

The determination of the titer of hydrochloric acid is performed both quickly and reproducibly.
Easy, fast, and precise titer determination using Metrohm autotitrators results in reliable titration analyses. Predefined calculation formulas implemented in these titrators or software, respectively, as well as the automatic storage of the titer factor makes standardization a simple task.

CONTACT

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CONFIGURATION



905 Titrando

High-end titrator for potentiometric titration with one measuring interface for use with Dosino dosing systems.

- up to four dosing systems of the 800 Dosino type
- dynamic (DET), monotonic (MET), and endpoint titration (SET)
- Measurement with ion-selective electrodes (MEAS CONC)
- Dosing functions with monitoring, Liquid Handling
- four MSB connectors for additional stirrers or dosing systems
- "iTrode" intelligent electrodes
- USB connector
- For use with OMNIS Software, *tiamo* software, or Touch Control unit
- Compliance with GMP/GLP and FDA regulations such as 21 CFR Part 11, if required



Unitrode

Combined pH electrode for pH titrations. This electrode is particularly suitable:

- for pH titrations in difficult, viscous, or alkaline samples
- at elevated temperatures

The fixed ground-joint diaphragm is insensitive to contamination.

Reference electrolyte: c(KCl) = 3 mol/L, storage in storage solution.
Alternatively: reference electrolyte for measurements at T>80°C: Idrolyte, storage in Idrolyte.