Application Note AN-T-154

Determination of alpha acids in hops according to EBC 7.4

Conductometric titration to test hops for alpha acid content

Hops are a key ingredient in beer production, contributing not only bitterness but also to its aroma and flavor. The alpha acid level (AA%) in hops plays a major role in the bitterness they can impart. During boiling in the brewing process, alpha acids transform into iso-alpha acids which make the beer bitter. For this reason, it is important for brewers to know the exact AA value of the hops they use.

Different hop varieties contain varying amounts of alpha acids—even the same hop variety may exhibit different levels. This also depends on factors such as growing conditions and harvesting time. The AA% can vary between 1% up to 20% in hops. Therefore, brewers maintain the consistency of their beer's flavor profile by accurately measuring and controlling the AA content.

This Application Note describes the determination of AA% in hops according to the EBC method 7.4. The hops are first extracted with toluene, then the alpha acid content in the extract is determined through a precipitation titration using conductometric methods.

SAMPLES

Dried hop pellets, Solero variety (16% AA)

EXPERIMENTAL

The hop pellets are first extracted with toluene. For the analysis, an aliquot of the prepared sample is pipetted into the sample beaker and then methanol is added. The solution is then titrated with standardized lead acetate in methanol/glacial acetic acid until after the equivalence point (Figure 1).

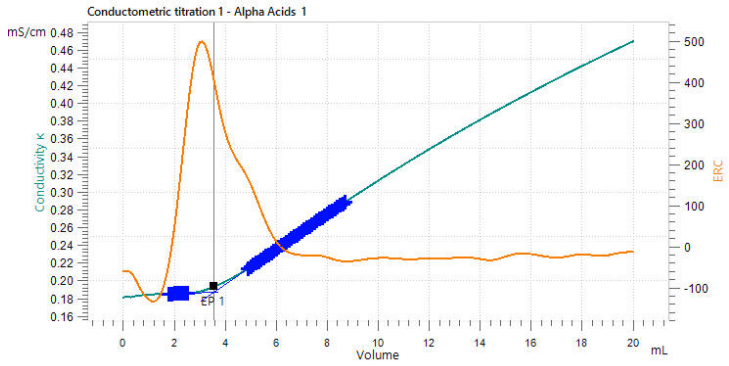

Figure 1. Example titration curve to determine alpha acid content in hop pellets.

RESULTS

The AA% could be reliably determined in hops with conductometric titration (Table 1).

Table 1. Results of the sample determination of alpha acid content in Solero hop pellets.

Sample	Result wt%	RSD in %
Solero	4.5	2.7

CONCLUSION

Alpha acid content in hop pellets can be easily determined by using conductivity titration according to EBC method 7.4. A significant advantage over other methods is the robust sensor used for the analysis. It is not influenced by external disturbances and is easy to clean. This quality also simplifies implementing automation of the system.

The pellets' alpha acid content decreases over time. Therefore, this parameter should be measured again shortly before their use for the best results.

Internal reference: AW CH1-1116-122011

CONTACT

Metrohm Turkey
Ayazağa Mah. Azerbaycan
Cad. No. 3I
34396 İstanbul
info@metrohm.com.tr

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

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Function license Conductometric titrator

Function license "Conductometric titrator" for the OMNIS Titrator

Contains the function modes

- MET COND
- MEAS U/T/pH/COND
- Liquid Handling
- Titration only with internal buret of an OMNIS Titrator

Measuring module conductivity

Measurement channel for one OMNIS Titrator or Titration Module for the connection of conductivity measuring cells.

5-ring conductivity measuring cell c = 0.7 cm-1 with Pt1000 (fixed cable 0.65 m)

5-ring conductivity measuring cell with cell constant c = 0.7 cm^{-1} (guide value), with integrated Pt1000 temperature sensor and with fixed cable (0.65 m) for connecting to the OMNIS Measuring Module Conductivity.

This sensor is suitable for measurements of medium conductivities (5 µS/cm to 20 mS/cm), e.g., in:

- Drinking water
- Surface water
- Waste water