Application Note AN-T-243

Sulfite determination in beet sugar

Automatic titration of sulfites in beet sugar

Sugar production is on the rise from sources like beets. Recent reports show an increase in beet sugar production due to improved crop varieties, advanced harvesting technologies, and expanded acreage in certain regions – particularly in the United States where beet sugar production is currently at a record high [1].

While primarily composed of sucrose, beet sugar can also contain naturally occurring sulfite compounds. These compounds, typically present in trace amounts, originate from various sources within the beet itself. Understanding the levels and distribution of these naturally occurring sulfites is important for assessing potential health implications and ensuring compliance with food safety regulations.

The known methodology for sulfite determination is iodometric titration on a large quantity of sample, with starch solution utilized as a visual indicator. To be carried out correctly, this procedure requires experienced analysts.

This Application Note proposes a method for the automatic titration of low sulfite levels in beet crystal sugar by redox titration with iodine using a Pt Titrode as the potentiometric sensor.

SAMPLE AND SAMPLE PREPARATION

No sample preparation is required.

EXPERIMENTAL

A 0.005 mol/L thiosulfate solution is titrated against standard 0.005 mol/L potassium dichromate to determine the so-called thiosulfate strength.
Next, a 0.004 mol/L iodine solution is titrated against the 0.005 mol/L thiosulfate solution to determine the so-called iodine strength.

Finally, 50.0 g of beet sugar is added to a 250 mL beaker. To this, 150 mL of deionized (DI) water and 5 mL of 1 mol/L HCl are added, and the iodine titrant is added until the first endpoint is detected by the Pt Titrode (Figure 1).

Table 1. Results of the determination of sulfite in beet sugar crystals with an OMNIS Titrator and Pt Titrode from Metrohm.

No. (n = 5)	Mean value in mg/L	s(abs) in mg/L	s(rel) in %
1	2.7	0.07	2.6

RESULTS

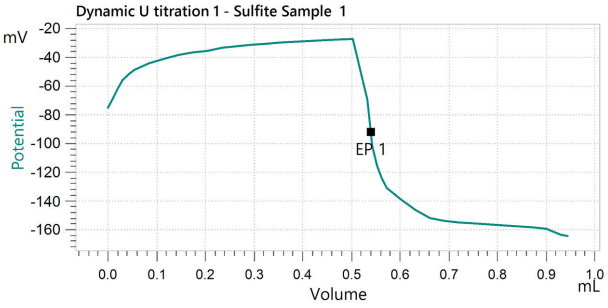

Figure 1. Exemplary titration curve of sulfite in beet sugar crystals using the OMNIS Titrator and Pt Titrode.

CONCLUSION

It was possible to fully automate the determination of sulfites in beet crystal sugar by potentiometric titration.
The titration rate must be set to slow and the maximum increment limited to 30 µL to avoid overtitration.
With OMNIS, sugar beet chemical analysis has never been easier to perform.

REFERENCE

1. U.S. Department of Agriculture. *Sugar and Sweeteners - Background*. USDA Economic Research Service. https://www.ers.usda.gov/topics/crops/sugar-and-sweeteners/background (accessed 2025-08-20).

CONTACT

Metrohm AG
Ionenstrasse
9100 Herisau

info@metrohm.com

CONFIGURATION

OMNIS Professional 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. Including "Professional" function license for parallel titration with additional titration or dosing modules.

- Actuation 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: 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 5-way parallel titration: "Professional" function license

Cylinder unit OMNIS 2 mL

Intelligent 2 mL cylinder unit for an OMNIS Titrator, Titration Module or Dosing Module. Includes dosing tubing and antidiffusion tip.

OMNIS

A WHOLE NEW LEVEL OF PERFORMANCE

dPt Titrode

Digital, combined platinum ring electrode for OMNIS with a pH glass membrane as reference electrode. This maintenance-free electrode is suitable for redox titrations when the pH value remains constant, e.g.:

- Iodometry
- Chromatometry
- Cerimetry
- Permanganometry

This electrode is stored in distilled water.
dTrodes can be used on OMNIS Titrators.

OMNIS Stand-Alone license

Enables stand-alone operation of the OMNIS software on a WindowsTM computer.

Features:

- The license already includes one OMNIS instrument license.
- Must be activated via the Metrohm licensing portal.