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

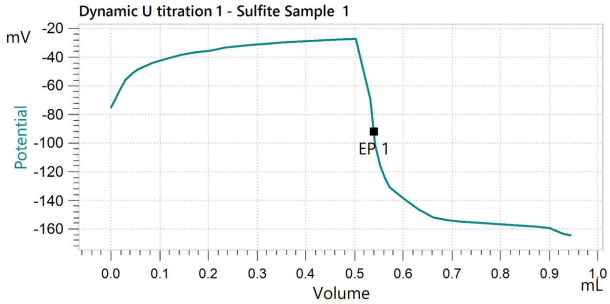

Figure 1. Exemplary titration curve of sulfite in beet sugar crystals using the OMNIS Titrator and Pt Titrode.

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).

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CONFIGURATION

OMNIS Professional Titrator

创新型、模块式电位分析 OMNIS Titrator,适于独立运行或作为 OMNIS 滴定系统的核心元件运行,用于终点和等当点滴定(单一/动态)。由于采用 3S OMNIS Liquid Adapter 技术,处理化学品从未像现在一样安全。可以使用测量模块和计量管单元自由配置滴定仪,并在需要时扩展一台棒式搅拌器。包括用于使用其他滴定或加液模块平行滴定的“Professional”功能许可证。

- 通过计算机或本地网络控制
- 可以为其他应用或辅助溶液另外连接最多四个滴定模块或加液模块
- 棒式搅拌器的连接方式
- 可提供不同大小的计量管:5、10、20 或 50 mL
- 采用 3S 技术的 OMNIS Liquid Adapter:安全处理化学品,自动传输生产厂家的原始试剂数据

测量模式和软件选项:

- 终点设定滴定:“Basic” 功能许可证
- 终点和等当点滴定(单一/动态):“Advanced” 功能许可证
- 终点和等当点滴定(单一/动态),包括 5 路平行滴定:“Professional” 功能许可证

OMNIS 2mL

智能型计量管单元 2 mL,用于 OMNIS 滴定仪、滴定模块或 Dosing 模块。包括计量软管和防扩散滴管。

dPt Titrode

带 pH 玻璃膜的 OMNIS 用数字组合式铂环形电极,用作参比电极。

该免维护电极适用于 pH 值恒定的氧化还原滴定,例如:

- 碘量法
- 重铬酸钾法
- 铈量法
- 高锰酸盐滴定法

该电极存放在蒸馏水中。

dTrodes 可在 OMNIS Titratoren 上使用。

OMNIS

A WHOLE NEW LEVEL OF PERFORMANCE

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允许单机版 OMNIS 软件在一台 WindowsTM 计算机上运行。

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- 须通过万通许可授权平台进行激活。