Application Note AN-T-222

Sulfur dioxide content in traditional Chinese medicines

Reliable and accurate photometric determination of the SO2 content in TCM according to ISO 22590

Traditional Chinese medicine (TCM) remedies are gaining popularity in other cultures.

In some TCM, sulfur dioxide (SO_2) is used as a preservative, antioxidant, and disinfectant. The products are treated by sulfurization with SO_2 gas. This prevents the browning or discoloration of ingredients and can increase the product's shelf life.

However, sulfur dioxide is a very poisonous gas. Global health authorities have set strict limits for the content of SO_2 in products. It is therefore of crucial importance to determine the sulfur dioxide content to comply with these limits.

In this well-suited method, the SO_2 content in different natural TCM products are analyzed reliably and accurately according to ISO 22590 using the Eco Titrator equipped with an Optrode and sodium hydroxide as titrant.

SAMPLE & SAMPLE PREPARATION

This application is demonstrated on caterpillar fungus (*dong chong xia cao*), earthworm (*di long*), seaweed (*hai zao*), arabian pea (*bu gu zhi*), turtle shell (*gui ban*), and a sodium sulfite standard.

Before testing, the sample must be dried and pulverized.

EXPERIMENTAL

In the first step, an appropriate amount of sample is digested with boiling hydrochloric acid, and the resulting released sulfur dioxide is added into a solution of hydrogen peroxide by means of a nitrogen stream. The sulfur dioxide is oxidized to sulfuric acid via the following reaction mechanism:

$SO_2 + H_2O_2 \rightarrow H_2SO_4$

In the second step, the formed sulfuric acid is titrated with sodium hydroxide to determine the sulfur dioxide content.

The determination is carried out with an Eco Titrator equipped with an Optrode.

Figure 1. Eco Titrator used for the analysis of sulfur dioxide in TCM products.

Table 1. Summarized results for SO2 in TCM samples and for the sodium sulfite standard

Sample	SO_2 (mg/kg)
Caterpillar fungus	4.4
Earthworm	4.6
Seaweed	6.1
Arabian pea	6.2
Turtle shell	26.3
Standard	**Recovery (%)**
Na_2SO_3	98.9

CONCLUSION

Titration is an accurate and precise method to accurately determine the SO_2 content in different natural TCM products.
Using the Eco Titrator equipped with an Optrode allows a reliable determination. The system offers low-priced analyses and user-friendly handling. The Optrode is completely maintenance-free, easy to use, and robust in daily laboratory work.

Internal reference: AW TI CH-1319-042021

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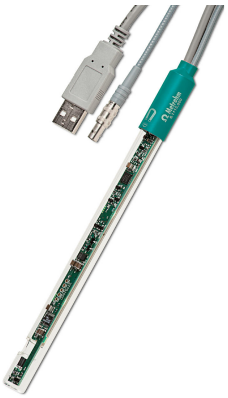
CONFIGURATION

Eco Titrator
The compact Eco Titrator with integrated magnetic stirrer and touch-sensitive User Interface is ideal for routine analysis. It provides GLP-compliant results with minimum space requirements at all times (approx. DIN A4).

Universally compatible with almost all potentiometric titrations, such as, for example, for

- Food products: Acid content, chloride, Vitamin C, iodine and peroxide number in fats
- Water analysis: Carbonate and Ca/Mg hardness, chloride, sulfate, permanganate index
- Petrochemistry: Acid/base number, sulfide & mercaptans, chloride, bromine number
- Electroplating: Total acid, metal content, chloride
- Surfactant analysis: Anionic, cationic and non-ionic surfactants
- Photometry with the Optrode: p and m value, metals, water hardness



Optrode

Optical sensor for photometric titrations offering 8 different wavelengths. The wavelength can be switched using the software (tiamo 2.5 or higher) or with a magnet. The glass shaft is completely solvent-resistant and easy to clean. For example, this space-saving sensor is suitable for:

- Non-aqueous titrations in accordance with USP or EP
- Determinations of carboxyl end groups
- TAN/TBN in accordance with ASTM D974
- Sulfate determination
- Fe, Al, Ca in cement
- Water hardness
- Chondroitin sulfate in accordance with USP

The sensor is not suitable for determinations of concentrations via measurement of color intensity (colorimetry).