



Application Note AN-T-090

Determination of zinc sulfate

Photometric analysis according Ph.Eur. and USP

The inorganic compound zinc sulfate is used for various applications. It is often utilized as a dietary supplement to nourish both humans and animals with zinc, an essential mineral for our health, since we cannot produce nor store it naturally. Zinc is also often used in medicine because of its antibacterial properties. Additionally, it can be applied on roofs to prevent extended moss growth, used as precursor of the white pigment «lithopone», or in zinc

electroplating. Due to its versatile applications, the determination of its purity is important.

This Application Note describes the photometric determination of zinc sulfate using the Optrode at a wavelength of 610 nm. Complexometric titration of zinc requires EDTA as titrant and Eriochrome Black T as indicator. The method fully complies with Ph. Eur. and USP.

SAMPLE AND SAMPLE PREPARATION

The analysis is demonstrated on a zinc sulfate heptahydrate sample. No sample preparation is

required.

EXPERIMENTAL

An appropriate amount of sample is weighed into a beaker and is dissolved in deionized water. Ammonia buffer pH 10 and a small amount of Eriochrome Black T indicator is then added to the beaker. The sample is titrated photometrically with standardized EDTA until after the break point.



Figure 1. 907 Titrando with tiemo. Exemplary setup for the photometric determination of zinc sulfate purity.

RESULTS

The analysis demonstrates a distinct color change which results in reliable and reproducible results. In this study, the zinc sulfate content was determined as

$w(\text{ZnSO}_4) = 57.61\%$ ($\text{SD}(\text{rel}) = 0.03\%$, $n = 6$). An example titration curve is shown in **Figure 2**.



Figure 2. Example titration curve for photometric zinc sulfate determination. The break point is quite obvious in this chart.

CONCLUSION

The purity of zinc sulfate can easily be assessed using photometric titration. To reliably indicate the color change, a sensor such as the Optrode should be used. This has the advantage that the analysis is performed objectively, and the endpoint is always designated at

the same color change. The use of a Metrohm autotitrator and software in place of manual titration allows completely automated documentation for full traceability according to various regulations.

The analysis fully complies with Ph.Eur. and USP.

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CONFIGURATION



907 Titrando

High-end titrator for potentiometric and volumetric Karl Fischer titration with one measuring interface and Dosino dosing units.

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



804 Ti Stand with stand

Titration stand and controller for 802 Rod Stirrer. The 804 Ti Stand together with the optional 802 Rod Stirrer provides an alternative to the magnetic stirrer. Ti Stand with base plate, support rod and electrode holder.



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).