Application Note AN-T-213

Ozone in water

Easy determination of ozone in water

Water treatment with ozone (O_3) is a common procedure for the disinfection of swimming pools. To efficiently kill microbes, ozone concentrations from 0.1–7 mg min/L are needed. During this process, it is important that a sufficient but not excessive amount of O_3 is produced to disinfect the water. Otherwise, the remaining ozone which is not used to disinfect the water could enter the swimming water. This concentration should not exceed 0.04 mg/L. If the concentration is higher, the ozone could irritate the respiratory system or the skin of bathers.

Therefore, it is recommended to monitor the produced ozone concentration. In addition, the disinfection process with ozone is used in drinking and waste water treatment. This is due to the fact that ozone is significantly more effective than chlorine at inactivating or killing viruses and bacteria. Ozone is widely used in Europe to treat drinking water.

This application note describes a method to determine the ozone concentration in water by potentiometric titration according to DIN 38408-3.

SAMPLE AND SAMPLE PREPARATION

Due to the reactive nature of ozone, this application is demonstrated on spiked groundwater. Immediately after spiking the sample with ozone (produced by electrolysis), potassium iodide solution is added to the sample to stabilize the ozone.

EXPERIMENTAL

This analysis is performed on an OMNIS Advanced Titrator equipped with a double Pt sheet electrode.
Sulfuric acid is added to a prepared sample solution, and the iodine, generated by the reaction of ozone with potassium iodide, is back titrated with sodium thiosulfate until after the equivalence point.
It is important to determine the ozone content immediately after the sample is prepared, because the ozone is not stable.

Figure 1. OMNIS Advanced Titrator equipped with a double Pt sheet electrode for the determination of ozone in water samples.

RESULTS

A mean ozone content of 13.44 mg/L (n = 3, SD(abs) = 0.83 mg/L, SD(rel) = 6.18%) is obtained for the spiked groundwater sample. If ozone is not generated in-situ but continuously, it should be possible to obtain a lower standard deviation.
With the used setup and titration parameters, one sample could be measured in under 2.5 minutes with sharp curves and clear equivalence points.

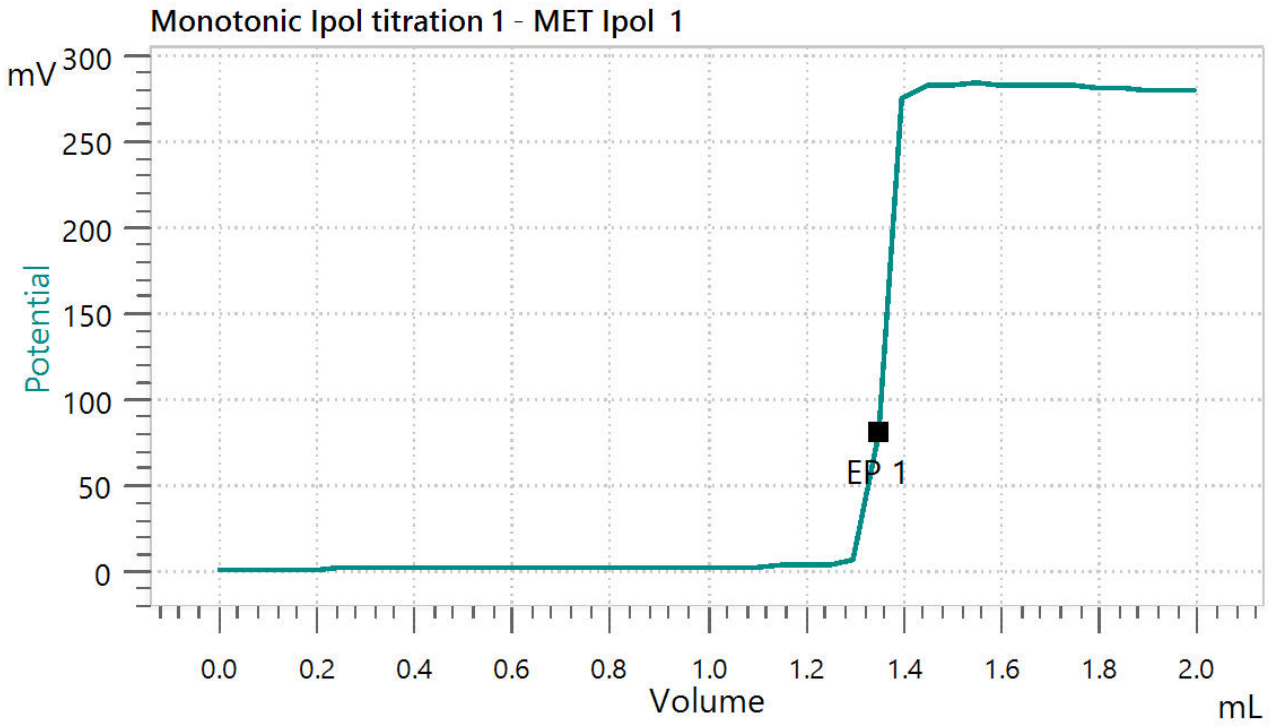

Figure 2. Example titration curve of the ozone determination in spiked groundwater.

CONCLUSION

Titration is an inexpensive method to determine ozone in water. With this method, it is possible to determine ozone contents as low as 0.1 mg/L.
Using an OMNIS Titrator allows you to customize the system according to your application needs and to expand it for other titration applications required for the quality control of water.

Internal reference: AW TI CH1-1297-012020

CONTACT

Metrohm Nordic AS
Sandviksveien 26
1363 Høvik
firmapost@metrohm.no

CONFIGURATION

OMNIS Advanced 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. If required, the OMNIS Advanced Titrator can be equipped for parallel titration via a corresponding software function license.

- 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 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 parallel titration: "Professional" function license

Double Pt sheet electrode

Glass shaft electrode with two platinum sheets (0.15 x 8 x 8 mm) which are polarized for redox titrations (bivoltammetric titration). This electrode is well suited for

- Vitamin C determination
- Coulometric nitrogen determination
- Bromine index
- Sulfurous acid (SO_2) in wine
- Oxygen content according to Winkler