Application Note AN-I-009

Cyanide in water

Inexpensive determination according to APHA Method 4500-CN and ASTM D2036

Cyanides are used in some industrial processes, e.g., in mining operations to extract gold from its ore, or for electroplating purposes. If not handled carefully, cyanides could contaminate the wastewater. In an acidic or neutral environment, wastewater contaminated with cyanide could form highly toxic hydrogen cyanide gas. Furthermore, the cyanide salts could also poison the environment and enter the ground water system. Therefore, it is essential to monitor the content of cyanide in effluent water.

Cyanides can be easily determined with a cyanide ion-selective electrode. This application note presents a method for cyanide analysis according to APHA Method 4500-CN and ASTM D2036. It is possible to determine the cyanide content down to a concentration of 0.06 mg/L. An ion concentration measurement is a rapid and inexpensive method in comparison to other techniques such as ion chromatography and can be easily integrated into process monitoring systems.

SAMPLE AND SAMPLE PREPARATION

This application is demonstrated on a spiked groundwater sample.

The sample was prepared according to the mentioned norm. Therefore, to release cyanide from the sample, a distillation is performed. The sample is first acidified and then distilled. The acidification converts the cyanide salts to hydrogen cyanide, which is then absorbed in an alkaline solution.

EXPERIMENTAL

This analysis is carried out on an OMNIS Basic Titrator equipped with a cyanide ion-selective electrode (CN ISE).

Before the ion concentration measurement of the sample, a calibration with four cyanide standards is prepared. The lowest concentration standard is measured first in order to avoid any carryover.

All measurements are performed in a thermostated vessel to improve the reproducibility.

Figure 1. OMNIS Basic Titrator equipped with a cyanide ion-selective electrode for the determination of cyanide in water samples.

RESULTS

This sample contains cyanide at a level of 1.70 mg/L (n = 3, SD(abs) = 0.05 mg/L, SD(rel) = 2.98%).

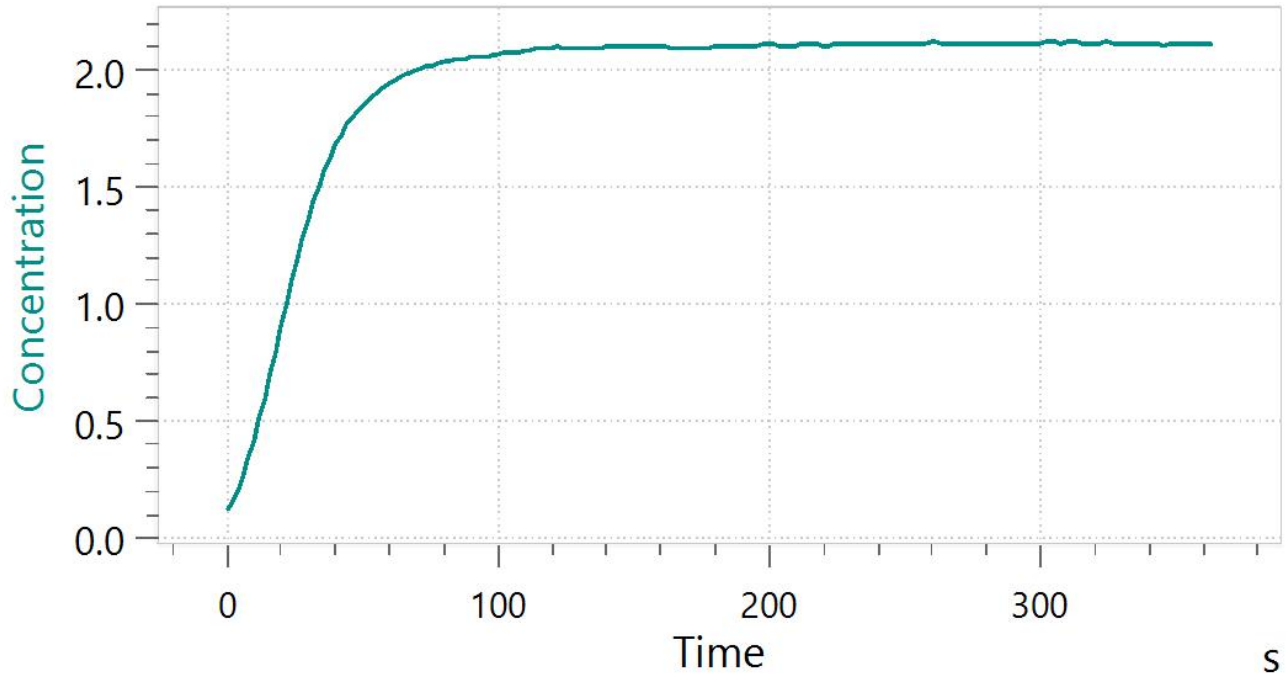

Figure 2. Exemplary curve of the cyanide measurement (mg/L) in spiked groundwater after distillation.

CONCLUSION

Inexpensive determination of cyanides according to APHA Method 4500-CN and ASTM D2036 can be easily performed with a cyanide ion-selective electrode. With this method, it is possible to measure cyanide content as low as 0.06 mg/L. Ion measurement thus presents a viable alternative to other technologies such as ion chromatography. Using an OMNIS Titrator for the measurement allows for system customizations according to your needs, with the possibility to expand it for other titration applications required for the quality control of water.

Internal reference: AW ISE CH2-0173-012020

CONTACT

Metrohm India
Annai Indira Nagar,
Thoraipakkam
600097 Chennai
info@metrohm.in

CONFIGURATION

OMNIS Basic 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. 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 range of functions of the OMNIS Basic Titrator can be supplemented with 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 of 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

Measuring module analog

Analog measurement channel for one OMNIS Titrator or Titration Module for the connection of analog electrodes.

OMNIS

A WHOLE NEW LEVEL OF PERFORMANCE

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.
- Not transferable to another computer.

Ion-selective electrode, CN

Cyanide-selective electrode with crystal membrane.

This ISE has to be used in combination with a reference electrode and is suitable for:

- ion measurements of CN- (8*10-6 to 10-2 mol/L)
- ion measurements in small sample volumes (minimum immersion depth 1 mm)
- titrations

Thanks to the robust/break-proof plastic shaft made of EP, this sensor is mechanically very resistant.

The polishing set supplied enables easy cleaning and renewing of the electrode surface.

LL ISE reference electrode

Silver / silver chloride reference electrode with double junction system.

This reference electrode is well suited for:

- automated applications
- ion measurements
- surfactant titrations

The ground-joint diaphragm, which is insensitive to contamination, offers a constant and reproducible electrolyte outflow. Additionally, the reference electrolyte is gelified for even better signal stability.

The sensor is delivered with c(KCl) = 3 mol/L as bridge electrolyte, which can be freely selected and exchanged as needed.

Titration vessel lid with 5 openings