



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

($n = 3$, $SD(\text{abs}) = 0.05 \text{ mg/L}$, $SD(\text{rel}) = 2.98\%$).

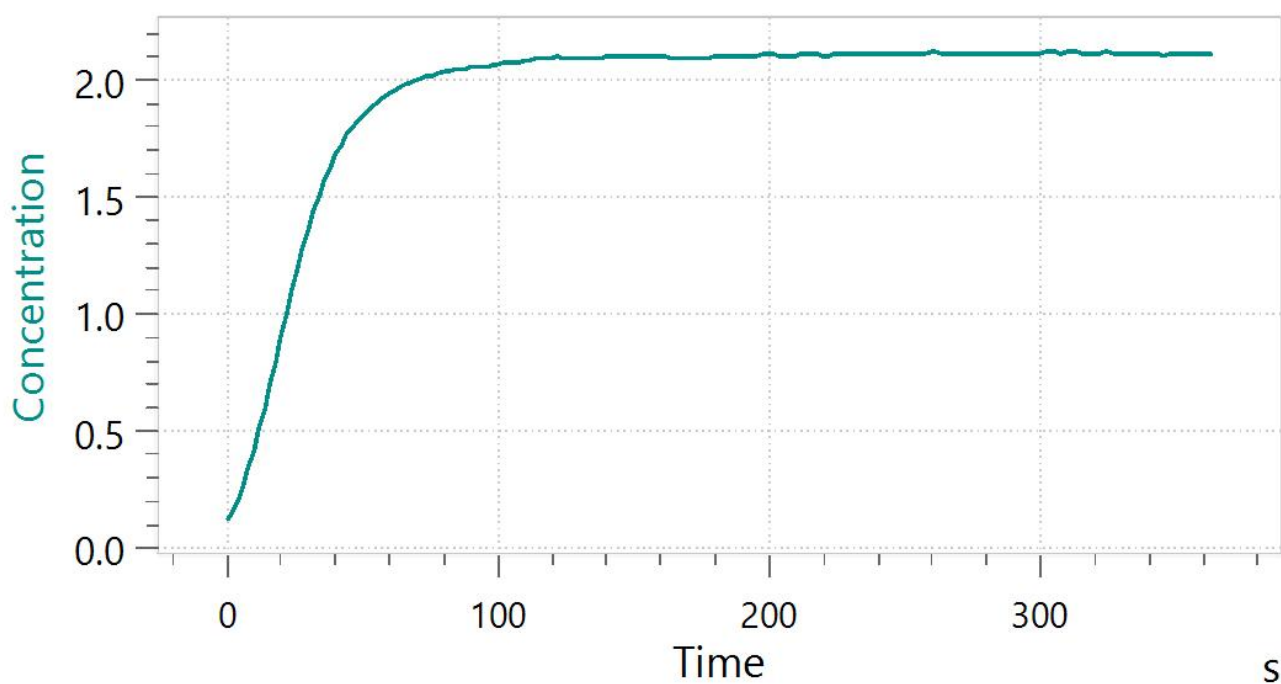


Figure 2. Exemplary curve of the cyanide measurement (mg/L) in spiked groundwater after distillation.

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.

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