Application Note AN-T-032

# Sulfide and hydrogen sulfide in water

## Inexpensive determination by potentiometric titration

Sulfides are a commonly found class of minerals. Inorganic sulfides are used in the extraction of metals such as copper, iron, lead, zinc, mercury, and the metalloid arsenic due to their high abundance in sulfide mineral ore. The sulfides are separated from the metals and accumulate in the wastewater effluent. They are malodorous and cause corrosion problems in wastewater treatment facilities (especially concerning concrete and iron). In acidic water, sulfides react to form hydrogen sulfides, which are extremely toxic even at low levels.

In addition, both sulfides and hydrogen sulfides are naturally present in thermal springs and could poison the bathers through evaporation. Therefore, it is important to monitor the amount of sulfides and hydrogen sulfides in the water.

This application note describes the trace level determination of sulfides and hydrogen sulfides in water in by potentiometric titration.

## SAMPLE AND SAMPLE PREPARATION

This application is demonstrated on spiked groundwater samples. The water is spiked with sodium sulfide.

Immediately after the sample is bottled, it is preserved with sodium hydroxide, to prevent the sulfides from forming volatile hydrogen sulfides.

## EXPERIMENTAL

This analysis is carried out on an OMNIS Advanced Titrator equipped with an Ag Titrode with an $Ag_2S$ coating. The $Ag_2S$ coating lowers the detection limit and ensures a fast response.

Before the titration, the sample is purged with nitrogen gas in order to remove any remaining oxygen. The samples are then titrated with silver nitrate until after the equivalence point.

**Figure 1.** OMNIS Advanced Titrator equipped with an Ag Titrode with Ag2S coating for the determination of sulfides and hydrogen sulfides in water samples.

## RESULTS

Reproducible results are obtained in spite of the low concentration of sulfide in the sample and low titrant concentration. For the tested groundwater, a hydrogen sulfide content of 0.31 mg/L (n = 3, SD(abs) = 0.01 mg/L, SD(rel) = 1.91%) is obtained.

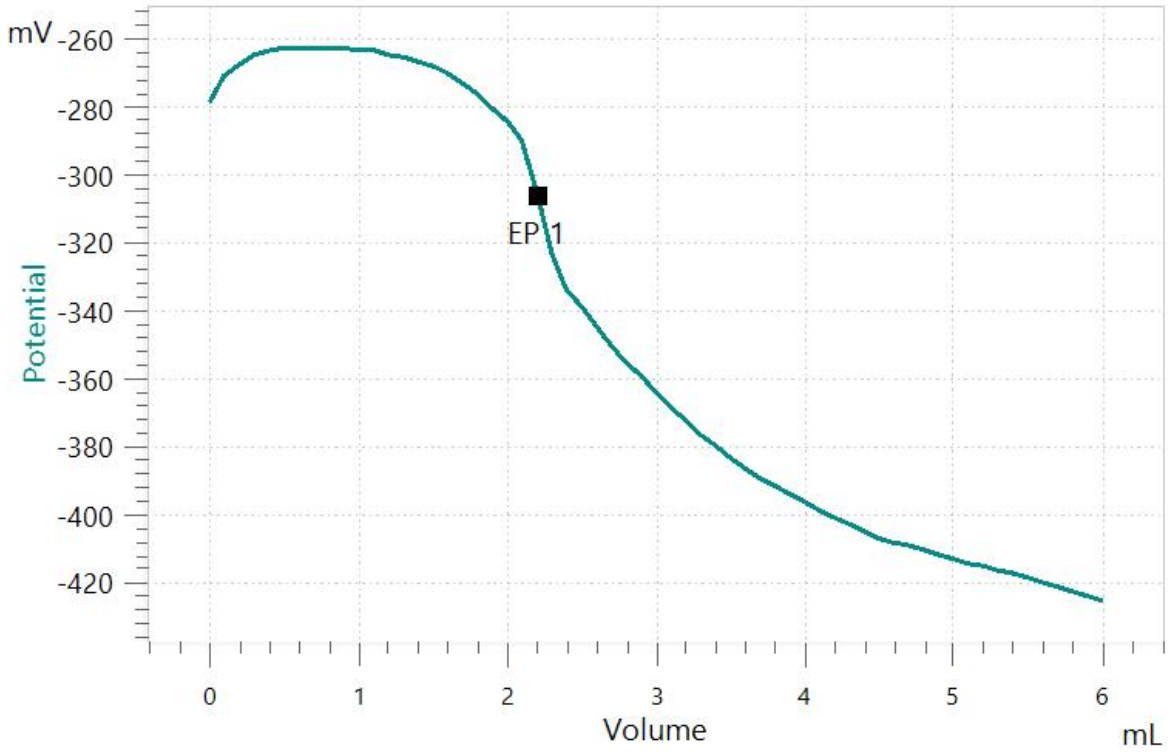


**Figure 2.** Exemplary titration curve of the hydrogen sulfides determination.

## CONCLUSION

Titration is an inexpensive method to determine sulfides and hydrogen sulfides in water. The method can measure a hydrogen sulfide content as low as 0.31 mg/L. To measure higher hydrogen sulfide levels, the concentration of the titrant can be increased. Therefore, the samples do not need to be diluted, which could falsify the results. This makes titration a versatile method covering a large concentration range in comparison to other methods such as photometry. Using an Ag Titrode with $Ag_2S$ coating ensures a fast response time and a low detection limit. This electrode is additionally maintenance-free using a pH glass membrane as reference electrode. It can be simply stored in distilled water.

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