



Application Note AN-T-032

水中硫化物和氢硫化物的测定

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.

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.

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



Figure 1. OMNIS Advanced Titrator equipped with an Ag Titrode with Ag_2S 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 ($n = 3$, $\text{SD}(\text{abs}) = 0.01 \text{ mg/L}$, $\text{SD}(\text{rel}) = 1.91\%$) is obtained.

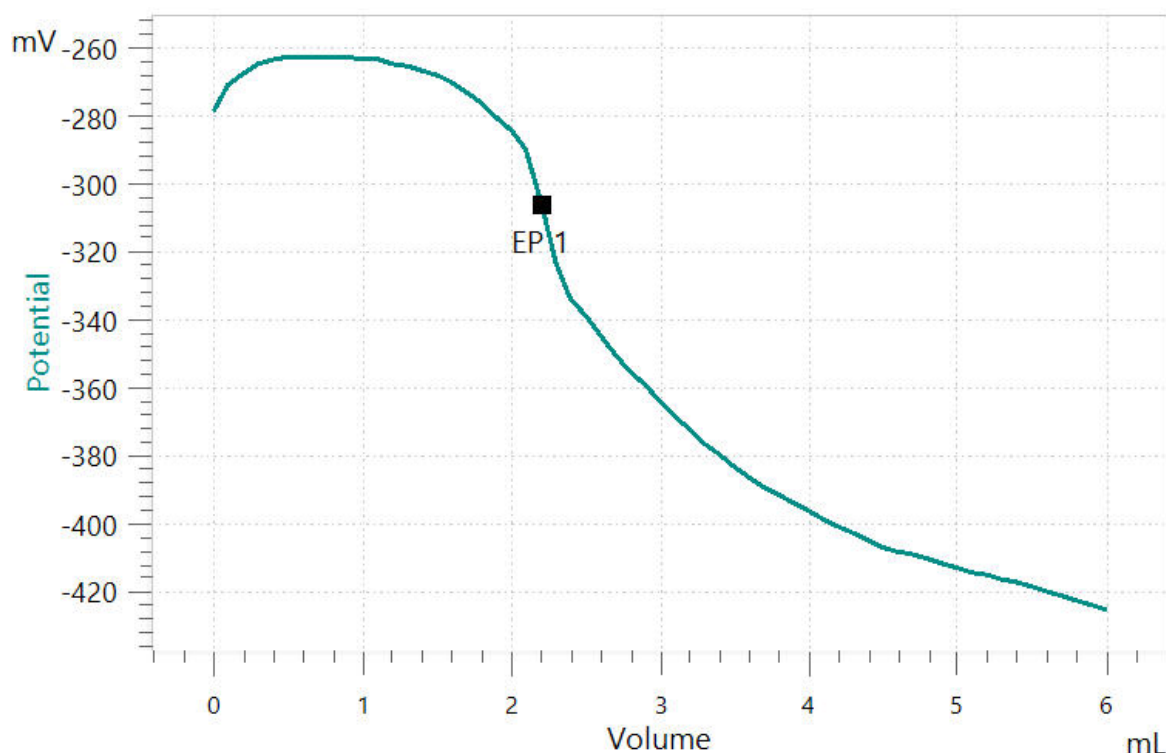


Figure 2. Exemplary titration curve of the hydrogen sulfides determination.

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.

CONTACT

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CONFIGURATION



OMNIS Advanced Titrator

创新型、模块式电位分析 OMNIS Titrator 滴定仪,适于独立运行或作为 OMNIS 滴定系统的核心元件运行,用于使用 OMNIS Sample Robot 进行终点和等当点滴定(单一/动态)。由于采用 3S 试剂瓶适配器技术,处理化学品很安全。可以使用测量模块和计量管单元自由配置滴定仪,并在需要时扩展一台螺旋搅拌器。在需要时可以通过相应的软件功能许可证为平行滴定升级 OMNIS Advanced Titrator。

- 通过计算机或本地网络控制
- 可以为其他应用或辅助溶液另外连接四个滴定模块或加液模块
- 螺旋搅拌器的连接方式
- 可提供不同大小的计量管:5、10、20 或 50 mL
- 采用 3S 技术的试剂瓶适配器:安全处理化学品,自动传输生产商的原始试剂数据

测量模式和软件选项:

- 终点设定滴定:“Basic” 功能许可证
- 终点和等当点滴定(单一/动态):“Advanced” 功能许可证
- 终点和等当点滴定(单一/动态),包括平行滴定:“Professional” 功能许可证



dAg Titrode Ag₂S

带 pH 玻璃膜的 OMNIS 用数字组合式银环形电极,用作参比电极。银环具有硫化物 (Ag₂S) 涂层,其适用于较高的灵敏度和更好的指示极限。

该免维护电极适用于 pH 值恒定的沉积滴定(硝酸银滴定剂),例如:

- 氯化物、溴化物、碘化物
- 硫化物
- 硫化氢
- 硫醇
- 氰化物

该电极存放在蒸馏水中。

dTodes 可在 OMNIS Titratoren 上使用。