

Application Note AN-T-204

水中的高锰酸盐指数

Fully automated determination according to GB/T 11892

The permanganate index (PMI) is a sum parameter that indicates the total load of oxidizable organic and inorganic matter in water. The substances concerned are mainly humic materials/acids that are primarily formed when dead organic material present in soil is further broken down and released into water sources. Another source of organic material in the water can be attributed to birds or fish. As it is an indicator of the water quality, testing of the PMI for drinking water is obligatory in many countries.

For the determination, it is necessary to heat the stabilized water sample to 95 ° C and higher for a stipulated time. Afterwards, the amount of permanganate that has remained after the reaction with the sample is determined titrimetrically. This sample preparation step requires considerable manual effort.

In this Application Note, a fully automated procedure for the determination of the PMI according to GB/T 11892 is described, including all sample preparation steps. The gains in productivity because of a reduced manual workload are considerable.

SAMPLE AND SAMPLE PREPARATION

The application is demonstrated for a resorcinol standard (6 mg/L corresponding to a PMI of 9.32–10.28 mg/L) and a water sample from a stream.

To stabilize the sample, sulfuric acid is added directly after sampling.

EXPERIMENTAL

The analysis is carried out on an automated system using an 810 Sample Processor with an external jacketed vessel, 916 Ti-Touch, a Pt Titrode for indication, and a Pt1000 temperature sensor.

The stabilized sample is poured into a titration beaker, which is then covered with aluminum foil, fixed with a foil holder, and placed on the sample rack.

For the sample determination, an aliquot of sample is pipetted into the external vessel. Sulfuric acid and potassium permanganate solution are added. The solution is heated up and the temperature is maintained for 30 minutes between 96–98 ° C. Sodium oxalate solution is added, and its excess is then back-titrated with standardized potassium permanganate until after the equivalence point. After the determination, the vessel is automatically emptied and rinsed twice with deionized water. The transfer tube is also rinsed with deionized water. A blank determination is performed in the same way, by replacing the sample with the same amount of deionized water.



Figure 1. 916 Ti-Touch and 810 Sample Processor. Example setup for the determination of the permanganate index in water.

RESULTS

According to EN ISO 8467, a resorcinol standard of 6 mg/L has a PMI between 9.32 and 10.28 mg/L. The analysis demonstrates acceptable and reproducible results for the standard and the sample, which are summarized in **Table 1**. An example titration curve is displayed in **Figure 2**.

Table 1. Mean PMI value for two different samples determined by a fully automated titration system (n = 5).

Sample	PMI / mg/L	SD(rel) / %
Resorcinol standard	10.04	1.75
Stream water	8.93	0.92

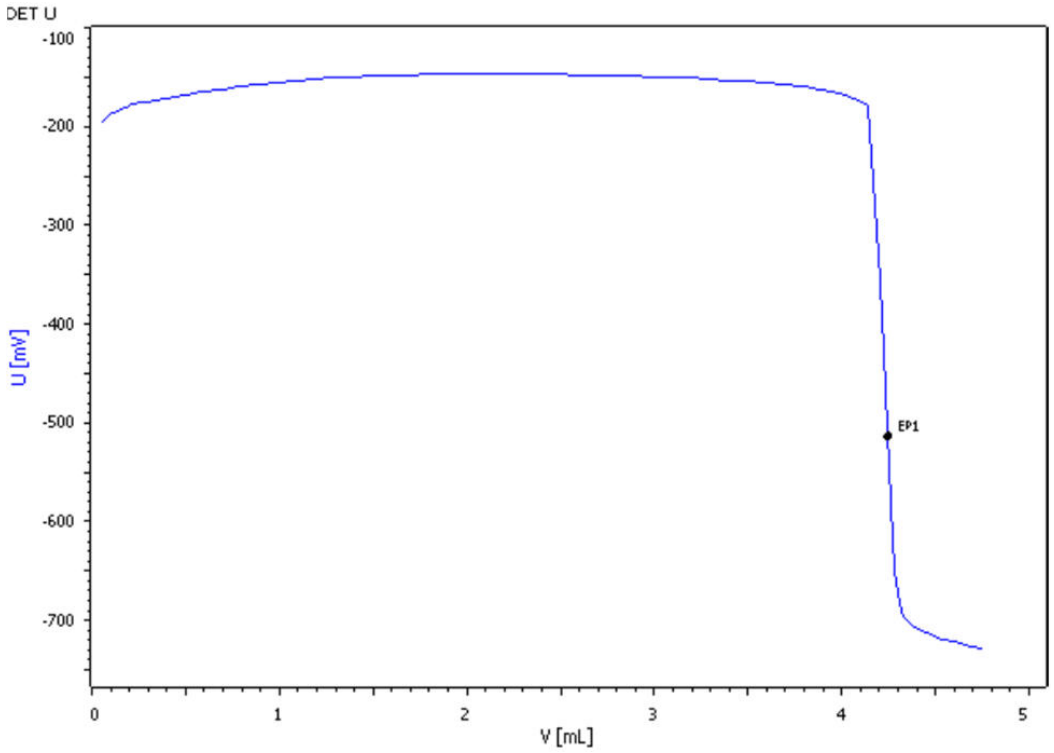


Figure 2. Example titration curve for the permanganate index determination in a stream water sample.

CONCLUSION

The determination of the PMI value in water samples can efficiently be carried out by using a Metrohm autotitrator equipped with an automation system. Fast and precise determination according to GB/T 11892 is possible. Furthermore, by fully automating all sample preparation steps, the productivity within the laboratory is significantly increased.

Internal reference: AW TI CH1-1256-122018

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CONFIGURATION



916 Ti-Touch

“Reduce to the max”(减少到最大)-这是 916 Ti-Touch 是瑞士万通新一代一体式自动电位滴定仪,系统整合度高,结构紧凑,外观设计简约时尚,日常样品分析的得力助手。

安装有磁力搅拌器的 916 Ti-Touch 支持所有电位分析滴定:滴定模式 DET(动态等当点滴定)、MET(等量等当点滴定)、SET(终点设定滴定,滴定至一个或两个设定好的终点)、STAT(酶催化和 pH-STAT 滴定)及 MAT(手动滴定)。

新 916 Ti-Touch 同样符合 FDA 条例 21 CFR,第 11 部分的要求。因此在审计时能确保您始终万无一失。有了 810 Sample Processor,您便可为 916 Ti-Touch 扩展自动功能 - 这样,您便增加了样品通过量,并改进了精度和重现性。



810 Sample Processor

用于通过 916 Ti-Touch 或 915 KF Ti-Touch 自动分析常规样品的 Sample Processor。

Sample Processor 包括一个客户端和一个内置的隔膜泵,用于自动处理少量至中等量的电位分析滴定,比如卡尔·费休滴定法。除了内置的泵之外,还可再连接一台泵(隔膜泵或蠕动泵)和多达三台加液单元用来进行 LQH 加液处理。

由于其应用范围很广,因此必须根据具体应用来选择合适的样品盘、搅拌器、滴定头和 Swing Head 以及样品容器并单独订购。



iPt Titrode

带 pH 玻璃膜且集成了传感器数据存储芯片的智能组合式铂环形电极,用作参比电极。
该免维护电极适用于 pH 值恒定的氧化还原滴定,例如:

- 碘量法
- 重铬酸钾法
- 铈量法
- 高锰酸盐滴定法

该电极存放在蒸馏水中。
iTrodes 可以在 Titrando、Ti-Touch 或 913/914 Metern 上使用。