



Application Note AN-T-204

# Permanganate index in water

## 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.

## 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.

## 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

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

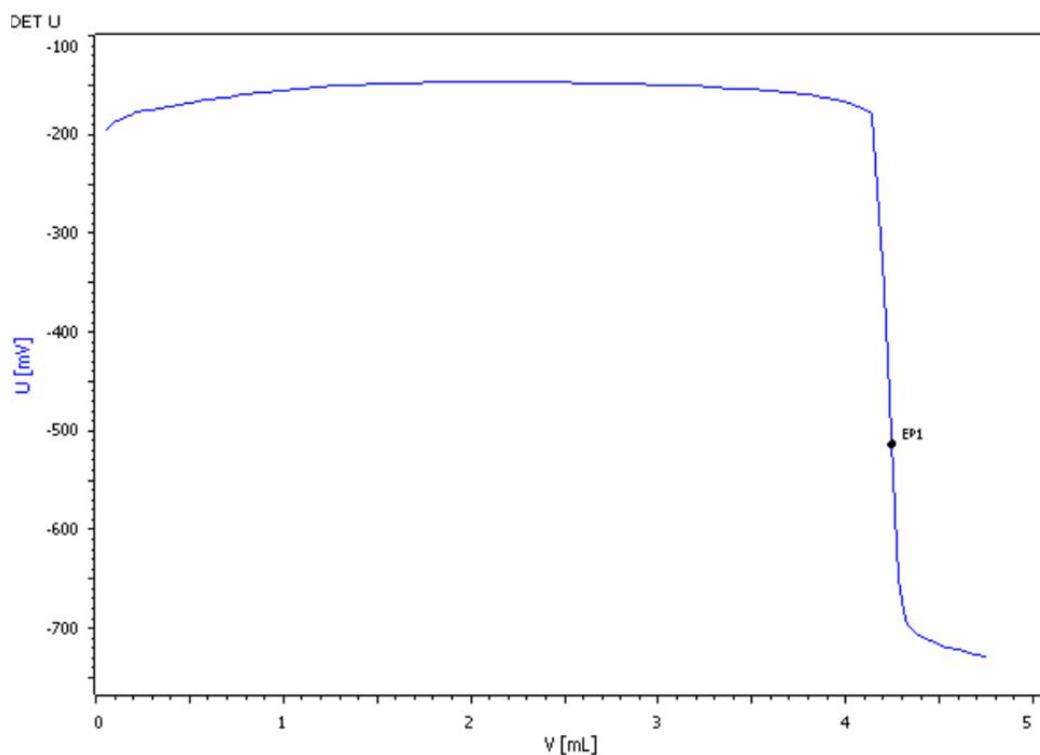


**Figure 1.** 916 Ti-Touch and 810 Sample Processor. Example setup for the determination of the permanganate index in water.

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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