Application Note AN-T-201

pH value of engine coolants or antirust

Fast determination according to ASTM D1287

Corrosion of metallic components is an inherent problem for engines, because metals naturally tend to oxidize in the presence of water and/or acids. Increased acid content is indicated by a low pH value, and could lead to a variety of problems like a shorter storage life (stability) or a reduced buffer capacity of the used engine coolant or antirust. This in turn leads to a reduced lifetime of engines, for example. Without proper coolants and antirust agents, engines can overheat and seize up, resulting in costly damage and extra maintenance, or even necessitating a full replacement of the affected parts.

In this Application Note, engine coolants or antirust samples are dissolved in water, and the pH measurement using the Profitrode is carried out according to ASTM D1287.

SAMPLE AND SAMPLE PREPARATION

The application is demonstrated for anhydrous ethylene glycol, anhydrous glycerol, engine coolant, and antirust oil.

No sample preparation is required.

EXPERIMENTAL

This analysis is performed on an OMNIS Basic Titrator equipped with a Profitrode and a temperature sensor.

An aliquot of sample is pipetted into the sample beaker. While stirring, deionized water is added. After stirring for 1 minute, the pH value is measured until a stable drift is reached. Afterwards, the sensors are rinsed with deionized water for cleaning. The Profitrode is then conditioned for 2 minutes by immersing the glass membrane alone in deionized water.

Figure 1. OMNIS Basic Titrator. Example setup for the determination of the pH value.

RESULTS

The analysis demonstrates reproducible results with a SD(rel) smaller than 1%, which are summarized in Table 1. An exemplary measurement chart is displayed in Figure 2.

Table 1. Mean pH value for different samples determined by an OMNIS titration system (n = 6).

Sample	pH	SD(rel) in %
Ethylene glycol	5.69	0.5
Glycerol	6.11	0.5
Engine Coolant	8.94	0.2
Antirust oil	3.13	0.8

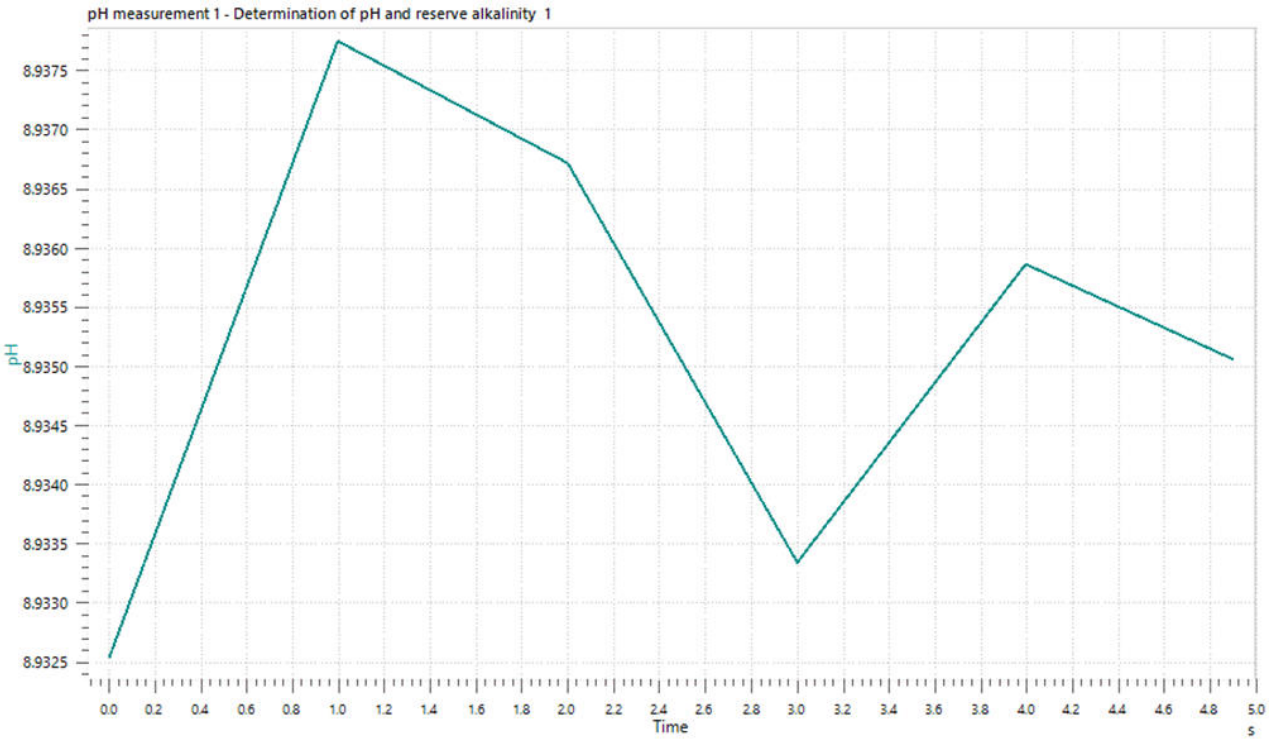

Figure 2. Example measurement chart for the pH value of engine coolant.

CONCLUSION

Using an OMNIS Basic Titrator equipped with a Profitrode allows operators to measure the pH value of engine coolants and antirust according to ASTM D1287 efficiently and reliably. Due to the modularity of OMNIS, the system can easily be upgraded to perform other applications for the analysis of engine coolants or antirust such as the determination of the reserve alkalinity or the moisture content.

Internal reference: AW TI CH1-1251-112018

CONTACT

Metrohm Slovensko, s.r.o.
Galvaniho 12
82104 Bratislava
office@metrohm.sk

CONFIGURATION

OMNIS Basic Titrator with magnetic stirrer

Innovative, modular potentiometric OMNIS Titrator for stand-alone operation or as the core of an OMNIS titration system for endpoint titration. Thanks to 3S Liquid Adapter technology, handling chemicals is more secure than ever before. The titrator can be freely configured with measuring modules and cylinder units and can have a rod stirrer added as needed. If required, the range of functions of the OMNIS Basic Titrator can be supplemented with a corresponding software function license.

- Control via PC or local network
- Connection option for up to four additional titration or dosing modules for additional applications or auxiliary solutions
- Connection option for one rod stirrer
- Various cylinder sizes available: 5, 10, 20 or 50 mL
- Liquid Adapter with 3S technology: Secure handling of chemicals, automatic transfer of the original reagent data of the manufacturer

Measuring modes and software options:

- Endpoint titration: "Basic" function license
- Endpoint and equivalence point titration (monotonic/dynamic): "Advanced" function license
- Endpoint and equivalence point titration (monotonic/dynamic) with parallel titration: "Professional" function license

Profitrode (length 12.5 cm)

Combined pH electrode with double-junction construction, installation length 11.3 cm. This electrode is suitable for pH measurements/titrations of samples:

- that contaminate the reference system of the electrode (e.g., galvanic baths, samples containing sulfides)
- for which potassium chloride c(KCl) = 3 mol/L cannot be used as reference electrolyte (e.g., reaction of potassium or chloride with sample)

The electrode is equipped with a flexible ground-joint diaphragm which is insensitive to contamination and which can be replaced when needed.

When c(KCl) = 3 mol/L is used as bridge electrolyte, storage in storage solution is recommended.
The bridge electrolyte can be easily replaced with a suitable electrolyte (e.g., potassium nitrate c(KNO_3) = 1 mol/L (6.2310.010)), storage in the used bridge electrolyte.
The Profitrode is available in other lengths under the following article numbers:
- 6.0255.110: Length 17.8 cm
- 6.0255.120: Length 31.0 cm