



## Application Note AN-T-202

# 发动机冷却液的储备碱度

## Straightforward determination according to ASTM D1121

Corrosion of metallic components is an inherent problem for engines, because metals naturally tend to oxidize in the presence of water and/or low pH value. The reserve alkalinity of engine coolants and antirusts is a measure of the buffering ability to absorb acidity. Such acids might be introduced by exhaust gas leakage, by residual acid cleaner, or by the oxidation of ethylene glycol or propylene glycol. The reserve alkalinity is frequently used for quality control during production and often listed in the specifications of the coolants. A fast and

accurate determination is therefore important. This Application Note describes the straightforward determination of reserve alkalinity according to ASTM D1121. Engine coolants or antirusts are dissolved in water. After a pH measurement, the determination is carried out by potentiometric titration.

Using a fully automated system allows an accurate and reliable determination due to the reduction of human errors. Furthermore, the operator is free to carry out other tasks increasing the efficiency of the laboratory.

# SAMPLE AND SAMPLE PREPARATION

The method is demonstrated on engine coolant.

No sample preparation is necessary.

## EXPERIMENTAL

The analysis is performed on an OMNIS system consisting of an OMNIS Sample Robot S and an OMNIS Advanced Titrator equipped with a Profitrode.

The Profitrode has to be calibrated before use. Engine coolant is pipetted into the sample beaker. While stirring, deionized water is added using the integrated pumps. The pH value is measured until a stable drift is reached, then the solution is titrated with standardized hydrochloric acid to the endpoint at pH 5.5. Afterwards, the solution is aspirated and the buret tips as well as the electrode are rinsed with deionized water. The glass membrane of the electrode alone is then conditioned for 2 minutes in deionized water.

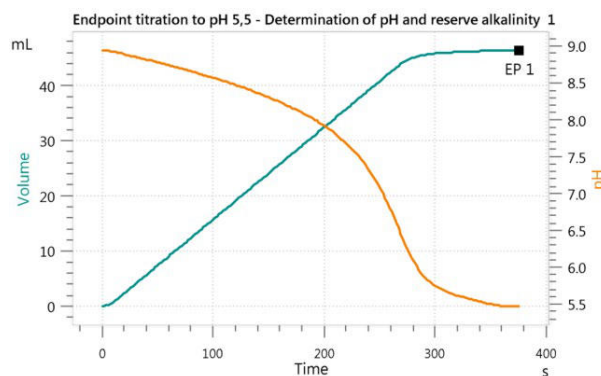


**Figure 1.** OMNIS system consisting of an OMNIS Sample Robot S and an OMNIS Advanced Titrator equipped with a Profitrode for the determination of the reserve alkalinity in engine coolant.

## RESULTS

The obtained results lay within the limits given by ASTM D1121 and are therefore acceptable.

An example titration curve can be seen in **Figure 2** and the results are summarized in **Table 1**.



**Figure 2.** Titration curve of the reserve alkalinity of engine coolant.

**Table 1.** Results of the determination of the reserve alkalinity in engine coolant (n = 6).

|                         | Mean  | SD(abs) | SD(rel) / % |
|-------------------------|-------|---------|-------------|
| Initial pH              | 8.94  | 0.02    | 0.2         |
| Reserve alkalinity / mL | 46.56 | 0.12    | 0.3         |

## CONCLUSION

The reserve alkalinity can precisely be determined according to **ASTM D1121** by using the Profitrode for indication and a reliable titration system from Metrohm. By choosing an

automated OMNIS system, the accuracy can be enhanced and the throughput maximized by the determination of samples in parallel.

Internal reference: AW TI CH1-1251-112018

## 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



### Profitrode 12.5 cm

带双结系统的组合 pH 电极,安装长度 11.3 cm。此电极适用于样品的 pH 测量/滴定,

- 污染传感器的参比系统(例如,浴液、含硫化物的样品)
- 其中氯化钾  $c(\text{KCl}) = 3 \text{ mol / L}$  不能用作参比电解质(例如,钾或氯化物与样品的反应)

此电极配备了可以抵抗污染的灵活磨口隔膜,如有必要可以更换。

当使用  $c(\text{KCl}) = 3 \text{ mol / L}$  作为外参比液电解质时,建议在保存液中储存。

中间电解质可以用合适的电解质(例如硝酸钾  $c(\text{KNO}_3) = 1 \text{ mol/L}$  (6.2310.010))代替。存储在用过的电解质中。

以下物品编号的 Profitrode 有更多长度的版本可供选购:

- 6.0255.110:长度 17.8 cm
- 6.0255.120:长度 31.0 cm