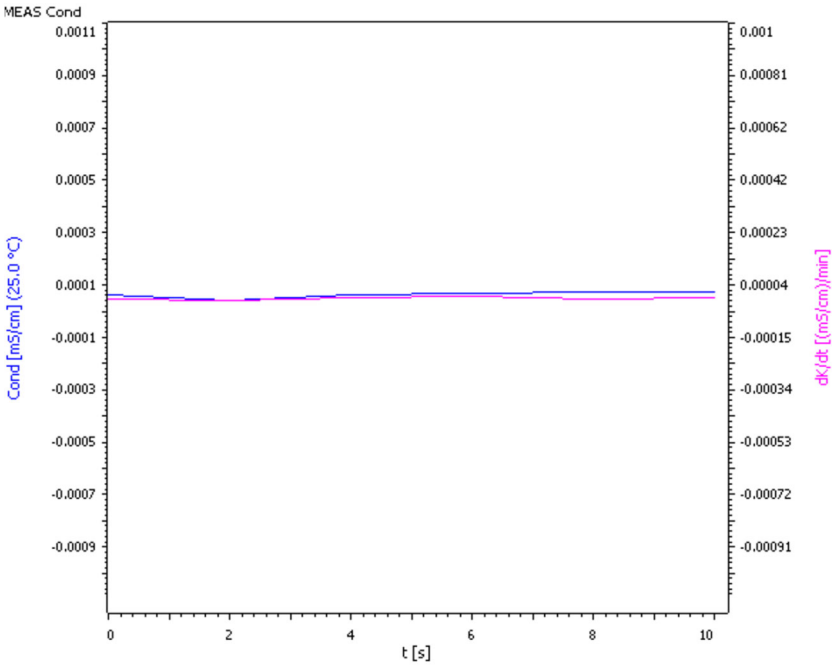
Titration Application Note T-209

Electrical conductivity in ethanol, bio-ethanol, and biofuel

Fast and easy conductivity measurement according to DIN 15938



Ethanol, bio-ethanol and biofuel (E85) are increasingly used as substitutes for petroleum-based fuels. During storage, they often come into contact with metallic substrates or surfaces, e.g., in barrels, tanks, or other containers. Excessive concentrations of ions in the stored fuel promotes corrosion. Monitoring the total concentration of the ions present in the fuel matrix should be the first step of an effective anti-corrosion strategy.

An easy, fast, and cost-effective method to determine the total amount of ions is by measuring the electrical conductivity according to DIN 15938.

Metrohm

Method description

Sample

Ethanol

Bio-ethanol

Configuration

For the analysis, either an 856 Conductivity Module or a 912 Conductometer can be used. In both cases, a compatible stainless steel conductivity probe with a cell constant of 0.1 cm^{-1} and an integrated Pt1000 is used for the measurement.

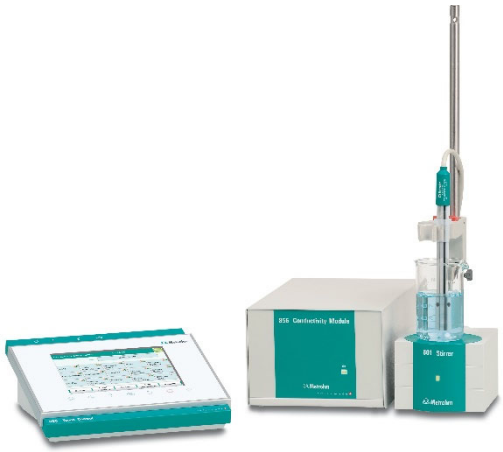


Fig. 1: 856 Conductivity Module: this high-end conductivity meter can either be used as a stand-alone system or fully integrated into automated systems.

Fig. 2: 912 Conductometer: this conductivity meter can either be used as mobile instrument for field measurements or as a benchtop instrument.

Sample preparation

No sample preparation is required.

Analysis

Temperature strongly influences conductivity measurements. For comparable results, it is therefore necessary to either convert all measurements to a reference temperature or measure all samples at the same temperature. As the sample composition further influences the conductivity-temperature behavior, measurement at a fixed temperature is recommended for ethanol, bio-ethanol, and biofuel.

The measuring vessel is filled in such a way that the stainless steel conductivity probe is fully immersed. The measurement is performed after reaching a stable temperature of 25 ± 0.1 °C.

Results

Table 1: Mean results for measurements with the 856 Conductivity Module

n = 3	Ethanol	Bio-ethanol
Mean	0.072 µS/cm	0.724 µS/cm
s(abs)	0.008 µS/cm	0.002 µS/cm
s(rel)	10.41%	0.30%

Table 2: Mean results for measurements with the 912 Conductometer

n = 3	Ethanol	Bio-ethanol
Mean	0.054 µS/cm	0.722 µS/cm
s(abs)	0.006 µS/cm	0.003 µS/cm
s(rel)	11.11%	0.42%

Summary

Fast and inexpensive conductivity measurement helps prevent corrosion. Conductivity can be reliably determined according to DIN 15938 using either a 912 Conductometer or an 856 Conductivity Module.

Titration Application Note T-209
Version 1, published January 2020

Metrohm