



Application Note AN-V-209

Carbonyl test methods for alcohols

Simultaneous determination of acetaldehyde, acetone, formaldehyde, and propionaldehyde with the Multi-Mode Electrode pro

Determination of carbonyl impurities, such as aldehydes and ketones, in alcoholic organic solvents is essential for ensuring product quality and stability.

This Application Note describes a polarographic method that employs the Multi-Mode Electrode pro for the simultaneous determination of different carbonyl compounds in alcohols. It offers a simple and sensitive tool for industries requiring rigorous alcohol

quality control.

This technique involves the formation of hydrazone derivatives through the reaction of carbonyl compounds with hydrazine sulfate. Its advantage lies in its multi-analyte determination, detection of low-concentration carbonyl compounds and applicability to a broad range of alcohols, e.g., methanol or propanol, enabling precise quality assessments.

EXPERIMENTAL

Add ultrapure water, the sample, and electrolyte solution into the measuring vessel and degas it for 5 min. Determination is carried out with the 884 Professional VA manual for MME (**Figure 1**) using parameters listed in **Table 1**. Quantification is done using two standard additions with respective standard addition solutions.



Figure 1. 884 Professional VA manual for MME

Table 1. Parameters

Parameter	Setting
Mode	DME
Start potential	-0.8 V
End potential	-1.6 V
Sweep rate	20 mV/s
Peak potential acetaldehyde	-1.22 V
Peak potential formaldehyde	-1.08 V
Peak potential acetone	-1.38 V
Peak potential propionaldehyde	-1.22 V

ELECTRODES

- Multi-Mode Electrode pro

RESULTS

Figure 2 shows the results of formaldehyde, acetaldehyde, and acetone determination in methanol.



Figure 2. Determination of formaldehyde, acetaldehyde, and acetone in methanol

Figure 3 shows the results of propionaldehyde and acetone determination in isopropanol.



Figure 3. Determination of propionaldehyde and acetone in isopropanol

Table 2. Result

Analyte	Methanol	Isopropanol
β (Formaldehyde) mg/L	8.22	-
β (Acetaldehyde) mg/L	7.08	-
β (Propionaldehyde) mg/L	-	5.95
β (Acetone) mg/L	45.21	4.02

Internal references: AW VA CH4-0634-042024

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CONFIGURATION



884 Professional VA manual for Multi-Mode Electrode (MME)

884 Professional VA manual for Multi-Mode Electrode (MME) is the entry-level instrument for high-end trace analysis with voltammetry and polarography with the Multi-Mode Electrode pro or the scTRACE Gold or the Bismuth drop electrode. The proven Metrohm electrode methods in combination with a high-performance potentiostat/galvanostat and the extremely flexible viva software open up new perspectives for the determination of heavy metals. The potentiostat with a certified calibrator readjusts itself automatically before each measurement, thus guaranteeing maximum precision.

Determinations with rotating disc electrodes can also be performed with the instrument, e.g. determinations of organic additives in electroplating baths with "Cyclic Voltammetric Stripping" (CVS), "Cyclic Pulse Voltammetric Stripping" (CPVS), and chronopotentiometry (CP). The replaceable measuring head enables rapid changes between the various applications with different electrodes.

The **viva** software is required for control, data collection, and evaluation.

The 884 Professional VA manual for MME is supplied with extensive accessories and a measuring head for the Multi-Mode Electrode pro. Electrode set and **viva** license need to be ordered separately.



Multi-Mode Electrode pro

Mercury electrode for voltammetry. Can be operated as DME, SMDE or HMDE.