



DETERMINATION OF FORMALDEHYDE, ALDEHYDE, AND KETONE EMISSIONS FROM NON METALLIC COMPONENTS, PARTS AND MATERIALS IN THE VEHICLE INTERIOR

Application

The test method describes the measurement procedure for determining formaldehyde, aldehyde, and ketone emissions from components, parts and materials in the interior of vehicles. The procedure is used for testing the distribution of aldehyde and ketone emissions between components. Subject to certain restrictions, it can also be used for material development and for acceptance testing.

As to its technical content, Part A is for determining formaldehyde content in accordance with the modified bottle method and conforms to VDA 275 (German Automotive Association). Part B is to analyze aldehyde and ketone emissions by high performance liquid chromatography (HPLC).

The bottle method was developed for the purpose of determining the formaldehyde emission from woven textiles and untreated particle boards. It has subsequently been applied in different variants for the testing of other materials.

Conditioning and Test Conditions

All test values indicated herein are based on material conditioned in a controlled atmosphere of 23 +/- 2 °C and 50 +/- 5% relative humidity for not less than 24 hours prior to testing and tested under the same conditions unless otherwise specified.

PART A. PHOTOMETRIC DETERMINATION OF FORMALDEHYDE EMISSION FROM NON METALLIC COMPONENTS, PARTS AND MATERIALS IN VEHICLE INTERIORS

Materials Required

Acetyl acetone, p.a.	Sodium thiosulphate ($c(\text{Na}_2\text{S}_2\text{O}_3) = 0.1 \text{ mol/L}$), p.a.
Ammonium acetate, p.a.	Sodium hydroxide ($c(\text{NaOH}) = 1 \text{ mol/L}$), p.a.
Formaldehyde solution (35-40%), p.a.	Starch, p.a.
Iodine solution ($c(\text{I}_2) = 0.05 \text{ mol/L}$), p.a.	Sulphuric acid ($c(\text{H}_2\text{SO}_4) = 1 \text{ mol/L}$), p.a.
Distilled water	

Note: Commercially available ready-mixed solutions can be used if the same results are achieved.

Date	Action	Revisions	Rev. 1
2011 07 14	Revised		
2009 01 23	Activated		

Apparatus Required

- Analytical balance with a ± 1 mg scale
- Heating chamber with air circulation
- Spectrophotometer test apparatus
- Polyethylene bottles with a volume of 1 litre with a lid (see fig. 1)
- Hook made of stainless steel with seals, positioned inside the lid of the test bottle
- Precision burette, 50 mL, calibrated at 20 °C
- Graduated flasks, 1000 mL, calibrated at 20 °C
- Graduated flasks, 100 mL, calibrated at 20 °C
- Pipette, 5 mL, calibrated at 20 °C
- Pipette, 10 mL, calibrated at 20 °C
- Pipette, 15 mL, calibrated at 20 °C

Method

1. Number of tests:

The determination shall be performed five times. The test pieces shall be evenly distributed over the width of the component and taken at suitable, representative points. The size of the test pieces shall be 40 mm x 100 mm x subject material thickness. At least 6 test pieces shall be taken from each component. Five of these are for the formaldehyde test and one for determining the moisture content.

2. Determination of moisture content

The moisture content is determined in accordance with BS EN 322 {Wood-based sheets - Moisture quotient - Testing}.

3. Determination of formaldehyde emission

One or 2 holes are positioned 10 mm from the upper edge of the test piece to permit them to be hung with the help of hooks.

The test piece is weighed prior to the start of the analysis on an analytical balance with an accuracy of 0.01 g. Using a pipette, 50 mL of distilled water are added to each of the polyethylene bottles.

After placing the test pieces on the hooks (see fig. 1), the vessel is sealed and kept for at least 3 h in the heating cabinet at a constant temperature of 60 °C.

At the end of the test period, the vessels are removed from the heating cabinet. After having stood for 60 min at room temperature, the test pieces are removed from the test bottle.

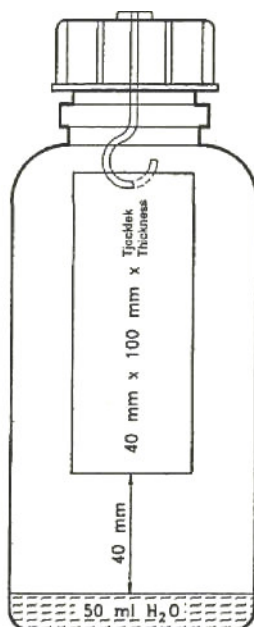


Figure 1

4. Blind test.

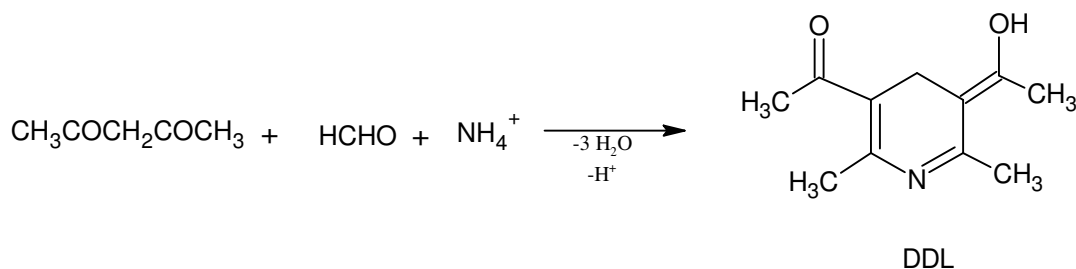
This test is performed in parallel without test pieces.

5. Determination of formaldehyde concentration in the aqueous solution

The determination of the formaldehyde level in the aqueous solution is performed photometrically by the acetyl acetone method.

5.1 Principle

The determination is based on the Hantzsch reaction in which formaldehyde in aqueous solution reacts with ammonium ions and acetyl acetone to form diacetyl dihydrolutidin (DDL). DDL has an absorption maximum at 412 nm. The reaction is specific to formaldehyde.



5.2 Reagents

Acetyl acetone solution

4 mL of acetyl acetone are poured into a 1000 mL graduated flask, which is then topped up with water to the 1000 mL mark. The solution is kept under a gas-tight seal and protected from the light for up to 4 weeks.

Ammonium acetate solution

200 g of ammonium acetate are weighed into a 1000 mL graduated flask, dissolved in distilled water and topped up to 1000 mL.