ICS 59.080.30
CCS W04

NATIONAL STANDARD OF THE PEOPLE'S REPUBLIC OF CHINA

GB/T 42704-2023

Textile trim materials in automotive interior applications - Determination of the emissions of volatile organic compounds - Chamber method

汽车内饰用纺织材料 挥发性有机物的测定 箱体法

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Foreword

This document was issued on 23 May 2023 by the State Administration for Market Regulation; Standardization Administration of the PRC and takes effect on 1 December 2023.

It is a GB/T standard: recommended rather than compulsory, but it is the text a Chinese reviewer applies when assessing a submission.

1 Scope

GB/T 42704-2023 measures what the textiles inside a car give off. A vehicle interior is a small, sealed, sun-heated volume lined with materials that continue to release volatile organic compounds long after manufacture - from the polymers themselves, from adhesives, backings and finishes - and the occupants breathe the result. Textile trim is a large share of the exposed surface, which makes it a large share of the emission. Measuring it credibly is the difficulty: emission rates depend strongly on temperature, air exchange and the ratio of sample area to chamber volume, so a number without a specified method means nothing and two suppliers' figures cannot be compared. This document describes a chamber method for collecting and determining the emissions of volatile organic compounds from textile trim materials used in automotive interiors. It applies to all

types of automotive interior textile trim materials, including woven fabrics and the other constructions used in the application. Under ICS 59.080.30 and CCS W04, it is written for textile and trim suppliers, for the vehicle manufacturers writing interior air quality requirements into their specifications, and for the testing laboratories that have to produce comparable numbers.

This document describes a test method for the collection and determination of the emissions of volatile organic compounds from textile trim materials in automotive interior applications using the chamber method.

This document applies to all types of textile trim materials in automotive interior applications, including woven fabrics, knitted fabrics, non-woven fabrics and coated fabrics, as well as composite fabrics.

2 Normative references

The following documents are referred to in the text in such a way that some or all of their content constitutes requirements of this document. For dated references, only the version corresponding to that date is applicable to this document; for undated references, the latest version (including all amendments) is applicable to this document.

HJ/T 400-2007, Determination of volatile organic compounds and carbonyl compounds in cabin of vehicles

3 Terms and definitions

For the purposes of this document, the following terms and definitions apply.

3.1

total volatile organic compounds; TVOC

Volatile organic compounds with retention time between n-hexane and n-hexadecane when using a Tenax tube for sampling, and a non-polar chromatographic column (polarity index less than 10) for analysis.

3.2

total hydrocarbon mass concentration

Glass or stainless-steel adsorption tube, which is filled with solid adsorption material with a particle size of 250 um ~ 180 um (60 mesh ~ 80 mesh).

Note: In most cases, Tenax-TA tubes are used, and adsorption tubes with other fillers can also be used.

3.10

DNPH tube

A sampling tube that is filled with 2,4-dinitrophenylhydrazine (DNPH) silica gel.

4 Principle

Put the sample into the test chamber; heat it under the specified temperature, humidity and air change rate; monitor the sampling environment in real time through the online hydrogen flame ionization detector (FID); use the sampling tube to collect the air in the chamber after a certain period of time; use gas chromatography/mass spectrometry (GC-MS) and high performance liquid chromatography (HPLC) to qualitatively and quantitatively determine the collected benzene series and aldehydes and ketones (see

5 Instruments and materials

5.1 Test chamber

5.1.1 General

5.1.1.1 The chamber capacity of the test chamber shall be 0.05 m3 ~ 4.0 m3, and a test chamber with a capacity of (1.00+/-0.05) m3 is recommended. The interior of the chamber shall be composed of a gas mixing device, a temperature regulating device, a humidity regulating device, a bracket for placing test samples, air intake and exhaust pipes, etc.

5.1.1.2 Chamber material: The inner wall of the chamber and the bracket for placing test samples shall be made of electropolished stainless steel. If the necessary parts or facilities inside the chamber cannot be made of electropolished stainless steel due to technical reasons, they shall be made of materials that have a weak adsorption of organic matter and do not emit organic matter, and the surface area of the parts or facilities using these materials shall not exceed 5% of the total internal surface area of the chamber.

5.1.1.3 Tightness: In order to avoid unnecessary air exchange, the chamber shall have

good airtightness.

5.1.1.4 Gas mixing: A gas mixing device shall be equipped, so that the airflow speed in the center of the chamber in the empty chamber state is greater than 0.1 m/s during the test process.

5.1.1.5 Chamber cleaning: By adopting appropriate cleaning methods, such as high-temperature thermal desorption, etc., ensure that the chamber is thoroughly cleaned after each test is completed. Before the start of the next test, all surfaces in the test chamber that are in contact with volatile organic compounds shall also be cleaned to ensure that the background value of the chamber will not affect the test results.

5.1.2 Temperature regulating device

The temperature regulating device shall ensure that the temperature difference at each point in the space of the test chamber does not exceed +/-1 °C.

5.1.3 Humidity regulating device

The humidity regulating device shall ensure that the relative humidity of the gas entering the test chamber is 45% +/- 5% at 23 °C and 5% +/- 0.5% at 65 °C, and no steam or spray can be generated during the humidity regulating process.

5.1.4 Test chamber tightness

In order to avoid uncontrollable gas exchange, it shall be ensured that under the condition of positive pressure of 1 000 Pa, the gas leakage per minute is less than 0.5% of the volume of the test chamber. In order to prevent outside gas from entering the test chamber, especially during gas sampling, it shall be ensured that the pressure of the test chamber is slightly higher than atmospheric pressure, that is, it is operated under the condition of slight positive pressure.

Set the chamber temperature to 65 °C, and test the airtightness of the test chamber by applying a positive pressure of 1 000 Pa on its surface and recording the pressure change of the test chamber within 2 h. The pressure sensor used shall be able to detect the pressure below 100 Pa and the deviation shall not exceed +/-5%. During the 2 h test period, the average leakage rate shall be calculated according to Formula (1):