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**INDUSTRY STANDARD OF THE
PEOPLE'S REPUBLIC OF CHINA**

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**Determination of ozone-depleting substances including CFC-12, HCFC-22, CFC-11
and HCFC-141b in rigid polyurethane foam and pre-blended polyether polyols --
Portable headspace/gas chromatography-mass spectrometry**

硬质聚氨酯泡沫和组合聚醚中 CFC-12、HCFC-22 CFC-11 和 HCFC-141b 等消耗
臭氧层物质的测定 便携式顶空气相色谱-质谱法

(English Translation)

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Foreword

In order to implement the "Environmental Protection Law of the People's Republic of China" Environment, protect human health, regulate CFC-12, HCFC-22, CFC-11 and HCFC-141b and other ozone-depleting substances are determined by this standard.

This standard specifies CFC-12, HCFC-22, CFC-11 and HCFC-141b in rigid polyurethane foams and combined polyethers.

Determination of portable headspace/gas chromatography-mass spectrometry.

Appendix A and Appendix B of this standard are informative appendices.

This standard is issued for the first time.

This standard is formulated by the Department of Eco-Environmental Monitoring, Laws and Standards Department of the Ministry of Ecology and Environment.

This standard was drafted. China Environmental Monitoring Station.

Verification units of this standard. National Environmental Analysis and Testing Center, Zhejiang Environmental Monitoring Center, Shandong Province Ecological Environment Monitoring Center, Guangdong Environmental Monitoring Center, Tianjin Ecological

Environment Monitoring Center and Chongqing Ecological Environment Monitoring Center.

This standard was approved by the Ministry of Ecology and Environment on October 31, 2019.

This standard will be implemented from October 31, 2019.

This standard is explained by the Ministry of Ecology and Environment.

CFC-12, HCFC-22, CFC-11 in rigid polyurethane foam and combination polyether and ozone depleting substances such as HCFC-141b and portable headspace/gas phase color Spectrum-mass spectrometry Warning. The standard used in this method is volatile and toxic chemicals. Protective equipment should be worn in accordance with requirements.

Avoid inhalation or contact with skin and clothing.

1 Scope

This standard specifies the determination of difluoromethylene chloride (CFC-12), difluoromethylene chloride in rigid polyurethane foam and combined polyethers.

Ozone depleting substances such as alkane (HCFC-22), monofluorotrichloromethane (CFC-11) and monofluorodichloroethane (HCFC-141b) Quality portable headspace/gas chromatography-mass spectrometry.

This standard applies to CFC-12, HCFC-22, CFC-11 and HCFC-141b in rigid polyurethane foams and combined polyethers.

Qualitative detection.

When using rigid polyurethane foam as the test object, under the conditions specified in this standard, CFC-12, HCFC-22, CFC-11 the method detection limits for HCFC-141b and HCFC-141b are 2 µg, 2 µg, 2 µg, and 0.6 µg, respectively.

When the combined polyether is used as the test object, under the conditions specified in this standard, CFC-12, HCFC-22, CFC-11 and the method detection limits of HCFC-141b are 3 µg, 2 µg, 2 µg, and 0.9 µg, respectively.

2 Method principle

Under a certain temperature condition, the target compound in the sample in the headspace bottle volatilizes to the liquid (solid) space, resulting in a certain the vapor pressure and gas-liquid (solid) two-phase dynamic equilibrium are reached. The target compound in the gas phase is purged with high purity carrier gas and adsorbed on in the built-in loop of a portable gas chromatography-mass spectrometer, the target compound in the loop is blown back into the carrier gas with high purity.

After separation by gas chromatography, it was detected by a mass spectrometer and

qualitatively compared with the retention time and mass spectrum of a standard substance.

3 Terms and definitions

The following terms and definitions apply to this standard.

Rigid polyurethane foam Abbreviated as polyurethane rigid foam, it uses isocyanate and polyether as the main raw materials. It is widely used in foaming agents, catalysts, flame retardants, etc.

Under the action of additives, high-molecular polymers that are mixed by special equipment and foamed on-site by high-pressure spraying.

Pre-blended polyether polyols the mixture is composed of monomer polyether, foaming agent, cross-linking agent, catalyst, foam stabilizer and other components. Production hard One of the two-component raw materials of high quality polyurethane foam, commonly known as white material.

Ozone-depleting substances Chemicals that have a destructive effect on the ozone layer and are included in the China List of Controlled Ozone Depleting Substances.

4 Reagents and materials

Unless otherwise specified, analytical reagents that meet national standards are used. Experimental water is free of target compounds of distilled water or water prepared by pure water equipment.

4.1

Difluoromethylene chloride (CFC-12) standard solution. commercially available certified standard solution, the solvent is methanol.

4.2

Difluoromonochloromethane (HCFC-22) standard solution. commercially available certified standard solution, the solvent is methanol.

4.3

Monofluorotrichloromethane (CFC-11) standard solution. commercially available certified standard solution, the solvent is methanol.

4.4

Monofluorodichloroethane (HCFC-141b) standard solution. commercially available certified standard solution, the solvent is methanol.

4.5

Carrier gas. nitrogen, purity $\geq 99.999\%$.

5 Instruments and equipment

5.1

Portable gas chromatograph-mass spectrometer. with loop injection function. The chromatographic part has the function of program temperature rise, the mass spectrometry part Electron Impact (EI) Ionization Source with 70 eV, with NIST Mass Library, Full Scan (SCAN), Manual/Auto Dynamic tuning, data acquisition and library search.

5.2

Headspace sampler. can be directly connected to the chromatographic section, and the sample can be purged to the portable gas chromatography-mass spectrometer by carrier gas Instrument inside the host.

5.3

Capillary column. 30 m x 0.32 mm, 1.0 m film thickness (100% polyethylene glycol), or 10 m x 0.1 mm, 0.2 m film thickness (100% polyethylene glycol). Other equivalent capillary columns can also be used.

5.4

Pipette. 20 µl, 5 ml or 10 ml.

5.5

Utility knife. metal.

5.6

Medicine spoon. metal material.

5.7

Sample vial. 40 ml brown screw-top glass bottle, Teflon-lined silicone rubber pad, or with headspace sampler (5.2) Matching glass bottles.

5.8

Sampling spoon. long handle, metal material.

5.9

General laboratory instruments and equipment.

6.1 Sample collection and storage

Rigid polyurethane foam. For each batch of foam products, 3 packaging units are randomly selected for sample collection; when packaging when there are less than 10 units, 1 or 2 packaging units can be selected for sample collection as appropriate. Collect 2 samples per packaging unit, One for analysis and one for preservation. When collecting samples, use a utility knife (5.5) on any of the rigid polyurethane foam Take a cube whose length, width and