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GB/T 24572.6-2026

Standard practice for the separation and concentration of ignitable liquid residues from fire debris samples - Part 6: Thermal desorption

火灾现场易燃液体残留物实验室提取方法 第6部分：热脱附法

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Foreword

This document complies with the provisions of GB/T 1.1-2020 "Standardization Work Guidelines Part

1.Structure and Drafting Rules of Standardization Documents". Drafting. This document is Part 6 of GB/T 24572 "Laboratory Extraction Methods for Flammable Liquid Residues from Fire Scenes". GB/T 24572 has been... The following sections have been published.

1.Solvent Extraction Method;

2.Direct Headspace Sampling;

3.Activated Carbon Adsorption Method;

4.Solid-Phase Microextraction;

5.Sweeping and Trapping Method;

6.Thermal Desorption. Please note that some content in this document may involve patents. The issuing organization of this document assumes no responsibility for identifying patents. This document was proposed by the National Fire and Rescue Administration. This document is under the jurisdiction of the National Fire Protection Standardization Technical Committee (SAC/TC113). This document was drafted by: Tianjin Fire Research Institute, Ministry of Emergency Management; Shenyang Fire Research Institute, Ministry of Emergency Management; and Shanghai Fire Research Institute, Ministry of Emergency Management. Research Institute, Sichuan Fire Research Institute of the Ministry of Emergency Management, Henan Provincial Fire and Rescue Corps, Hunan Provincial Fire

and Rescue Corps, Tsinghua University Hefei Public Security The entire research institute and the Tianjin Fire and Rescue Corps. The main drafters of this document are. Tian Guihua, Fan Zilin, Deng Zhenyu, Liang Guofu, Guo Ge, Liu Shujun, Huang Hao, Zhang Yi, Su Wenwei, and Liu Haiyan. Li Changzheng and Guo Lei.

Identifying flammable liquid residues at a fire scene is crucial for determining whether arson is suspected. This includes the laboratory extraction of samples. Quantity is a key factor affecting the accuracy of identification conclusions. To standardize this type of physical evidence identification work, a system has been established within my country's fire investigation standard system. Standard for laboratory pretreatment methods for fire evidence. GB/T 24572, "Laboratory Extraction Methods for Flammable Liquid Residues at Fire Scenes," is proposed to consist of six parts.

1.Solvent Extraction Method. This method aims to address the extraction of high-boiling-point substances and soot samples.

2.Direct Headspace Sampling. This method is designed for extracting residues of low-boiling-point flammable liquids.

3.Activated Carbon Adsorption Method. The purpose is to address flammable liquid residue samples that can be selectively adsorbed by activated carbon. extract.

4.Solid-Phase Microextraction. The aim is to address flammable liquids that can be selectively adsorbed by solid-phase microextraction fiber coatings. Extraction of residue samples.

5.Purge and Trap Method. This method is designed for extracting flammable liquid residues with high water content.

4 Principles and Characteristics

4.1 Principle Sample tubes containing the evidence, or sample tubes adsorbed with flammable liquid from the evidence, are placed on a thermal desorption instrument and directly heated for desorption. Flammable liquid enters a low-temperature cold trap along with the carrier gas. The cold trap is rapidly heated to a high temperature, and the desorbed and vaporized flammable liquid is then transported along with the carrier gas through a constant-temperature transfer line. The sample is then subjected to gas chromatography-mass spectrometry for detection.

4.2 Characteristics Thermal desorption has the following characteristics.

---Do not damage the appearance of the sample;

---Applicable to small-volume and fluffy evidence;

---Suitable for enrichment of trace amounts of flammable liquid residues.

5 Materials and Equipment

5.1 Carrier Gas Nitrogen gas with a purity of 99.9% or higher; high-purity helium gas with a purity of 99.999% or higher.

5.2 Container Material

5.2.1 Evidence Bag Including polyamide nylon, polyethylene terephthalate (PET), and polyethylene (PE). Evidence bags should be made of plastics such as ethylene (PE) and polyvinyl chloride (PVC). Evidence bags should ideally be airtight. Nylon and PET evidence bags.

5.2.2 Container Various types of containers with good airtightness. Containers should preferably have an air inlet at the bottom and an air outlet at the top, and be sealed with silicone rubber, fluororubber, or similar materials. A special metal container for the ring.

5.3 Adsorbent Materials Adsorbent materials include.

a) Dry powder fire extinguishing agents, diatomaceous earth, and other micron-sized high specific surface area fine powders with a specific surface area of 10m^2/g to 300m^2/g;

b) Soft, porous materials such as plant fibers, hair, oil-absorbing cotton, activated charcoal, or activated charcoal fibers;

c) Polydimethylsiloxane (PDMS), divinylbenzene (DVB), and other polymers Solid-phase microextraction fibers and films with coatings.

5.4 Sample Tubes This includes empty stainless steel tubes and adsorption tubes filled with adsorbent packing material. The adsorbent packing material should preferably be poly(2,6-diphenyl-p-phenylene ether) (Tenax- TA) and poly(2,6-diphenyl-p-phenyl ether) containing 30% graphitized carbon black (Tenax-GR).

5.5 Sampler This includes syringes and sampling pumps with a volume of at least 50 mL. Small-volume sampling pumps with flow control functionality are preferred.

5.6 Heating Equipment For ovens or other heating equipment with temperature control functions, the heating temperature should be between 40°C and 100°C.

5.7 Aging device The technical requirements for aging sample tubes in an aging device shall meet the following criteria.

---The set temperature should not be lower than 400°C;

---The carrier gas flow rate is adjustable, and the maximum carrier gas flow rate should not be less than 100 mL/min.

5.8 Thermal Desorption Instrument Manual loading of the thermal desorption unit or fully automatic thermal desorption unit.

5.9 Gas Piping System Gas lines and related accessories used to connect thermal desorption instruments and gas chromatograph-mass spectrometers.

6 Thermal Desorption

1.Scope This document describes the characteristics of the laboratory-based thermal desorption method, and the materials and equipment used for extracting flammable liquid residues from fire scenes. and experimental procedures. This document applies to the enrichment and desorption of flammable liquids such as gasoline, kerosene, diesel, and paint thinner remaining at fire scenes in the laboratory. He used it as a reference for the enrichment and desorption of volatile substances and thermal decomposition products of polymer materials.

3.Terms and Definitions This document does not contain any terms or definitions that need to be defined.

6.2 Sealing of the sample

6.2.1 Static Adsorption Sealing Sealing steps for static adsorption method.

a) Place the sample in an evidence bag, suspend the absorbent tube or absorbent material inside the bag, and then seal it;

b) Place the sample into the container, suspend the adsorption tube or adsorption material on the container lid, and then close and seal it.

6.2.2 Dynamic Adsorption Sealing Sealing steps for dynamic adsorption method.

a) The evidence was placed in a sealed bag. 1) Place the sample in a bag, tie the bag tightly, preferably by folding the edges of the bag opening in half and then binding it, or by using a special tool strip to lock it securely; 2) Connect the air inlet end of the adsorption tube to the evidence bag. Place the evidence bag horizontally, insert the air inlet end of the adsorption tube into the evidence bag, and cut it open. Insert it into the small opening or the special air outlet of the evidence bag and lock it tightly, keeping the air outlet of the adsorption tube sealed.

b) Sealed container. 1) Place the sample into a special container with an air inlet at the bottom and an air outlet at the top, and seal it. 2) Insert the air inlet end of the adsorption tube into the air outlet of the container and lock it in place, keeping the air outlet end of the adsorption tube sealed.

6.3 Adsorption

6.3.1 General Requirements This includes static adsorption and dynamic adsorption, both of which are optional. Static adsorption should be used when the sample clearly shows a positive result for flammable liquids, except... In addition, all samples should be subjected to