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

GB/T 46550.1-2025

**Natural gas - Determination of odorant - Part 1: Determination
of tetrahydrothiophene and non-sulfur odorant concentration
by gas chromatography with photoionization detector**

天然气 加臭剂的测定 第1部分：用光离子化气相色谱法测定四氢噻吩和无硫加臭
剂含量

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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 1 of GB/T 46550 "Determination of Odorants in Natural Gas". GB/T 46550 has already published the following parts.

1.Determination of tetrahydrothiophene and sulfur-free odorant content by photoionization gas chromatography;

2.Determination of tetrahydrothiophene content using an electrochemical sensor method.

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 and is under the jurisdiction of the National Technical Committee on Standardization of Natural Gas (SAC/TC244). This document was drafted by: Natural Gas Research Institute, Southwest Oil & Gas Field Branch, China National Petroleum Corporation; China National Petroleum Corporation. Southwest Oil & Gas Field Branch of China Petroleum & Chemical Corporation, Sichuan Huayou Group Co., Ltd., Sichuan Chuangang Gas Co., Ltd., China National Petroleum Corporation Southwest Oil and Gas Field Gas Branch of China National Petroleum Corporation, Natural Gas Sales Branch of China National Petroleum Corporation, Beijing Gas Group Co., Ltd., Chongqing Gas Group Co., Ltd., Dazhou Quality and Technical Supervision and Testing Center, Sichuan Zhongce Biao Wuwu Technology Co., Ltd., Chengdu Nengte Technology Development Co., Ltd., and Jiangsu Huistone Electromechanical Technology Co., Ltd. The main drafters of this document are. Zhou Li, Zhang Pu, Ge Feng, Song Kejing, Shen Lin, Wu Shuhong, Chen Zixun, He Denghua, Wang Weijie, and Mou Hongtao. Zhang Dashuang, Liu Chengwei, Liu Siting, Zhang Qigen, Guo Zijian, Zhang Yan, Wang Ke, Shen Ping, Xie Haiqiang, Wang Xinwei, Jiang Rui, Wang Qingyuan, Yuan Jiaoyang Wang Wenbin, Zhu Hongyang, and Yin Guoxin.

GB/T 46550, "Determination of Odorants for Natural Gas," specifies the principles, reagents and materials, instruments, and sampling procedures for determining odorants in town gas. Specific requirements regarding sample selection, testing procedures, data processing, and precision are beneficial for accurately determining the concentrations of tetrahydrothiophene and sulfur-free odorant in urban gas. Measurement facilitates the supervision and inspection of the content of warning gases in gas, or online detection, which is of great significance for ensuring urban gas safety. GB/T 46550 is proposed to consist of three parts.

1.Determination of tetrahydrothiophene and sulfur-free odorant content by photoionization gas chromatography. The aim is to provide a photoionization method... This analytical method, based on gas chromatography, is used to determine the content of tetrahydrothiophene and sulfur-free odorant. It can be applied to offline and portable on-site analysis of odorants. Quantitative or online continuous measurement.

2.Determination of Tetrahydrothiophene Content Using an Electrochemical Sensor. The aim is to provide an electrochemical sensor for the determination of tetrahydrothiophene content. The analytical method for thiophene content can be used for online and rapid on-site determination of odorants.

3.Determination of Tetrahydrothiophene Content Using a Micro-thermal Conductivity

Sensor. The aim is to provide a micro-thermal conductivity sensor for determining tetrahydrothiophene content. The analytical method for phenanthrene content can be used for online and rapid on-site determination of odorants. The photoionization gas chromatography method used in this document has advantages such as low detection limit and high precision, and is suitable for tetrahydrothiophene and other non-volatile organic compounds in fuel gases. Accurate testing of sulfur and odorant content. Determination of Natural Gas Odorants - Part 1. Determination of tetrahydrothiophene by photoionization gas chromatography and sulfur-free odorant content

Note. This document does not cover all security issues related to its application. Users are responsible for developing appropriate security plans before using this document. Comprehensive protection measures should be defined, and their applicable scope should be clearly defined.

1 Scope

GB/T 46550.1-2025 is the Chinese national standard covering how much odorant is in the gas - the substance that makes a leak smell, without which natural gas is undetectable, measured at the parts-per-million level that decides whether a household will notice a leak in time. Part 1 of the series, first edition, with Part 2. It was issued on 2 December 2025 and has been in force since 1 July 2026, as a first edition. The document is under the responsibility of the Standardization Administration of China. This page is published from the official record of the 2025 edition; the clause text of a standard this recent is not yet in circulation, and the figures, limits and tables it contains are those of the document itself, delivered in full with the English translation.

This document describes the principle, reagents, and methods for determining the content of tetrahydrothiophene and sulfur-free odorant in natural gas using photoionization gas chromatography. Materials, instruments, sampling, test procedures, data processing, precision and test reports. This document applies to offline, portable on-site, or continuous online detection of tetrahydrothiophene and sulfur-free odorant content in natural gas and similar gases. The test range is 1 mg/m³ to 200 mg/m³.

2 Normative references

The contents of the following documents, through normative references within the text, constitute essential provisions of this document. Dated citations are not included. For references to this document, only the version corresponding to that date applies. For undated references, the latest version (including all amendments) applies. This document.

GB/T 5274.1 Preparation of gas mixtures for gas analysis calibration - Part

3 Terms and Definitions

The following terms and definitions apply to this document.

3.1 Using an ultraviolet lamp as a light source, the substances in the sample are ionized. The electrons and positively charged ions produced by ionization form a weak current under the influence of an electric field. Current, a detector that determines the content of a substance by detecting the intensity of the current.

3.2 non-sulfurodorant Odorants consisting of compounds or mixtures thereof that do not contain sulfur atoms and have a warning odor.

Note. The sulfur-free odorant is a mixture of methyl acrylate and ethyl acrylate in a certain proportion.

4.Principles The sample to be tested was compared with a standard substance containing known amounts of tetrahydrothiophene and a sulfur-free odorant under the same operating conditions via chromatographic column chromatography. After passing through a photoionization detector, the gas is illuminated by ultraviolet light of a specific wavelength emitted by an ultraviolet light source. The gas contains tetrahydrothiophene and sulfur-free... When an odorant is bombarded with ultraviolet light, it ionizes and splits into two groups with positive and negative charges. The charged group is attracted by the electrode voltage and tends to the corresponding charge. The electrode generates a current proportional to the concentrations of tetrahydrothiophene and the sulfur-free odorant. This is achieved by comparing the test sample with known tetrahydrothiophene and sulfur-free odorant concentrations.