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

GB/T 27894.7-2025

**Natural gas - Determination of composition and associated
uncertainty by gas chromatography - Part 7: Rapid
determination of helium content using two packed columns**

天然气 用气相色谱法测定组成和计算相关不确定度 第7部分：用两根填充柱快速
测定氦气含量

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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 7 of GB/T 27894 "Determination of Composition and Calculation of Related Uncertainties of Natural Gas by Gas Chromatography".

GB/T 27894 has published the following parts.

- Part 1: General Guidelines and Composition Calculations;
- Part 2: Uncertainty Calculation;
- Part 3: Precision and Bias;
- Part 4: Determination of nitrogen, carbon dioxide, and C1 to C5 and C6 molecules using two chromatographic columns in laboratory and online measurement systems

Hydrocarbons;

- Part 5: Determination of nitrogen, carbon dioxide, and C1 to C5 and C6 atoms using three chromatographic columns in laboratory and online process systems Hydrocarbons;
- Part 6: Determination of hydrogen, helium, oxygen, nitrogen, carbon dioxide, and C1 to C8 hydrocarbons using a three-capillary column;
- Part 7: Rapid determination of helium content using two packed columns.

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: Exploration and Development Research Institute of China National Petroleum Corporation (CNPC) and CNPC West Coast Institute of Petroleum Corporation (CNPC West Coast Institute of Petroleum).

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Introduction

GB/T 27894 provides methods for natural gas analysis and for calculating the mole fraction and uncertainty of components, intended for use in measuring H₂, He, and other components.

N₂, CO₂, and hydrocarbon components, as well as component clusters, are analyzed, where component clusters are determined by uniformly classifying heavy components with C₅ or higher as C₆. This method is applicable to various...

Applications include determining the composition of calibration gas mixtures and natural gas, or providing uncertainty data for calorific value calculations and other physical property

calculations.

GB/T 27894 is proposed to consist of 7 parts.

- Part 1: General Guidelines and Composition Calculations. This section aims to provide general guidelines and composition calculations for the analysis of natural gas using gas chromatography.

Data processing methods for mole fraction determination.

- Part 2: Uncertainty Calculation. This section describes the steps for calculating the uncertainty of the mole fraction of each component.

- Part 3: Precision and Bias. This section aims to describe the expected precision of gas chromatography methods established according to ISO 6974-1, in order to...

And provide guidelines for assessing biases.

- Part 4: Determination of nitrogen, carbon dioxide, and C1 to C5 and C6 hydrocarbons using two chromatographic columns in laboratory and online measurement systems This class aims to provide methods for determining nitrogen, carbon dioxide, and [other substances] using gas chromatography with two columns in laboratory and online measurement systems.

Methods for C1 to C5 and C6 hydrocarbon components.

- Part 5: Determination of nitrogen, carbon dioxide, and C1 to C5 and C6 hydrocarbons using three chromatographic columns in laboratory and online process systems This class aims to provide methods for determining nitrogen, carbon dioxide, and [other substances] using gas chromatography with three columns in laboratory and online process systems.

Methods for C1 to C5 and C6 hydrocarbon components.

- Part 6: Determination of hydrogen, helium, oxygen, nitrogen, carbon dioxide, and C1 to C8 hydrocarbons using a three-capillary column. The aim is to provide sampling...

Gas chromatography using three capillary columns was employed to determine hydrogen, helium, oxygen, nitrogen, carbon dioxide, and C1 to C8 hydrocarbon components. method.

- Part 7: Rapid Determination of Helium Content Using Two Packed Columns. This section aims to provide a rapid method for determining helium content using two packed columns in gas chromatography.

Methods for determining helium content.

Helium is a globally important strategic resource, playing an irreplaceable role in the development of cutting-edge technologies such as aerospace, nuclear energy, and cryogenic superconductivity.

Function. Accurate determination of helium content is crucial to the accuracy of helium

resource assessment results and the reliability of subsequent extraction engineering design. Currently, there are...

National or industry standards related to natural gas component analysis mainly target the dominant hydrocarbon components in natural gas, and the helium content in natural gas.

The quantitative analysis range is relatively narrow, the instrument configuration is complex, the detection time is long, and the analysis conditions are wide, making it difficult to quickly and accurately evaluate helium abundance and resource potential.

This presents significant challenges, including process upgrades. Therefore, establishing stable and reliable standards for rapid analysis methods of helium component content is crucial for different testing instruments.

The analytical data from these structures can be compared with each other, whether for an accurate assessment of helium composition and resource potential, or for evaluating the level of helium production technology.

The improvement of these aspects is of great significance.

Composition and calculation of natural gas by gas chromatography Related Uncertainties, Part 7: Using Two Filling Columns Rapid determination of helium content Warning. This document does not address all potential security issues. Users are responsible for taking appropriate security and protective measures and ensuring compliance.

It meets the conditions stipulated by relevant national laws and regulations.

1 Scope

This document describes a method for the rapid determination of helium content using gas chromatography with two packed columns.

This document applies to different types of natural gas and similar gases, including wellhead natural gas, pipeline natural gas, processing plant feedstock gas, and processed natural gas.

Rapid determination of helium content in a mixture of gases with a mole fraction ranging from 0.005% to 40%.

2 Normative references

GB/T 4946

GB/T 13609

GB/T 14850

GB/T 20604