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NATIONAL STANDARD OF THE PEOPLE'S REPUBLIC OF CHINA

GB/T 7131-2026

Replacing GB/T 7131-1986

Plastics - Identification of polymers - Pyrolytic gas chromatography

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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 replaces GB/T 7131-1986 "Identification of Polymers by Pyrolysis Gas Chromatography". Compared with GB/T 7131-1986, except for the structure... Aside from adjustments and editorial changes, the main technical changes are as follows:

a) The scope of application has been changed (see Chapter 1, Chapter 1 of the 1986 edition);

b) Added terms and definitions (see Chapter 3);

c) The descriptions of polar stationary phases and packed columns, along with their corresponding technical details, have been removed (see section

4.4.1.1 of the 1986 edition).

d) A capillary column and corresponding analytical conditions were added (see

6.3.5 and 7.2.3);

e) The experimental procedures were changed (see Chapter 7, Chapter 4 of the 1986 edition);

f) Added 27 identifiable plastic names and their corresponding major pyrolysis products (see 7.3.6). 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 China Petroleum and Chemical Industry Federation. This document is under the jurisdiction of the National Technical Committee on Plastics Standardization (SAC/TC15). This document was drafted by: Petrochemical Research Institute of China National Petroleum Corporation and Zhonglan Chenguang Chengdu Testing Technology Co., Ltd. The company, Zhejiang Xinhecheng Special Materials Co., Ltd., and Kingfa Science & Technology Co., Ltd. The main drafters of this document are. Xue Huifeng, Chen Fei, Chen Xiaofeng, Zheng Wen, Zhang Yanjun, Zhang Qian, Qin Peng, and Wang Shihui. This document was first published in 1986, and this is its first revision. Identification of Plastic Polymers by Pyrolysis Gas Chromatography

1 Scope

GB/T 7131-2026 is the Chinese national standard covering identifying a plastic by burning a fragment of it in the absence of air and reading the chromatogram of what comes off - the fingerprint method that identifies a polymer, a blend or a copolymer when no other information about the sample exists. It replaces GB/T 7131-1986, a standard forty years old, and has been in force since 1 October 2026. It was issued on 31 March 2026 and takes effect on 1 October 2026, replacing GB/T 7131-1986. The document is under the responsibility of the China Petroleum and Chemical Industry Federation. This page is published from the official record of the 2026 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 a method for identifying plastics using pyrolysis gas chromatography. This document applies to the identification of polymers in plastics containing a single polymer material, and also to plastics containing two or more polymer materials. Identification of the main polymers in the material. This document is not applicable to identifying the same type of plastic produced by different processes, nor is it applicable to identifying the same type of plastic with different comonomer contents.

4.Principles When polymers undergo thermal decomposition at a certain temperature, they follow specific decomposition patterns, yielding decomposition products. Different polymers produce different decomposition products. Different polymers also have certain characteristic products. Based on this characteristic, single polymers or polymer mixtures can be identified. A known plastic is thermally pyrolyzed at a given temperature. The pyrolysis products are introduced into a gas chromatograph and separated and detected under certain conditions. The pyrolysis products of the plastic were obtained. Under the same pyrolysis temperature and gas chromatography conditions, the pyrolysis products of the unknown plastic were determined. The unknown plastic was identified by comparing the

retention time and distribution characteristics (relative intensity) of the main components in the chromatogram of the pyrolysis products.

5 Reagents and Materials

5.1 Carrier Gas High-purity helium or high-purity nitrogen, with a purity of not less than 99.999% (volume fraction), dried with silica gel or 5A molecular sieve and activated carbon. Purification.

5.2 Combustion Gas Hydrogen gas, with a purity of not less than 99.99% (volume fraction), is dried and purified using silica gel or 5A molecular sieve.

5.3 Combustion-supporting gas Air, oil-free, dried and purified by silica gel or 5A molecular sieve.

6 Instruments

6.1 Instrument Composition It consists of a pyrolyzer and a gas chromatograph. The pyrolyzer has a suitable interface to connect to the vaporization chamber (inlet) of the gas chromatograph.

6.2 Pyrolysis Unit

6.2.1 Hot filament pyrolyzer It is constructed from a spiral tube made of platinum or nickel heating wire. The sample can be placed directly on the spiral heating wire, or it can be placed inside a quartz tube and then... The pyrolysis tube is placed in a spiral tube. The maximum pyrolysis temperature is not lower than 800°C, and the heating temperature accuracy is better than 5°C.

6.2.2 Tubular Furnace Cracker It consists of a quartz tube heated by an external heating wire. The maximum pyrolysis temperature is not lower than 800°C, and the heating temperature accuracy is better than 5°C.

6.2.3 Curie Point Cracker It consists of a Curie-point high-frequency induced heating element. Ferromagnetic materials are used as the heating element; the pyrolysis temperature varies depending on the material of the Curie-point heating foil. Depending on the degree, the highest pyrolysis temperature is not lower than 800°C, and the heating temperature accuracy is better than 5°C.

6.3 Gas Chromatograph

6.3.1 Composition of Gas Chromatograph It consists of a vaporization chamber (inlet), a column oven, a detector, a data processing system, and a column.

6.3.2 Vaporization chamber (sample inlet) Split/non-split vaporization chamber, maximum operating temperature not lower than 350°C, temperature accuracy better than 1°C. Carrier

gas pressure adjustable, pressure accuracy not... Greater than

0.1 kPa.

6.3.3 Chromatography column oven It can perform programmed heating, with a heating temperature adjustable from at least 30°C to 350°C, and a temperature control accuracy better than 0.1°C; the heating rate is at least... Adjustable within the range of 1°C/min to 20°C/min.

6.3.4 Detector The flame ionization detector (FID) has a maximum operating temperature of 350°C and a temperature accuracy better than 1°C. Some plastics produce large amounts of permanent gases during pyrolysis. For example, the pyrolysis of polyvinyl chloride produces large amounts of hydrogen chloride, and the pyrolysis of polycarbonate produces large amounts of hydrogen chloride. The reaction produces a large amount of carbon dioxide, and these permanent gases do not respond to FID, therefore they cannot be detected by FID. If you want to detect... For measuring these permanent gases, other detectors such as thermal conductivity detectors (TCDs) are preferable.

6.3.5 Data Processing System It can acquire the detector signal and automatically calculate the retention time and peak area of the chromatographic peak.

6.3.6 Chromatographic Column Capillary column, stationary phase. 100% polydimethylsiloxane, or 5% diphenyl-95% dimethylpolysiloxane, or 5% diphenyl... 1% vinyl (94%) dimethyl polysiloxane can effectively separate the main components in plastic pyrolysis products. A column length of 25m is typically chosen. For nonpolar or weakly polar capillary columns up to 50m in length, a 30m nonpolar or weakly polar capillary column is recommended.

7.1 Sample Pretreatment

7.1.1 If the sample contains a large amount of low-molecular-weight organic additives or low-molecular-weight filler oils, and interferes with the separation and determination of plastic pyrolysis products... Therefore, an appropriate solvent should be used to extract and separate the sample to remove interfering substances. The extraction solvent should not dissolve the plastic.

7.1.2 The extraction method should be selected from Soxhlet extraction or heating and reflux, etc.

7.2 Analysis Conditions

7.2.1 The thermal decomposition temperature is 500°C~700°C, and 600°C is preferred.

7.2.2 If the pyrolysis unit is connected to the gas chromatography vaporization chamber (inlet) via a transfer line, the transfer line temperature should be selected as 250°C~320°C.

7.2.3 The temperature of the gas chromatograph vaporization chamber (injector) shall not