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

GB/T 32868-2025

Replacing GB/T 32868-2016

**Nanotechnologies - Characterization of carbon nanotube
samples using thermogravimetric analysis**

纳米技术 碳纳米管的热重表征方法

(English Translation)

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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 32868-2016 "Thermogravimetric Characterization Method of Single-Wall Carbon Nanotubes in Nanotechnology", and is consistent with GB/T 32868-Compared to 2016, aside from structural adjustments and editorial changes, the main technical changes are as follows.

- The scope has been changed (see Chapter 1, Chapter 1 of the 2016 edition);
- Terms and definitions such as "thermal stability," "uniformity," and "purity" have been changed (see 3.2, 3.3, and 3.6, 2016 editions of 3.2, 3.3, and 3.6).
- DTA, TGC, and TOX have been removed (see Chapter 4 of the 2016 edition);
- Added abbreviations and symbols such as CNT, MWCNT, and SWCNT (see Chapter 4);
- The content regarding "Exothermic and Endothermic Reactions" has been revised (see

5.2, 2016 version 5.2);

---Added some crucible options for TGA testing of carbon nanotubes (see Table 1);

---The guidelines for sample quantity in sample preparation have been changed [see 6.2a) and 7b), 6.2a) and 7b) in the 2016 edition.

This document is equivalent to ISO/T S11308.2020 "Nanotechnology - Thermogravimetric characterization method for carbon nanotubes", and the document type is changed from ISO.

The technical specifications have been adjusted to become my country's national standards.

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 Chinese Academy of Sciences.

This document is under the jurisdiction of the National Technical Committee on Standardization of Nanotechnology (SAC/TC279).

Introduction

Carbon nanotubes (CNTs) are cylindrical nanostructures and are allotropes of carbon. Due to several...

Due to the unique structure of CNTs, they exhibit distinctive mechanical, thermal, and electronic properties. CNTs can be synthesized through various methods, including pulsed excitation.

Photoevaporation, arc discharge, high-pressure carbon monoxide dismutation, and chemical vapor deposition (CVD) are methods used to synthesize CNTs and heterogeneous materials.

Mixtures of these substances often require subsequent purification. Commonly observed impurities include other forms of carbon, such as fullerenes, amorphous carbon, and fossil fuels.

Black carbon, single-walled carbon nanotubes (SWCNTs) and multi-walled carbon nanotubes outside the ideal size and chiral range and/or thermal oxidation is carried out.

Reaction kinetic parameters related to pyrolysis, oxidation, pyrolysis, corrosion, moisture absorption/desorption, and gas escape. The reaction kinetic parameters of the samples are evaluated.

Numbers can be used to qualitatively or quantitatively measure the relative proportions of different components.

TGA is one of many analytical techniques that can be used to assess impurity levels in CNT-containing samples. For CNT-containing samples, TGA...

TGA is typically used to quantify the content of non-volatile impurities (such as metal catalyst particles). TGA can also be used to evaluate the thermal stability of a given sample.

The TGA instrument provides information about the types of carbon present in the material. Recent advances in TGA instruments have improved the resolution of the analysis process. However, the TGA itself...

The information obtained from TGA alone is insufficient to determine the relative composition of carbonaceous products in a material. Therefore, information obtained from TGA is generally used to supplement other analytical techniques.

The information collected is used to achieve a comprehensive assessment of the components of a CNT sample.

Thermogravimetric characterization method of carbon nanotubes in nanotechnology

1 Scope

This document describes a method for characterizing carbon nanotube (CNT) samples by thermogravimetric analysis (TGA) under inert or oxidizing conditions.

This document is applicable to the measurement and quantitative evaluation of carbon species types and non-carbon impurities (such as metal catalyst particles) in materials.

The purity of CNT samples was qualitatively assessed, as well as the thermal stability and homogeneity of CNT-containing samples. This document is not applicable to confirming CNT type and gold content.

It is an impurity component.

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 documents, only the version corresponding to that date applies to this document; for undated references, the latest version (including all amendments) applies.

This document.

ISO/T S80004-3 Nanotechnology Terminology Part 3: Carbon Nanomaterials (Nanotechnologies-Vocabulary-) Part 3: Carbonnano-objects Note. GB/T 30544.3-2015 Nanotechnology Terminology Part 3: Carbon Nanomaterials (ISO/T S80004-3.2010, IDT)

3 Terms and Definitions

The terms and definitions defined in ISO/T S80004-3, as well as the following terms and definitions, apply to this document.

The URLs for the terminology databases maintained by ISO and IEC for standardization are as follows.

TOX'

The temperature at which the strongest peak appears on the differential thermogravimetric curve.

thermal stability

Dimensional stability of solid materials when heated under specified conditions.

homogeneity

The degree to which a property or a component (3.4) is uniformly distributed in a certain amount of substance.

Example. Main oxidation temperature.

component constant

The different components contained in carbon nanotubes.

Note: Carbon nanotube samples often contain different forms of carbon and non-carbon materials, which can be identified by the oxidation peak and residual amount in the TGA curve.