IEC TS 62607-6-22

Edition 1.0 2022-11

TECHNICAL SPECIFICATION

colour inside

Nanomanufacturing – Key control characteristics – Part 6-22: Graphene-based material – Ash content: incineration



IEC TS 62607-6-22:2022-11(en)



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INTERNATIONAL ELECTROTECHNICAL COMMISSION

ICS 07.120

ISBN 978-2-8322-6003-6

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NANOMANUFACTURING – KEY CONTROL CHARACTERISTICS –

Part 6-22: Graphene-based material – Ash content: incineration

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IEC TS 62607-6-22 has been prepared by IEC technical committee 113: Nanotechnology for electrotechnical products and systems. It is a Technical Specification.

The text of this Technical Specification is based on the following documents:

Draft	Report on voting
113/704/DTS	113/681/RVDTS

Full information on the voting for its approval can be found in the report on voting indicated in the above table.

The language used for the development of this Technical Specification is English.

This document was drafted in accordance with ISO/IEC Directives, Part 2, and developed in accordance with ISO/IEC Directives, Part 1 and ISO/IEC Directives, IEC Supplement, available at www.iec.ch/members_experts/refdocs. The main document types developed by IEC are described in greater detail at www.iec.ch/publications.

A list of all parts of the IEC TS 62607 series, published under the general title *Nanomanufacturing – Key control characteristics,* can be found on the IEC website.

The committee has decided that the contents of this document will remain unchanged until the stability date indicated on the IEC website under webstore.iec.ch in the data related to the specific document. At this date, the document will be

- reconfirmed,
- withdrawn,
- replaced by a revised edition, or
- amended.

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INTRODUCTION

Impurity, which is inevitable because of the production process, often has significant influence on the performance of graphene in energy conversion and storage, electronics, composites and catalysis, etc. The ash content can quickly provide an indication of impurity to some extent.

Determination of ash content of graphene is essential for manufacturers to perform quality control. It is also important for users to choose suitable product.

Incineration, the most common method of testing ash content, is a low cost, good repeatable and easy to operate method. Some unique properties of graphene-based material, such as ultra-low bulk density, relative high oxygen content and thermal exfoliation, make it impossible to follow existing incineration standards to determine the ash content of graphene-based material correctly. With the development of the graphene industry, it is important to establish a specific standard method for graphene to determine the ash content correctly. In this method, the two key objectives are to increase the bulk density of ultra-low density reduced graphene oxide through press or impregnation and to avoid instant exfoliation of high oxygen content graphene oxide through low-speed heating during heating at 130 °C to 200 °C.

This document introduces a reliable method for determining the ash content of graphene with incineration. This document can be used as the reference for other carbonaceous materials, such as single-walled and multi-walled carbon nanotubes.

NANOMANUFACTURING – KEY CONTROL CHARACTERISTICS –

Part 6-22: Graphene-based material – Ash content: incineration

1 Scope

This part of IEC TS 62607 establishes a standardized method to determine the key control characteristic

- ash content

  of powder and dispersion of graphene-based material by

- incineration.

The ash content is derived by residue obtained after incineration under the operating conditions specified in this document, being divided by the mass of the dried test portion.

- The method is applicable for graphene, graphene oxide and reduced graphene oxide in forms of both dry powder and dispersion. This document can be used as reference for graphite oxide and other modified graphene.
- Typical application areas of this method are research, manufacturer and downstream user to guide material processing and quality control.

2 Normative references

There are no normative references in this document.

3 Terms, definitions, symbols and abbreviated terms

For the purposes of this document, the following terms and definitions apply.

ISO and IEC maintain terminological databases for use in standardization at the following addresses:

- IEC Electropedia: available at http://www.electropedia.org/
- ISO Online browsing platform: available at http://www.iso.org/obp

3.1 General terms

3.1.1
graphene
graphene layer
single-layer graphene
monolayer graphene
single layer of carbon atoms with each atom bound to three neighbours in a honeycomb structure

Note 1 to entry: It is an important building block of many carbon nano-objects.

Note 2 to entry: As graphene is a single layer, it is also sometimes called monolayer graphene or single-layer graphene and abbreviated as 1LG to distinguish it from bilayer graphene (2LG) and few-layer graphene (FLG).

Note 3 to entry: Graphene has edges and can have defects and grain boundaries where the bonding is disrupted.

[SOURCE: ISO/TS 80004-13:2017, 3.1.2.1]