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Nanomanufacturing - Product specification -
Part 2-1: Carbon nanotube-related products - Blank detail specification: single-walled carbon nanotubes in powders and dispersions

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IEC Secretariat
3, rue de Varembé
CH-1211 Geneva 20
Switzerland

Tel.: +41 22 919 02 11
info@iec.ch
www.iec.ch

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

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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.

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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,

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– revised.

INTRODUCTION

This document is intended to provide guidance on how to list, illustrate and define various characteristics of single-wall carbon nanotubes (SWCNTs) for use in electrotechnical products, and how to incorporate these into a bilateral detail specification between vendor and user. A particular point of interest is the fact that there are many different types (diameter, chirality) of SWCNTs and various treatments for chemical modification have been developed. Subtle differences in the physical structure give rise to marked differences in electrical, optical and chemical properties; therefore it is important to pay these characteristics special attention.

To permit common processing equipment and common unit processes with predictable and reproducible results to be used in multiple fabrication lines, it is essential for the carbon nanotube characteristics to be described and assessed in a standardized manner and to standardize the methods for quality control of the manufacturing processes.

To facilitate a reliable source of carbon nanotubes with tailored properties (length, diameter, purity, chirality, conduction type), it is important to specify the characteristics in a standardized way, stating the specification limits and the characterization methods to prove conformance.

Accurately measuring and assessing the quality of nanotube-containing materials and the dispersion of nanotubes in liquids or polymers, are both considered crucial for the continued growth of applications incorporating single-wall carbon nanotubes. Although a range of SWCNT powders and dispersions are commercially available, the specifications for these products vary significantly. Some suppliers provide specifications of many parameters along with the methods of measurement used while others only report a minimal set of numbers with no indication of how these were measured. For this reason, comparison and specification of the quality of CNT materials is extremely difficult. While much progress in development of SWCNT characterization measurements has been made [1] [2] [3][1], significant improvements are still crucial to assess the quality of carbon nanotube-containing materials and the protocol for doing so (e.g. how to describe the characteristics relevant for the quality of the final nano-enabled products).

In addition to providing guidance for materials suppliers and users for how to draft bilateral procurement contracts, this BDS can also serve as a roadmap for the future development of KCC measurement standards for SWCNTs.

[1] Numbers in square brackets refer to the Bibliography.

1 Scope

This part of IEC 62565 establishes a blank detail specification and format for listing the relevant key control characteristics (KCCs) of single-wall carbon nanotubes (SWCNTs). This document is intended to be used for SWCNTs in the form of powders and dispersions.

For each KCC listed, methods and existing standards (in cases where they are applicable) for their measurement are indicated. Numeric values to be specified for the properties and characteristics are intentionally left blank and are determined by agreement between customer and supplier. Properties and characteristics not of relevance for a specific application can be classified as not applicable or not specified.

2 Normative references

There are no normative references in this document.

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