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Nanotechnologies — Method to estimate cellular uptake of carbon nanomaterials using optical absorption

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Contents

Page

Foreword ..... **iv**
Introduction ..... **v**
1 Scope **1**
2 Normative references **1**
3 Terms, definitions and abbreviated terms **1**
3.1 Terms and definitions 1
3.2 Abbreviated terms 1
4 Method overview **2**
4.1 General 2
4.2 Optical absorption of carbon nanomaterials 3
4.3 Optical absorption of biomolecules 4
4.4 Determination of the concentration of CNMs in dispersion by absorbance 4
4.5 Case studies 4
5 Materials and apparatus **5**
5.1 Materials 5
5.1.1 Chemicals 5
5.1.2 Cell line 5
5.2 Apparatus 5
5.2.1 UV-Vis-NIR spectrometer 5
5.2.2 Cuvette for optical absorption measurement 5
5.2.3 Incubator, 37 °C, humidified, 5 % CO_2/air. 5
5.2.4 Culture dishes, single-well or multi-well plates can be used. 6 multi-well plates with flat bottom are recommended. 5
5.2.5 Centrifuge. 5
5.2.6 Homogenizer. 6
5.2.7 Cell counter. 6
6 Cell-uptake testing protocol **6**
6.1 General 6
6.2 Sample preparation 6
6.3 Preparation of calibration curve of CNM dispersions 6
6.4 Cell-seeding 6
6.5 Treatment of cells with testing suspension 7
6.6 Cell counting 7
6.7 Washing cells and preparation of the cell lysate 7
6.7.1 General 7
6.7.2 For adherent cells 7
6.7.3 For floating cells 8
6.8 Absorbance measurement of the cell lysate 8
7 Sources of variability **8**
8 Data output **9**
8.1 General 9
8.2 Data analysis and reporting 9
8.3 Data sheet format 9
Annex A (informative) **Case study with SWCNTs** **10**
Annex B (informative) **Case study of CNHs** **16**
Annex C (informative) **Case study of MWCNTs** **20**
Bibliography **24**

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Foreword

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This document was prepared by Technical Committee ISO/TC 229, *Nanotechnologies*.

Any feedback or questions on this document should be directed to the user's national standards body. A complete listing of these bodies can be found at www.iso.org/members.html.

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Introduction

Owing to their unusual physical and chemical properties, carbon nanomaterials (CNMs), such as carbon nanotubes, carbon black, graphene, and carbon nanohorns, have been considered for various applications such as in the fields of electronics, energy, nanotechnology, and biology. With the increase of CNM-based products on the market, the public concern regarding possible toxicities has also increased. Estimation of the amount of CNM associated with the targeted cells is useful for an initial toxicological screening of CNMs and for developing applications in medicine[1][2][3][4].

Fluorescent dyes and/or radioactive isotopes have been routinely used to measure cellular uptake. Because CNMs absorb light in near infrared (NIR) region, where the bio-components such as protein and water in cells or tissues have relatively low light absorption, the cellular uptake of CNMs can be estimated from the absorbance of cell-lysate[5][6][7][8].

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Nanotechnologies — Method to estimate cellular uptake of carbon nanomaterials using optical absorption

1 Scope

This document describes a near-infrared optical absorption method to estimate the in vitro cellular uptake of carbon nanomaterials including both internalized and/or tightly adhered to the cell membrane from liquid dispersions. This is a simple method to screen carbon nanomaterials uptake; additional analysis using a different technique can be required if quantification is desired.

2 Normative references

The following document is referenced in the text in such a way that some or all of their content constitutes requirements of this document. For dated references, only the edition cited applies. For undated references, the latest edition of the referenced document (including any amendments) applies.

ISO 3696:1987, *Water for analytical laboratory use — Specification and test methods*

ISO/TS 80004-3, *Nanotechnologies — Vocabulary — Part 3: Carbon nano-objects*

3 Terms, definitions and abbreviated terms

For the purposes of this document, the following terms, definitions and abbreviations as well as the terms and definitions given in ISO/TS 80004-3 apply.

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

— ISO Online browsing platform: available at https://www.iso.org/obp

— IEC Electropedia: available at http://www.electropedia.org/

3.1 Terms and definitions

3.1.1
cellular uptake
internalization or association of a substance by a living cell

3.1.2
cell lysis
destruction or dissolution of cells with release of contents

3.1.3
absorbance
measure of the capacity of a substance to absorb light at a specified wavelength

3.2 Abbreviated terms

CNH	carbon nanohorn
CNM	carbon nanomaterial
CNT	carbon nanotube

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