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

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**Nanotechnologies - Assessment of protein secondary structure
alterations caused by nanomaterials - Ultraviolet circular
dichroism spectroscopy**

纳米技术 纳米材料导致蛋白质二级结构变化评估 紫外圆二色光谱法
(English Translation)

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References

Foreword

This document is a standard or guiding technical document.

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 is equivalent to ISO /T S23459.2021 "Nanotechnology - Evaluation of protein induced by nanomaterials using ultraviolet circular dichroism spectroscopy".

The document type of "Changes in Secondary Structure of Proteins" has been changed from an ISO technical specification to a national standardization guidance technical document of my country.

The following minimal editorial changes have been made to this document.

---To align with existing standards, the standard name has been changed to "Evaluation of Changes in Protein Secondary Structure Caused by Nanotechnology and Nanomaterials (Purple)". "Outer Circular Dichromatic Spectroscopy";

---The error in equation (2) of ISO /T S23459.2021 has been corrected.

Introduction

Currently, nanomaterials (such as nanoobjects and their aggregates and clusters, NOAA) are being mass-produced and widely used globally.

They are found in various fields. However, there are concerns about their interactions with biological systems (including proteins), which could potentially lead to... This can lead to reversible or irreversible changes in the secondary structure of a protein. The latter may affect the protein's function and conformation, thereby influencing the protein as a whole.

Biological reactivity. Monitoring these changes could provide important information about the interactions between NOAA and biological systems.

In biological matrices, the folding process of polypeptides produces the secondary structure of proteins, which determines their biological activity. An important feature of this structure is... This includes hydrogen bonds between the amino hydrogen and carbonyl oxygen atoms on the peptide backbone and disulfide bonds between two cysteine residues.

Certain metal ions and bioactive compounds can affect the secondary structure of proteins. Furthermore, the ionic strength, pH, and other properties of different buffer solutions can also influence this.

Temperature also has an effect [1]. Changes in protein function and conformation may arise from reorganization during the folding process (i.e., misfolding) and the overall protein structure.

Changes in protein size. Some diseases, such as amyotrophic lateral sclerosis (ALS), Alzheimer's disease, and Parkinson's disease, are caused by the misfolding of proteins. Caused by stacking [2].

Several methods exist for determining NOAA-induced structural and conformational changes in protein molecules, as well as folding processes, including high-field methods.

Nuclear magnetic resonance (NMR) spectroscopy, Fourier transform infrared (FT-IR) spectroscopy, Raman spectroscopy, and ultraviolet circular dichroism (UV-CD) spectroscopy [3-6].

In addition, synchrotron circular dichroism spectroscopy (SRCD) is a sensitive method that can provide information about protein secondary structure and folding. Information [7].

1 Scope

This document provides a method for evaluating protein secondary structure resulting from interactions with nanomaterials using ultraviolet circular dichroism (UV-CD) spectroscopy. Changing test plans and conditions.

This document is not applicable to characterizing conformational changes in disordered proteins.

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 80004-1 Nanotechnology Vocabulary Part 1: Core Terms Corevocabulary)

Note: GB/T 30544.1-2014 Nanotechnology Terminology Part 1: Core Terminology (ISO /T S80004-1:2010, IDT)

ISO /T S80004-2 Nanotechnology Vocabulary Part 2: Nanomaterials Nano-objects ISO /T S80004-4 Nanotechnology Terminology Part 4: Nanostructured Materials

Note: GB/T 30544.4-2019 Nanotechnology Terminology Part 4: Nanostructured Materials (ISO /T S80004-4:2011, IDT) ISO /T S80004-6 Nanotechnology Terminology Part 6: Characterization of Nanomaterials

Note: GB/T 30544.6-2016 Nanotechnology Terminology Part 6: Characterization of Nanomaterials (ISO /T S80004-6:2013, MOD)

3 Terms and Definitions

The terms and definitions defined in ISO 80004-1, ISO /T S80004-2, ISO /T S80004-4 and ISO /T S80004-6, as well as the following terms and definitions. This applies to this document.

3.1 Nanoparticles;NP

A nano-object with three external dimensions at the nanoscale.

Note: If the three external dimensions differ significantly (usually more than 3 times), it is preferable to use terms such as nanofibers or nanosheets rather than nanoparticles. [Source: ISO 80004-1:2023, 3.3.4]

3.2 Nanomaterials

Materials with one or more external dimensions at the nanoscale or containing nanoscale internal or surface structures.

Note 1: This general term includes nanoobjects and nanostructured materials.

Note 2: See engineered nanomaterials, artificial nanomaterials and associated nanomaterials. [Source: ISO 80004-1:2023, 3.1.4]