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

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**Nanotechnologies - Testing the photocatalytic activity
of nanoparticles for NADH oxidation**

纳米技术 基于NADH氧化的纳米颗粒光催化活性测试

(English Translation)

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Table of Contents

Preface	
Introduction	
1 Scope	
2 Normative References	
3 Terms, Definitions, Symbols, and Abbreviations	
3.1 Terms and Definitions	
3.2 Symbols and Abbreviations	
4 Overview 3.	
5 Reagents and Instruments 3.	
5.1 Reagent	
5.2 Instruments	
6 Measurement Steps	
6.1 Measurement of basic properties of NP suspension	
6.1.1 UV-Vis Absorption Spectroscopy Measurement	
6.1.2 Measurement of NP suspension stability	
6.2 UV Transmitter Intensity Calibration Based on 2NB Intensity Measurement Method	
6.3 Measurement of fluorescence intensity in NADH solution	
6.3.1 Measurement of NADH photo-oxidation rate at different NP concentrations	
6.3.2 Calculation of NADH photo-oxidation rate at different NP concentrations	
7 Precision	
7.1 Repeatability	
7.2 Reproducibility	
8 Test Report	
8.1 Report Data Format	
8.1.1 Calibration factor $C(i,j)$ obtained by light intensity measurement (see 6.2)	
8.1.2 Calibration slope of NADH fluorescence decrease	
8.1.3 Relationship between k_{app} and NP concentration	
8.1.4 NADH equivalent ratio photocatalytic activity	
8.2 Information	
Appendix A (Normative) Schematic diagram of 96-well plate placement	
Appendix B (Informative) Example 11 of UV Transmitter Light Intensity Calibration	
Appendix C (Informative) Interlaboratory Comparison Study of TiO_2 NPPCA	

- C.1 Research Methods
- C.2 Data Analysis
- C.3 Data Fitting
- C.4 Result
- C.5 Approval value
- References

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 is modified to adopt ISO 20814:2019 "Nanotechnology - Test of photocatalytic activity of nanoparticles based on NADH oxidation".

This document has undergone the following structural adjustments compared to ISO 20814:2019.

---The order of sections 3.1.4 and 3.1.5 has been adjusted; after the adjustment, section 3.1.5 references content from section 3.1.4.

---The order of Chapters 7 and 8, and 8.1 and 8.2 has been swapped to conform to standard practice in chapter arrangement.

The technical differences between this document and ISO 20814:2019, and the reasons therefor, are as follows.

---Added 3.1.6 terms and definitions for phototoxicity to facilitate understanding of phototoxicity.

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).

The main drafting units of this document are. National Center for Nanoscience and Technology, Zaozhuang University, Haihe Laboratory of Cell Ecology, Xuchang University, and Chinese Academy of Medical Sciences.

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Introduction

Photocatalytic activity (PCA) refers to the ability of a material to accelerate a specific photochemical reaction under specified conditions (see ISO 20507:2014, 2.3.31).

With the widespread application of nanomaterials, under illumination (including natural and artificial light), nanomaterials may cause chemical reactions and the production of harmful substances.

Increased activity could have impacts on human health and the environment.

Nanomaterials, upon absorbing photons of sufficient energy, generate electron-hole pairs.

Some electrons and holes may migrate to the particle surface and react with water and oxygen to generate highly reactive free radicals and reactive oxygen species.

(ROS). Some wide bandgap materials, such as titanium dioxide (TiO₂), zinc oxide (ZnO), tungsten trioxide (WO₃), cerium dioxide (CeO₂), and carbon.

Nanotubes, quantum dots, and some metal nanoparticles generate reactive oxygen species (ROS) under ultraviolet-visible (UV-Vis) light irradiation, causing oxidative stress and impacting biological processes.

The material produces a toxic effect [5]. Therefore, measuring the PCA of nanomaterials under physiological conditions can be used to assess their phototoxicity.

Due to issues such as excessively large test volumes, excessively long measurement times, or the use of organic dyes with poor biocompatibility as reaction indicators, existing...

Standards for PCA measurement methods for particles and surfaces (see ISO 10676 and ISO 10678) cannot be directly applied to nanoparticles that may cause phototoxicity.

PCA measurement of rice material.

PCA testing of nanoparticles based on the oxidation of reduced nicotinamide adenine dinucleotide (NADH) aims to evaluate the performance of nanomaterials under ultraviolet light.

The ability to produce phototoxicity under light irradiation.

Nanotechnology based on NADH oxidation nanoparticles Photocatalytic activity test

1 Scope

This document describes a method for measuring the photocatalytic activity of nanoparticles. The method involves suspending nanoparticles in physiologically relevant water.

In solution, the oxidation of reduced nicotinamide adenine dinucleotide (NADH) induced by

ultraviolet light was measured.

This document applies to the assessment of phototoxicity of nanomaterials, as well as nanoparticle aggregates and clusters.

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

3 Terms, definitions, symbols and abbreviations

The terms and definitions defined in ISO 80004-1 and ISO/T S80004-2, 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.

3.1 Terms and Definitions

3.1.1

Actinometry

A method for measuring the number of photons within a specified time or the number of photons per unit time.

3.1.2

catalytic activity

For a given chemical reaction, the change in the rate of material conversion due to catalysis is measured under specified test conditions.

[Source. ISO 18153:2003, 3.2, modified] 3.1.3 oxidation reaction in a chemical reaction involving electron transfer, the reactant atoms lose electrons and their oxidation number increases.