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NATIONAL STANDARD OF THE PEOPLE'S REPUBLIC OF CHINA

GB/T 36082-2018

Nanotechnologies -- Surface characterization of gold nanoparticles for nanomaterial specific toxicity screening -- FT-IR method

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Foreword

This standard was drafted in accordance with the rules given in GB/T 1.1-2009.

This standard uses the translation method identical to ISO /T S14101.2012 Surface characterization of gold nanoparticles for specific toxicity screening. Fourier transform

Infrared spectroscopy.

The Chinese documents that have a consistent correspondence with the normatively cited international documents in this standard are as follows.

---GB/T 32269.2015 Terms and Definitions for Nanotechnology Nanoobjects Nanoparticles, Nanofibers, and Nanosheets

(ISO /T S27687.2008, IDT).

This standard made the following editorial changes.

--- In line with the current standard series of the Technical Committee of the Orthodox Standardization Institute, the standard name was changed to "Nanotechnology Specific Toxic Screening

"Fourier Transform Infrared Spectroscopy" for surface characterization of gold nanoparticles;

--- Symbols and abbreviations, because g is the acceleration of gravity, x g is the relative centrifugal unit symbol, so x will be removed;

In - - 5.1.3, in order to meet the centrifugal operation requirements, the sample volume was corrected to 1mL 1.5mL;

--- In Appendix A, according to the molecular structure of citrate, increase the note, it is recommended to change the vibration mode of CO?? to the vibration mode of COO

According to the classification rules of infrared spectrum vibration frequency, add note, it is recommended to change 1581cm-1 CO?? scale to COO objection

Weighing and telescoping, changing 1396cm-1 carboxylic acid COH bending to COH bending and COO symmetrical stretching, will be 1257cm-1

Carboxylic acid CO stretching changed to CC stretching vibration, changing 1111 cm-1 alcohol CO stretching to CO and ether CO stretching

vibration;

---7.2 and Appendix B, according to the infrared spectrum vibration frequency classification rules, increase the note, the proposed 3311cm-1N-H stretching vibration

Change to Amide A band (NH stretching vibration), change 1653cm-1N-H bending to Amide I band (CO?? stretching vibration)

Moving), the 1550 cm-1 N-H curve was changed to the amide II band (NH bending vibration).

This standard was proposed by the Chinese Academy of Sciences.

This standard is under the jurisdiction of the National Nanotechnology Standardization Technical Committee (SAC/TC279).

This standard is drafted by. National Center for Nanoscience.

Participated in the drafting of this standard. PerkinElmer Business Management (Shanghai) Co., Ltd., Peking University.

Introduction

Gold nanoparticles are easy to control due to their size, shape, and surface ligands, making them ideal for studying the relationship between physicochemical properties and cytotoxicity.

Type system [1-3]. Among the various properties of gold nanoparticles, one finds surface ligand properties such as chemical composition, molecular structure, and binding molecules.

The quantity plays an important role in determining the behavior of gold nanoparticles, such as the extent of aggregation or agglomeration in solution, and the

The binding of molecules and the toxicity to living cells [4-12]. On the other hand, surface ligand modification during synthesis is not always successful.

The degree of body replacement should be determined prior to the specific cytotoxicity test of gold nanoparticles to obtain reliable and consistent results.

FT-IR (Fourier Transform Infrared) absorption spectroscopy is one of the important tools for ligand surface identification and quantitative analysis. use

The FT-IR method can analyze the structure and relative amount of ligand molecules bound

to the surface of nanoparticles [13-20]. However, gold nanoparticles

Is synthesized in water, and the concentration is very low, the interpretation of the measurement results becomes complicated. Low concentration of gold nanoparticles measured absorbance values

Small, susceptible to background noise or trace impurity absorption. Since the cytotoxicity test is conducted in an aqueous environment, if you want to study

To study the effect of surface properties on the toxicity of gold nanoparticles, it is necessary to analyze what is present on the surface of the gold nanoparticles in aqueous solution. However, water

The molecules have strong absorption of infrared light over a wide range of wave numbers, so it is impossible to analyze the very low concentration of solutes by infrared spectroscopy.

It is therefore necessary to develop test guidelines to minimize the impact of the above problems. In this standard, it strives to develop a test for the detection of dry gold

The surface of the rice granules incorporates chemical group specifications to provide information on the binding molecules of the gold nanoparticles in the aqueous solution. FT-IR measurement

The standardization of the program will serve as the basis for this technical specification, and a large amount of space will also be used to describe the samples needed for proper FT-IR analysis.

Preparation Process.

Nanotechnology specific toxicity screening gold nanoparticles

Surface Characterization Fourier Transform Infrared Spectroscopy

1 Scope

This standard specifies the identification of surface-bound molecules in dry gold nanoparticle films before and after nanomaterial cytotoxicity testing

Transform Infrared Spectroscopy (FT-IR).

Note 1. The gold nanoparticles may already have ligands attached to the surface prior to testing, and may also be covered (or coated) with organic or biological substances during cytotoxicity testing.

Molecule.

Note 2. The relevant absorption bands of phosphodiester, amine or lipid can be determined separately by Fourier transform infrared spectroscopy and can be determined separately in the gold nanoparticles.

On the nucleic acid, amino acid, lipid or cell membrane components, but the type of nucleic acid, protein or lipid can not be specifically determined by infrared spectroscopy.

2 Normative references

The following documents are indispensable for the application of this document. For dated references, only dated versions apply to this article

Pieces. For undated references, the latest version (including all amendments) applies to this document.

ISO /T S27687 Nanotechnology Nanoobjects Terms and Definitions Nanoparticles, Nanofibers, and Nanosheets (Nanotechn-

ologies-Terminologyanddefinitionsfornano-objects-Nanoparticle,nanofibreandnanoplate)

3 Terms and definitions

The terms and definitions defined by ISO /T S27687 and the following apply to this document. For ease of use, the following is repeated

Some terms and definitions in ISO /T S27687.

3.1

Attenuated total reflection modeattentoatedtotalreflectionmode

ATR mode

An instrument operating mode in which the incident angle of infrared light within the crystal is greater than the critical angle.

Note. Infrared light is completely reflected on the upper surface of the crystal, and its intensity is attenuated due to the absorption of materials covering the surface of the crystal. Absorbed infrared light frequency

To determine the chemical group, the absorbance is used to determine the number of chemical groups.

3.2

Dialysis dialysis

The process by which small molecules or ions are separated from macromolecules or suspensions in solution by thin film diffusion.

[ISO 6107-2.2006, definition 38]

3.3

Fourier transform infrared spectroscopy Fouriertransforminfraredspectroscopy; FT-IR