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

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**Nanotechnologies - Generation of metal nanoparticles for
inhalation toxicity testing - Evaporation-condensation method**

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Foreword

This document is in accordance with the provisions of GB/T 1.1-2020 "Guidelines for standardization work Part 1: Structure and drafting rules for standardization documents" Drafting.

This document is equivalent to ISO 10801:2010 "Nanotechnology - Preparation of metal nanoparticles for respiratory toxicity testing by evaporation/condensation method".

Rice Grains.

The following minimal editorial changes were made to this document.

--- In order to coordinate with the existing standards, the name of the standard was changed to "Preparation of Evaporation of Metal Nanoparticles by Nanotechnology for Inhalation Toxicity Studies" Condensation method";

--- Added a footnote to Chapter 2."ISO/T S27687 in the international original text has been replaced by ISO 80004-1";

---5.3.3 Added explanatory notes.

Introduction

Consumer products based on nanotechnology that contain nanoparticles such as silver, gold, carbon, zinc oxide, titanium dioxide and silicon dioxide are growing rapidly.

As the scope of application becomes wider and wider, the number of people at risk of exposure to nanoparticles continues to increase. In particular, people working in the nanotechnology industry Consumers are also at risk of exposure to man-made nanoparticles if nanoparticles are released from products.

Potential risks of rice particles.

At present, people's understanding of the toxicity of nanoparticles is limited. As scientific research continues to deepen, relevant knowledge will become more and more extensive.

Nanoparticles are increasingly being used in the production of nanoparticles. Methods for preparing nanoparticles include gas phase, vapor, colloid, and grinding. Potential exposure routes include inhalation through the respiratory tract.

Exposure through inhalation, skin exposure and oral ingestion. Inhalation exposure may come from direct leakage of particles in the gas phase or vapor state and from product recovery, handling, packaging, etc.

The manufacturing, use and disposal of products may lead to exposure to nanoparticles, which is related to Public and practitioner health.

There are currently no recognized test methods for nanoparticle inhalation toxicity, nor are there specific nanoparticle preparation methods for these tests.

The technology of dispersing powder into physicochemically stable inhalable nanoparticles is a difficult problem in evaluating the effects of inhaled nanoparticles on the respiratory system.

When nanoparticles are dispersed in the air, the size of the formed nanoparticles may be larger than the set size due to aggregation and agglomeration effects.

In order to obtain key information on the health effects of inhaled nanoparticles, nanosized particles need to be prepared and used in experimental environments to study the effects of nanoparticles on the health of the subjects.

Acute, subacute, and subchronic inhalation toxicity in experimental animals. Nanoparticles prepared by evaporation-condensation of metals (such as silver) can provide uniform the particle size distribution and stable number concentration make it suitable for short-term or long-term inhalation toxicity studies.

This document provides a standard method for preparing stable silver nanoparticles with a particle size of up to 100 nm.

The detailed steps of the method are described. The method has sufficient stability for continuous 90-day inhalation toxicity testing. The prepared nanoparticles can be used it has been used in a variety of experimental systems, including high-throughput human cell chip experiments and various in vitro experiments [10-13], as well as animal experiments, including but not limited to Whole body exposure, head exposure and nasal inhalation exposure. This method is not only applicable to silver nanoparticles, but also can be used to prepare nanoparticles with similar melting points and evaporation rates.

However, this method is not applicable to the preparation of all metal nanoparticles.

Nanotechnology. Metal Nanoparticles in Inhalation Toxicity Research Particle preparation by evaporation-condensation method

1 Scope

This document specifies the use of the evaporation-condensation method to prepare aerosols of metal nanoparticles such as gold and silver for inhalation toxicity testing and provides the relevant requirements and suggestions are given (see Appendix A).

2 Normative references

The contents of the following documents constitute the essential clauses of this document through normative references in this document.

For referenced documents without a date, only the version corresponding to that date applies to this document; for referenced documents without a date, the latest version (including all amendments) applies to this document.

ISO 80004-1 Nanotechnologies-Vocabulary-Part 1: Core terms

- 1) International text ISO 27687 has been replaced by ISO 80004-1.
- 2) Published by the Organization for Economic Co-operation and Development (OECD).

Note: GB/T 30544.1-2014 Nanotechnology Terminology Part 1: Core Terminology (ISO/T S80004-1:2010, IDT) Note. GB/T 27025-2019 General requirements for the competence of testing and calibration laboratories (ISO/IEC 17025:2017, IDT) Note. GB/T 21605-2008 Test methods for acute inhalation toxicity of chemicals (OECD No. 403.1981, OECD No. 433..2002, MOD) Note. GB/T 21754-2008 28-day/14-day repeated dose inhalation toxicity test method for chemicals (OECD No. 412..2005, IDT) Note. GB/T 21765-2008 Test method for subchronic inhalation toxicity of chemicals (OECD No. 413.1981, IDT)

3 Terms and definitions

For the purpose of this document, the terms and definitions defined in ISO 15900 and ISO 80004-1 and the following apply.

It consists of a differential electromigration classifier, a particle charge regulator, a flow meter, a particle detector, connecting pipes, a computer and related software.

System for detecting submicron aerosol particle size distribution.

[Source. ISO 15900:2009, 2.8, modified]