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

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**Nanotechnology - Determination of silver content in biological
samples**

纳米技术 生物样品中银含量测量 电感耦合等离子体质谱法

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Foreword

This standard was drafted in accordance with the rules given in GB/T 1.1-2009. Please note that some elements of this document may involve patents. The issuer of this document is not responsible for identifying these patents. This standard is proposed by the Chinese Academy of Sciences. This standard is under the jurisdiction of the National Nanotechnology Standardization Technical Committee (SAC/TC279). This standard was drafted. National Nanoscience Center, China Food and Drug Inspection and Research Institute, Beijing Physical and Chemical Analysis and Testing Center, National Pharmaceutical Center for Medical Device Technical Evaluation of Product Supervision and Administration. The main drafters of this standard. Wu Meiyu, Liu Ying, Li Ruiyu, Wang Xinsheng, Liu Lin, Gao Xia, Zhao Ting, Chen Kuan, Dan Mo, Chen Liang, Xu Liming, Xie Liming.

Silver nanoparticles have a broad spectrum of antibacterial activity and are widely used in daily necessities and medical devices [1,2]. With the range of applications It has been enlarged, and the ways of silver nanoparticles entering the human body have become more diversified and exist in biological tissues in various forms. So the silver exposed wind Risk has aroused great concern. In the evaluation of biological effects and safety of silver nanoparticles, such as toxicokinetics, after exposure to silver nanoparticles, It exists in biological samples in various forms such as particles and ions, and different forms of silver elements play an important role in their biological functions. Therefore, it is very important to accurately measure the total content of silver in biological samples. However, there are currently no relevant national standards. Inductively coupled plasma mass spectrometry

(ICP-MS) is a mass spectrometric elemental analysis method using plasma as an ion source. Simultaneous determination of multiple elements is suitable for the analysis of trace or trace heavy metal elements [3 ~ 5]. This standard includes exposure via silver nanoparticles Microwave digestion method for biological samples, and the method for measuring the total silver content in digested samples by ICP-MS. Measurement of silver content in nanotechnology biological samples Inductively coupled plasma mass spectrometry Warning

--- Some reagents used in this standard method are corrosive and strong oxidizing, you need to be careful to avoid contact with skin and clothing The microwave digestion process should be carried out in a fume hood and operated in accordance with the safety regulations of the relevant equipment of the instrument; pay attention to the safe use of electricity.

1 Scope

China's national method for determining silver in biological samples. It specifies the terms and definitions, the abbreviations, the principle, the instruments and the procedure. It exists because silver nanoparticles are the most widely used engineered nanomaterial in consumer products, and the question of where they end up in an organism is the central one for their safety assessment. Measuring total silver in tissue is the first step of any such study - in the liver, spleen, kidney, lung and blood of an exposed animal, or in the tissue around a wound dressing. The difficulty is the matrix: biological tissue must be digested completely before the silver can be measured, and silver is prone to being lost during digestion or to precipitating as the chloride, which every biological sample contains in quantity. A method that gets the digestion and the stabilisation right is what makes results from different laboratories comparable.

This standard specifies the quantitative measurement method of silver content in biological samples, including sample preparation and measurement steps. This standard applies to the quantitative measurement of silver content in a variety of biological samples (biological tissues, cells, 3D tissue models, etc.).

2 Normative references

The following documents are essential for the application of this document. For dated references, only the dated version applies to this article Pieces. For undated references, the latest version (including all amendments) applies to this document.

GB/T 6682 Analytical laboratory water specifications and test methods

GB/T 19619 Nanomaterials terminology

GB/T 30903 Determination of impurity elements in inorganic chemical products. Inductively coupled plasma mass spectrometry (ICP-MS)

3 Terms and definitions

The terms and definitions defined in GB/T 19619 and GB/T 30903 apply to this document.

4 Abbreviations

The following abbreviations apply to this document. ICP-MS. inductively coupled plasma mass spectrometry

5 Principle

The volume of biological samples was determined by microwave digestion, and the resulting solution was tested for elemental content by ICP-MS. Internal standard Method, that is, the internal standard element of the same concentration is added online by a peristaltic pump in the test sample, blank sample and spiked sample. The quantitative relationship between the ratio of the degree to the intensity value of the internal standard element and the silver element concentration enables the quantitative analysis of silver. In this method, a spiked sample is set to Determine the accuracy of the measurement results.

6.1 Instrument

6.1.1 Inductively coupled plasma mass spectrometer (ICP-MS analyzer).

6.1.2 Microwave Digestion Device. It has a programmed power setting function, the maximum output power is $\geq 1200\text{W}$, and the maximum setting temperature is $\geq 195\text{ }^{\circ}\text{C}$.