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Extinction spectra characterization of the aggregate structure of gold nanorods

金纳米棒聚集体结构的消光光谱表征

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Foreword

This standard is drafted in accordance with the rules given in GB/T 1.1-2009. This standard is proposed by the Chinese Academy of Sciences. This standard is under the national standard of nanotechnology standardization technical committee (SAC/TC279). The main drafting of the standard units. the National Center for nano-science, the Beijing Entry-Exit Inspection and Quarantine Bureau, Shenzhen City, Germany-nanotechnology Limited. The main drafters of this standard. Wu Xiaochun, Ji Yinglu, Tang Xiaoping, Shang Weili, Xu Hao.

The gold nanorod is a rod-shaped gold nanoparticle that has a potential response in the fields of biological detection, biological imaging, disease diagnosis and treatment. With value. According to the technical report issued by the International Organization for Standardization Nanotechnology Committee ISO /T R13014..2012 "Nanotechnology Project Guidance on Physical and Chemical Parameter Characterization of Toxicity Evaluation of Nanomaterials ", which involves key physicochemical parameters including size and size distribution, agglomeration/aggregation State, shape, surface area/specific surface area, composition, purity, surface chemistry, surface charge, solubility/dispersibility. This standard is consistent with its reunion/poly Set the state corresponding. The nanoparticle aggregates are aggregates formed by the aggregation of two or more nanoparticles together. So it is used to characterize the particle size Methods, such as light scattering, microscopic imaging techniques, can be used for the characterization of aggregate structures. For gold with a surface plasmon resonance characteristic Is a nanostructure, and the agglomerated state has a significant effect on this resonance characteristic, so it is also possible to characterize the agglomeration state according to its variation. At present domestic The relevant standards have not yet been promulgated. This standard is based on extinction spectroscopy to characterize the structure of gold nanorod aggregates. Characterization of Aggregate Structure of Gold Nanometer Rod by Extinction Spectroscopy

1 Scope

China's national method for characterising the aggregate structure of gold nanorods from their extinction spectra. It specifies the principle, the instrument, the pretreatment of test

samples, the measurement method, the calculation of the agglomeration parameters and the expression of results, with informative annexes giving a worked calculation of the agglomeration index, examples of end-to-end and side-by-side assembly characterisation, an evaluation of measurement uncertainty and a report format. Its introduction places it precisely: the international technical report on the physicochemical characterisation of nanomaterials for toxicity evaluation lists the key parameters as size and size distribution, agglomeration and aggregation state, shape, surface area, composition, purity, surface chemistry, surface charge and solubility - and this standard addresses the agglomeration and aggregation state. What makes gold nanorods a special case is that their aggregation can be read directly from an optical spectrum. A gold nanorod has two plasmon resonances, a transverse one across its width and a longitudinal one along its length, and when rods come close together those resonances couple. The coupling depends on how they are arranged: rods joined end to end shift the longitudinal peak strongly to the red, while rods lying side by side shift it to the blue and strengthen the transverse peak. So the extinction spectrum does not merely say that aggregation has occurred - it says what kind. That is a rare property. For almost every other nanoparticle the aggregation state has to be established by microscopy or by scattering, and this method gets it from a measurement any laboratory can make in a minute. Issued on 25 April 2016 and in force since 1 November 2016.

This standard specifies a method for characterizing the structure of gold nanorod aggregates based on extinction spectroscopy. This standard applies to extinction spectroscopy to characterize the structure of gold nanorod aggregates, and other noble metal nanoclusters can also be used as reference.

2 Normative reference documents

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

GB/T 13966 terminology for analytical instruments

GB/T 19619 Glossary of Materials for Nanomaterials

GB/T 24369.1-2009 Characterization of gold nanorods - Part 1. UV/Vis/near infrared absorption spectroscopy

3 Terms and definitions

GB/T 13966, GB/T 19619 and GB/T 24369.1-2009 and the following terms and definitions apply to this document.

3.1 Aggregates Strongly bound or fused particles of new particles, the outer surface of which may be significantly smaller than its individual particle surface area Sum [2-3].

Note 1. The forces that support the aggregates are strong forces, such as covalent bonds or from sintering or complex physical entanglement.

Note 2. Aggregates are also referred to as secondary particles, while source particles are referred to as primary particles.

3.2 Agglomerate agglomerate The aggregates, aggregates, or mixtures of weakly bound particles have a similar surface area to the sum of the surface area of their individual particles [2-3].

Note 1. The forces that support the aggregates are weak, such as van der Waals forces or simple physical entanglement.

Note 2. Agglomerates are also referred to as secondary particles, while source particles are referred to as primary particles.

3.3 Flocculation flocculation The dispersed particles are contacted and adhered together to form a larger group of processes (IUPAC definition [4]).

3.4 Flocculation parameter flocculationindex The integral area of the surface plasmon resonance peak in the gold nanoparticle extinction spectrum.

3.5 Aggregation parameter aggregationindex The flocculation parameters in the gold nanoparticle extinction spectrum are divided by the maximum absorbance.