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

GB/T 24369.1-2009

**Characterization of gold nanorods - Part 1: Ultraviolet, visible
and near-infrared absorption spectroscopy**

金纳米棒表征 第1部分：紫外/可见/近红外吸收光谱方法

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Quarantine;
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Foreword

GB/T 24369-2009 "gold nanorod characterization" is divided into seven parts.

- Part 1. UV/VIS/NIR absorption spectroscopy;
- Part 2. Surface plasmon resonance peak dielectric susceptibility;
- Part 3. Surface-enhanced Raman scattering factor estimates;
- Part 4. fluorescence quantum efficiency estimates;
- Part 5. Evaluation of the effect of light and heat;
- Part 6. Methods of measurement of surface charge;
- Part 7. Characterization of structure of aggregates. This section GB/T 24369-2009 Part 1. This section of the Appendix A, Appendix B, Appendix C and Appendix D is an informative annex. This section proposed by the Chinese Academy of Sciences. This part of the National Nano Technology Standardization Technical Committee (SAC/TC279) centralized. This part mainly drafted by: National Center for Nanoscience. Participated in the drafting of this section. Institute of Physics. The main drafters of this section. Fruitful Ji Lu Ying, Xie Sishen, Feng Lili, Zhang Ke, Liu Jianbo, He Weiwei, Hu Xiaonuo to Yan Juan, noble, Zhao Rui, Wang He Lei.

Since the novel nature of the scale effect brought about nanomaterials gives more functionality. Anisotropic nanocrystalline noble metal is one one type. Nanoscale noble metal nanocrystals with strong surface plasmon resonance characteristics. This feature not only scale-dependent resonance, Its shape is also closely related. Precious metal nanocrystals surface plasmon resonance peaks and the peak position and the number of surface-enhanced Raman scattering has Efficient spectral range can be performed by controlling the shape control and optimization. Therefore, they are more excellent than the spherical particles of some of the optical And electrical properties. Excellent performance is expected in the noble metal nanostructures biosensors, drug delivery, disease diagnosis and treatment, biological and biomedical imaging Closely related fields play an important role. These properties are most closely associated with the surface characteristics of plasma. Therefore, in order to better Use of these properties, to characterize the features of

the surface plasmon becomes extremely important. Typically, a noble metal nanostructure surface ion Body resonance peak at UV/VIS/NIR absorption spectrum region, so the development of this method is based on the characterization of the standard it is extremely important and urgent cut. Specific to this section, we formulate UV/VIS/NIR absorption spectroscopy Characterization of Gold bars average axial ratio. Gold nanorods characterization - Part 1. UV/VIS/NIR absorption spectroscopy

1 Scope

China's national method for characterising gold nanorods by ultraviolet, visible and near-infrared absorption spectroscopy. It is Part 1 of GB/T 24369 and specifies the apparatus, the sample preparation, the measurement and the interpretation of the absorption spectrum of a gold nanorod suspension. Gold at the nanoscale behaves quite unlike gold. The conduction electrons of a metal particle much smaller than the wavelength of light oscillate collectively when the light drives them - a localised surface plasmon resonance - and the particle absorbs and scatters intensely at the resonant wavelength. For a sphere there is one resonance, which is why colloidal gold is red. For a rod there are two, because the electrons can oscillate along the rod or across it: a transverse resonance that sits near the sphere's, and a longitudinal one that moves to longer wavelength as the rod gets longer relative to its width. That longitudinal peak is the whole reason gold nanorods are made. Its position depends on the aspect ratio and on almost nothing else, so it can be tuned by synthesis anywhere from the visible into the near infrared - and tuning it into the tissue transparency window, where blood and water absorb least, is what makes the rods useful for photothermal therapy, for imaging and for biosensing. So the absorption spectrum is not one characterisation among several but the primary one: the position of the longitudinal peak gives the aspect ratio, its width reflects the distribution of aspect ratios in the sample, and the ratio of the two peaks indicates how many spheres and other shapes are present alongside the rods. The standard fixes the instrument and its calibration, the dilution and the solvent, the cell, the wavelength range and resolution, and the extraction of the peak parameters. Issued on 30 September 2009 and in force since 1 December 2009.

This section GB/T 24369 specifies the gold nanorods UV/VIS/NIR absorption spectra and characterization methods used to gauge the absorption peak Operators average axial ratio. This section applies to the axis ratio of 2 to 5, a cylindrical rod of gold 30nm diameter less than characterization. Other precious metals nanostructures UV/VIS/NIR absorption spectra characterization may also refer to the implementation of this section.

2 Normative references

The following documents contain provisions which, through reference

GB/T 24369 in this section constitute provisions of this section. For dated reference documents Member, all subsequent amendments (not including errata content) or revisions

do not apply to this section, however, encouraged to reach under this section Parties to research agreement to use the latest versions of these documents. For undated reference documents, the latest versions apply to this section.

GB/T 13966 Analytical Instruments terms

GB/T 19267.2 criminal and chemical examination of trace evidence in Part 2. UV - visible absorption spectroscopy

GB/T 19619 nanomaterials term JJG178 ultraviolet, visible, near-infrared spectrophotometer test procedures

3 Terms and Definitions

GB/T 19619, GB/T 13966 and GB/T 19267.2 and established the following terms and definitions apply to this section.

3.1 NIR) The UV/visible absorption spectrum measurement range extended to the near infrared region.

3.2 When the incident electromagnetic wave is irradiated to the metal when the metal free electrons in driving electric field relative to the positive ions of the lattice constant of The frequency of occurrence of coherent oscillations generated by absorption.

3.3 Rod-like particles are nano-scale, which scale than in one dimension with the other two dimensions of greater than 1. In two smaller scale The size dimensions should be between 1nm ~ 100nm between.

3.4 For nanorods along the major axis length of the short axis direction length ratio.
Principle

4 Surface plasmon resonance of gold nanorods showed two directions of the resonance absorption, shown in Figure 1. Where peak 1 is an electron along the short axis