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

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Evaluation of the photothermal effect of gold nanorods

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Foreword

This standard was drafted in accordance with GB/T 1.1-2009 given rules. This standard was proposed by the Chinese Academy of Sciences. This standard by the National Standardization Technical Committee of nano technology (SAC/TC279) centralized. This standard is drafted by: National Center for Nanoscience. Participated in the drafting of this standard. Peking University. The main drafters of this standard. Fruitful (CGI), Ji Lu Ying, Fang Zheyu.

Because of its size and surface structure of noble metal nanoparticles shape dependent plasmon resonance absorption, may have a greater effect of light and heat, it is a kind of treatment I want photothermal imaging and photothermal therapy material with potential applications in diagnosis and treatment of disease and so on. Among them, the gold nanorods because of its good biological compatibility And chemical stability as one of the most talked about photothermal material noble metal nanoparticles. In order to promote the development of the sector, the development of gold nanorods photothermal Evaluation of effects. Evaluation of gold nanorods photothermal effect

1 Scope

China's national method for evaluating the photothermal effect of gold nanorods. It specifies the principle, the instrument components, the sample preparation, the test procedure and the data processing, and it applies to the evaluation of the photothermal effect of gold nanorod sols; sols of other noble metal nanoparticles may take it as a reference. Gold nanorods absorb light through a plasmon resonance whose wavelength depends on the ratio of their length to their width, and by changing that ratio the absorption peak can be tuned across the near infrared. That is the property that makes them interesting medically, because the near infrared is the window in which tissue is most transparent: light at those wavelengths penetrates centimetres of tissue, while visible light does not. A gold nanorod delivered to a tumour and illuminated through the skin absorbs that light and converts it to heat, raising the local temperature enough to destroy the tissue around it while leaving the surrounding tissue untouched. Gold nanorods are the most studied of the noble metal photothermal materials because they combine that tunable absorption with good

biocompatibility and chemical stability. What has been missing is a common way of stating how well a particular preparation converts light into heat, and without one the figures quoted in the literature and by suppliers cannot be compared. This standard supplies it, defining the photothermal conversion efficiency as the ratio of the heat produced to the light energy absorbed and setting out how it is measured: a sol of known concentration is irradiated at a known power, its temperature rise is recorded, and the efficiency is calculated from the heating and cooling curves. Issued on 11 September 2015 and in force since 1 October 2016.

This standard specifies the principles of the gold nanorods photothermal effect evaluation instrument components, sample preparation, test procedures and data processing. This standard applies to gold nanorods evaluation sol photothermal effect, photothermal effect of other precious metal nanoparticles sol reviews Also refer to the implementation of this standard.

2 Normative references

The following documents for the application of this document is essential. For dated references, only the dated version suitable for use herein Member. For undated references, the latest edition (including any amendments) applies to this document.

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

GB/T 24369.1-2009 gold nanorods characterization - Part 1. UV/VIS/NIR absorption spectroscopy

3 Terms and Definitions

GB/T 13966, GB/T 19267.2, GB/T 19619, GB/T 24369.1-2009 and as defined in the following terms and definitions apply This document.

3.1 Photothermal effect photothermaleffect Substance absorbed light is converted to heat effect.

3.2 Photothermal conversion efficiency photothermalconversionefficiency After absorbing light is converted into heat and absorbing substance ratio of light energy.

3.3 Surface plasmon resonance surfaceplasmonresonance; SPR When light is incident to the surface of the metal nano-structure, the free electron and photon coupling metal surface to produce a collective oscillation. Principle

4 Gold nanorod surface plasmon resonance with a transverse (transverseSPR, TSPR) and

longitudinal (longitudinal SPR, LSPR) two basic modes in which LSPR resonance wavelength is closely related to its aspect ratio, usually located in the near-infrared region of the spectrum and gold Stick with high photothermal conversion efficiency. If the LSPR wavelength matches the wavelength of the incident light can be efficiently absorbed light gold nanorods Energy into heat, so that the ambient temperature. Experiments measuring heating and cooling curve, based on the heat balance equation, calculate its light and heat Conversion efficiency.