ICS 17.040.20
CCS A42

NATIONAL STANDARD OF THE PEOPLE'S REPUBLIC OF CHINA

GB/T 44075-2024

Nanotechnology - Determination of the uniformity of SERS solid substrate - Raman mapping analysis

纳米技术 表面增强拉曼固相基片均匀性测量 拉曼成像分析法

Issued on: May 28, 2024 **Implemented on: December 1, 2024**

Issued by: State Administration for Market Regulation;
Standardization Administration of the PRC

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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. Please note that some of the contents of this document may involve patents. The issuing organization of this document does not assume the responsibility for identifying patents. This document was proposed by the Chinese Academy of Sciences. This document is under the jurisdiction of the National Nanotechnology Standardization Technical Committee (SAC/TC279). This document was drafted by: Suzhou Nanotech Co., Ltd., Suzhou Institute of Metrology and Testing, Suzhou University, and Suzhou Nanotechnology Co., Ltd. of the Chinese Academy of Sciences With the Institute of Nano-Bionics, China Institute of Inspection and Quarantine, and Jiangsu Feiwotai Nano-Tech Co., Ltd. The main drafters of this document are. Guo Qinghua, Zhu Jianrong, Yao Jianlin, Yuan Yaxian, Fang Dan, Jiang Jiang, Xi Guangcheng, Lu Di and Wang Zhen.

Advantages. It can provide rich information about the structural characteristics and adsorption state of the sample within the trace concentration range. It is mainly divided into metal nanosol and SERS solid phase substrate. Based on SERS solid phase substrate, it can be used for food safety, biomedicine and Application testing is carried out in multiple directions such as public safety. Establishing a scientific evaluation standard for SERS solid-phase substrates is the key to the application of SERS technology. It is one of the basic quality indicators, which is used to describe the difference in SERS activity at different locations on the substrate. The signal difference is large, which can easily lead to signal distortion of the measured sample, affecting the reproducibility and reliability of the test results. The spectral imaging method is used to detect the uniformity of the SERS solid phase substrate, which is conducive to standardizing and improving the uniformity index of

the SERS solid phase substrate, thereby improving Reproducibility and reliability of SERS detection results. Nanotechnology Surface Enhanced Raman Solid-State Substrate Uniformity Measurement Raman imaging analysis

1 Scope

GB/T 44075-2024 gives the Chinese method for determining the uniformity of a surface-enhanced Raman scattering substrate by Raman mapping. SERS substrates are sold on their enhancement factor, but for any quantitative use the number that actually matters is how much that enhancement varies from point to point across the chip: a substrate with a high average and poor uniformity gives an intensity that depends on where the laser happened to land, which makes calibration impossible. The standard sets the principle, the reference analyte and its deposition on the substrate, the Raman instrument and its parameters, the mapping area, step size and number of points required for a representative sample, the acquisition procedure, the extraction of the characteristic band intensity at each point, the calculation of the mean, the standard deviation and the relative standard deviation that expresses the uniformity, the treatment of outliers and hot spots, and the reporting. It takes effect on 1 December 2024.

This document describes a method for measuring the uniformity of surface enhanced Raman solid-state substrates using Raman spectroscopy imaging analysis, including a method overview, Instruments and equipment, reagents and materials, test process and test reports, etc. This document is applicable to the uniformity measurement of SERS solid substrates.

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.

GB/T 30544.6 Nanotechnology Terminology Part

3 Terms and definitions

The terms and definitions defined in GB/T 30544.6 and GB/T 33252 and the following apply to this document.

3.1 Raman effect Inelastic scattering caused by monochromatic light irradiating matter is characterized by a frequency shift of the light caused by elementary excitations such as rotation or vibration. [Source: GB/T 30544.6-2016, 4.9]

3.2 Raman spectroscopy A spectroscopic method that uses the Raman effect (3.1) to detect the energy levels of a sample. [Source: GB/T 30544.6-2016, 4.10]

3.3 A spectroscopic method based on the adsorption of specific metal surfaces with nanometer-scale roughness under the irradiation of light of appropriate wavelength. The phenomenon of enhanced Raman effect exhibited by certain molecules or nano-objects. NOTE

1 Typical metals for which varying degrees of enhancement are observed include Au, Ag, Cu and Al. NOTE

2 For enhancement to occur, the surface roughness is typically in the range of tens of nanometers. [Source: GB/T 30544.6-2016, 4.11]

3.4 A spectrometer that uses laser as the excitation light source and combines Raman spectroscopy analysis technology with microscopy analysis technology.

6 Characterization of Nanoobjects

GB/T 33252 Nanotechnology laser confocal micro-Raman spectrometer performance test

JJF1544 Raman spectrometer calibration specification