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Nanotechnologies - Raman shift standard curve for spectrometer calibration

纳米技术 用于拉曼光谱校准的标准拉曼频移曲线

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Foreword

This standard was drafted in accordance with the rules given in GB/T 1.1-2009. This standard was 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 by: China Academy of Metrology, Qingdao Haishu Group Co., Ltd. The main drafters of this standard. Ren Lingling, Yao Yayi, Gao Huifang, Wang Xunlong.

Raman spectroscopy has become a major measurement in the field of nanotechnology with its unique information, rich information, simple sample preparation, and no damage to the sample. One of the characterization means. With the development of new materials such as fullerenes, graphene, and carbon nanotubes and high-tech industries such as MEMS and semiconductors, As the requirements for the characterization and measurement of microstructures and stress effects continue to increase, so does the accuracy of Raman frequency shift measurements. such as The Raman frequency shift is closely related to the structure of the material. Its minor changes, in addition to the qualitative nature of the material, can also reflect charge doping and deformation stress. Therefore, the calibration of the Raman shift has significant implications for the development of Raman spectroscopy. The development of this standard will provide methods for the calibration of Raman shifts using standard substances and the uncertainty introduced by the calibration process for Raman The comparable and reliable basis for the frequency shift measurement results promotes the use and development of Raman spectroscopy in nanotechnology and other fields. Nanotechnology for Raman Spectroscopy Calibration Standard Raman frequency shift curve

1 Scope

China's national standard for the Raman shift calibration curve used to calibrate a spectrometer. It supplies the reference against which an instrument's wavenumber axis is

set. This is the piece of metrology on which every Raman measurement rests, and it is easy to underestimate. A Raman spectrum is read as a set of shifts from the excitation line, and the quantities of interest are often small differences: a shift of a few wavenumbers distinguishes one polymorph from another, indicates strain in a semiconductor, or counts the layers in graphene. An instrument whose wavenumber axis is off by that much gives a confident wrong answer. Calibration is therefore performed against materials whose peak positions are established to high accuracy and which are stable, available and easy to mount - and fixing that curve in a national standard is what allows a spectrum measured in one laboratory to be compared with one measured in another, which is the whole basis of a spectral library.

This standard specifies the terms and definitions of Raman shift calibration curves, calibration conditions, Raman shift calibration, and uncertainty assessment. This standard applies to Raman spectrometer (hereinafter referred to as the instrument) Raman frequency shift calibration.

2 Normative references

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

GB/T 33252-2016 Nanotechnology Laser Confocal Microscopy Raman Spectrometer Performance Test

3 Terms and definitions

The terms and definitions defined in GB/T 33252-2016 apply to this document.

4 Overview

Raman spectroscopy is a molecular scattering spectrometer that produces modulated frequencies due to inelastic scattering when the material is exposed to monochromatic radiation energy. The spectrum. The Raman frequency shift is closely related to the structure of the material. Its minor changes, in addition to the qualitative nature of the material, can also reflect the charge doping and shape. The stress is changed, so the Raman shift needs to be calibrated. When Raman spectrometers are used, monocrystalline silicon is generally used for preliminary calibration to check the instrumentation. state. When performing measurements, linear calibration of multiple Raman shifts across the entire raster range is required. At this point, the calibration of the Raman shift needs to be established Curves, and find the linear correlation coefficient of the calibration curve. This standard provides comparable and reliable basis for Raman frequency shift measurement results and promotes Raman The use and development of spectroscopy in nanotechnology

and other fields.

5 Calibration conditions

5.1 Laboratory conditions The ambient temperature is 20 °C ~ 25 °C, the use of temperature fluctuation range does not exceed ± 2 °C. Relative humidity <= 60%.

5.2 Instrument warm-up Turn on the laser before testing. Preheat and settling times follow the instructions for the instrument.

6 Raman frequency shift calibration

6.1 Selection of reference materials Select the certified reference material that covers the Raman shift range of the sample to be tested. To meet the above conditions, it is advisable to select a solid and liquid sample