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Nanotechnology - Performance testing for laser confocal microscope Raman spectrometers

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China's national standard for testing the performance of laser confocal micro-Raman spectrometers. It specifies the terms and definitions, the instrument structure, the requirements, the test methods and the test report, with informative annexes on the composition of such an instrument, on the reference specimens used to calibrate it and on a reference format for the test report. It applies to dispersive confocal micro-Raman spectrometers using a continuous laser excitation source with single, double or triple stage spectrometers, and it does not apply to non-dispersive instruments such as Fourier transform Raman spectrometers or to instruments based on pulsed laser sources. Raman spectroscopy works because a small fraction of the light scattered by a material is scattered inelastically, shifted in frequency by the vibrational modes of the molecules or the lattice it met. That shift is a fingerprint of chemical bonding and of crystal structure, and combining it with a confocal microscope gives a spectrum from a volume about a micron across - which is what makes it the workhorse of nanomaterials characterisation. It is the standard way to distinguish graphene from graphite and to count layers, to identify carbon nanotubes and measure their diameter, to tell one polymorph from another and to measure strain in a semiconductor. The problem is that the measurement is comparative in practice: laboratories compare peak positions, widths and intensity ratios, and those depend on the instrument as much as the sample. So the instrument's spectral resolution, wavenumber accuracy, spatial resolution and sensitivity have to be established and stated, which is what this standard specifies. Issued on 13 December 2016 and in force since 1 July 2017.

This standard specifies the terms and definitions of laser confocal microscopy Raman spectrometer, instrument structure, technical requirements, test methods and so on. This standard applies to continuous laser as the excitation light source, with single-stage, two or

three spectrometer dispersion-type confocal microscopy Raman spectroscopy Instrument (hereinafter referred to as instrument). This standard does not apply to non-dispersive Raman spectroscopy such as Fourier transform Raman spectrometer and Raman light based on pulsed laser light source Spectrometer.

3 instrument structure

The laser emitted from the laser is subjected to an interference filter to the sample surface to excite the sample, the excitation light is irradiated by a Rayleigh filter and a confocal pinhole, Seam, raster, and finally reach the detector to detect the Raman signal. Instrument structure diagram shown in Figure 1. See Appendix A for details.

3 Test Report

3 Appendix A (informative) Composition of laser confocal microscopy Raman spectrometer

5 Appendix B (informative) Standard specimen for calibration of laser confocal microscopic Raman spectrometer

9 Reference 11

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 drafting of this standard. China Institute of Metrology, Institute of Semiconductors, Chinese Academy of Sciences, Xiamen University, Guangzhou measurement test study House, Horiba (China) Trading Co., Ltd. The main drafters of this standard. Ren Lingling, Tan Pingheng, Ren Bin, Gao Xitian, Ding Xiang, Wang Haiyan, Pu Yumei. Nano - technology laser confocal microscopy Raman spectrometer Performance Testing