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Nanotechnology - Characterization of multiwall carbon nanotubes in aqueous solution - Extinction spectroscopy

纳米技术 水溶液中多壁碳纳米管表征 消光光谱法

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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. Institute of Basic Medical Sciences, Chinese Academy of Medical Sciences, Shenzhen Defang Nano Technology Co., Ltd. The main drafters of this standard. Xu Haiyan, Meng Jie, Wen Tao, Zhang Weiqi, Kong Lingyong, Wang Yuying.

Carbon nanotubes have broad application prospects in drug (gene) delivery, biomedical detection and imaging. This standard uses carbon nano The tube has a conjugated pi-electron system, which can absorb the ultraviolet light and the physical properties of the electronic transition, and the multi-wall carbon nanotubes are used by extinction spectroscopy. The aqueous solution was tested to give the characteristic extinction spectrum of multi-walled carbon nanotubes; and the extinction spectrum was further obtained by peak-spin fitting analysis. The correlation with the length of the multi-walled carbon nanotubes and the surface oxidation state plays an important role in detecting and aligning the physical and chemical properties of the carbon nanotubes. Characterization of multi-walled carbon nanotubes in nanotechnology aqueous solution Extinction spectroscopy

1 Scope

China's national method for characterising multiwall carbon nanotubes in aqueous suspension by extinction spectroscopy. It specifies the terms and definitions, the basic principles, the instruments and equipment, the reagents, the sample preparation and the measurement method. Carbon nanotubes are hydrophobic and attract one another strongly, so in water they do not disperse - they bundle and settle - and every application that uses them in a liquid, from conductive inks to composite processing to biological work, depends first on getting and keeping them apart. Extinction spectroscopy measures how much light a suspension removes from a beam, by absorption and by scattering together, and it is the practical way to follow that. It gives the concentration of dispersed tubes and, tracked over time, tells whether a dispersion is stable or slowly re-aggregating. Since dispersion quality is what determines whether the tubes deliver their properties, this is the routine quality measurement of the field.

This standard specifies the method of characterizing multi-walled carbon nanotubes dispersed in aqueous solution by extinction spectroscopy, and gives the extinction spectrum and The relationship between the length of the carbon nanotubes and the oxidation state of the surface. This standard applies to aqueous solutions of multi-walled carbon nanotubes.

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 edition (including all amendments) applies to this document.

GB/T 9721-2006 General rules for molecular absorption spectrophotometry of chemical reagents (UV and visible light)

3 Terms and definitions

The following terms and definitions apply to this document.

3.1 Multiwall carbon nanotubes multiwalcarbonnanotube; MWCNT Carbon nanotubes nested by concentric or nearly concentric carbon monolayers with a layer spacing close to that of graphite.

Note. The structure can be seen as a number of single-walled carbon nanotubes nested inside each other; the cross-section is cylindrical when the diameter is small, and becomes a polygon as the diameter increases. [GB/T 30544.3-2015, definition 4.6].

3.2 Extinction spectrum extinctionspectrum When the concentration of the substance to be tested and the thickness of the mater are constant, the extinction (or any function of the extinction) corresponds to the wavelength (or any function of the wavelength) Curve. [GB/T 33249-2016, definition 3.1].

4 Basic principles

Carbon nanotubes have a conjugated pi-electron system, which can absorb ultraviolet light and undergo electronic transition, and multi-walled carbon nanotubes dispersed in an aqueous solution A characteristic extinction zone appears in the ultraviolet region, and the carbon nanoparticle obtained according to the ultraviolet/visible/near infrared absorption spectroscopy method of GB/T 9721-2006 Tube extinction spectrum, as shown in Figure 1.