ICS 17.040.30
CCS N 51

NATIONAL STANDARD OF THE PEOPLE'S REPUBLIC OF CHINA

GB/T 44926-2024

Nanotechnologies-Characterization of micro surface and sub surface-Optical dark-field confocal microscopy

纳米技术 微区表面及亚表面表征 光学暗场共焦显微法

Issued on: December 31, 2024 **Implemented on: July 1, 2025**

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

Table of Contents

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 standard was drafted by: Harbin Institute of Technology, China Institute of Metrology,

Kunming Institute of Physics, Xi'an Institute of Applied Optics, Beijing Institute of Microelectronics Technology, China Aerospace Science and Industry Corporation Defense Technology Research and Experimental Center.

The main drafters of this standard.

Introduction

The surface and subsurface quality control of micro-nano devices and high-end optical components is an important factor affecting product performance and service life.

Effective characterization of micron and nanometer-scale characteristic structures on the surface and subsurface of the region is an important step in improving the exploration of micro-nano processing and ultra-precision processing mechanisms and processes.

It is an important guarantee for the quality control capability of finalization and mass production, and is widely used in the fields of ultra-smooth optical components, micro-optical devices, semiconductor materials, etc. need.

Optical dark-field confocal microscopy can realize three-dimensional efficient detection of weak dark-field scattering signals on the surface and subsurface of sample micro-areas.

The formulation of this document provides a unified standard for characterizing the surface and subsurface structure of optically transparent solid materials using optical dark-field confocal microscopy.

This method is conducive to improving the detection level of high-performance devices and providing quality control and new process development for the processing and production of precision optical components and micro-nano devices. Provide testing guarantee.

Nanotechnology Micro-area Surface and Sub-surface Characterization Optical dark-field confocal microscopy

1 Scope

This document describes a method for characterizing micro-areas surfaces and sub-surfaces using optical dark-field confocal microscopy.

This document applies to solid materials.

2 Normative references

GB/T 34879-2017

3 Terms and definitions

The terms and definitions defined in GB/T 34879-2017 and the following apply to this

document.

3.1 Subsurface

The optically transparent region beneath the surface of a solid material.

Note. Usually the depth is within 100 microns.

3.2 Confocal microscopy; CM

Using constrained illumination and constrained detection, optical tomography images were obtained by axial scanning, and the maximum axial signal position was extracted to determine the A method for measuring the surface shape of a sample in a certain area.

[Source. GB/T 34879-2017, 3.1]

3.3

Based on the principle of confocal microscopy, annular light field constrained illumination and aperture matching constrained detection are used to obtain the surface and subsurface areas of the sample.

An optical instrument that detects dark-field scattering signals in the deep domain and obtains three-dimensional tomographic images of samples by axial scanning.

3.4 axialenvelope

The recorded detection signal corresponds to a function of the change in the axial position of a single image point in the confocal tomographic image.

[Source. GB/T 34879-2017, 3.8]

3.5

The ratio of the inner diameter to the outer diameter of the cross-section of the annular illumination beam measured at the objective entrance pupil.