Scratches on optical module structural components

Overview

These are narrow marks or abrasions on the surface of an optical component, often caused by accidental damage during assembly or the manufacturing process. Scratches are highly sensitive to light and can severely impact light reflection, refraction, and transmission. Common defects include scratches, pits, bubbles, burrs, and chipped edges. These imperfections are governed by several international and national standards, such as ISO. First, a multimodal microscopic imaging system is created by combining discrete multispectral illumination with linear polarization. Imaging experiments demonstrated that this system could highlight more scratch details, improve image clarity, and alleviate the image blur problem induced by wide. In response to the challenge of detecting nanoscale defects on optical component surfaces, we propose a method for the detection and classification of various types of defects on optical component surfaces via reflection Mueller matrix spectroscopy (RMMS). Firstly, an electromagnetic scattering. This is Sections 9.

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Article Content

SFD-YOLO: A Multi-Angle Scattered Field-Based Optical Surface

Using a simulated dataset of multi-width scratch defects, the proposed method achieves high classification accuracy with strong generalization and computational efficiency.

Quantitative detection of weak scratches of optical elements based on ...

A reliable method for quantitative detection of weak scratches is proposed based on scratch segmentation and connection of broken scratches. The DWMLD method is used to segment

Research on light scattering detection technology of surface scratches ...

This study employs a 2D finite-difference time-domain (FDTD) model to investigate the effects of scratch dimensions (depth and width) on scattered light intensity (SLI), with experimental

(PDF) Automatic scratch detector for optical surface

This paper presents an automatic detecting method for the scratches on optical surface with machine vision inspection (MVI) method.

Weak Scratch Detection of Optical Components Using Attention

The proposed method can achieve the best performance to detect the weak scratch inspection of optical components compared to the traditional scratch detection methods and other deep learning-based

Surface defect detection of planar optical components based on OPT

A hardware system was built independently for detecting surface defects in planar optical components and an optical component surface defect detection algorithm was proposed called OPT

Understanding Surface Defects in Optical Components and Relevant ...

These are narrow marks or abrasions on the surface of an optical component, often caused by accidental damage during assembly or the manufacturing process. Scratches are highly

Surface weak scratch detection for optical elements based on a ...

The detection experiments demonstrate that our model can accurately segment the weak scratches on optical surfaces and achieve better detection performance using significantly fewer parameters

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Investigation of Surface Defects in Optical Components Based on

This method provides a theoretical basis and reference for the detection and classification of various types of defects in precision optical components.

Understanding Surface Quality Specifications | Edmund Optics

The surface quality of an optical component is an evaluation of the surface imperfections, such as scratches and pits, or digs, which may be caused during the manufacturing or handling process.

Generation of Scratches and Their Effects on Laser Damage ...

In this paper, we systematically studied the influence of ductile and brittle scratches generated artificially during polishing process on the damage performance of fused silica optical

Scratch Forensics

Scratches on optical components are almost always detrimental. Whether formed during fabrication, cleaning or handling, scratches can cause increased scatter, impaired system performance, and, in

Effect of scratches on the laser damage performance of silicon carbide ...

Similar to traditional fused quartz components, silicon carbide optical components also exhibit laser-induced damage precursors such as surface scratches. The influence of these

Quantitative detection of weak scratches of optical elements based on ...

The detection of weak scratches on the surface of optical elements has always been a challenge in ensuring the quality of precision optics. An effective method for quantitative detection of

Formation and Control of Scratches on Surfaces of Optical Components ...

Abstract The types of surface scratches on the fused-silica workpiece during the polishing process and the length of the scratches caused by impurity particles having different particle sizes in the ending

Scratch Morphology Transformation: An Alternative Method of Scratch ...

The scratches on an optical surface can worsen the performance of elements. The normal process method is removing scratches entirely. However, it is a tough and high-cost

Inspecting for Lens Defects Only Scratches the Surface

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Scratch numbers are an inexact measurement of scratch brightness. Rather, they provide a scale on which to subjectively compare how bright a scratch appears

Scratch iridescence: Wave-optical rendering of difractive surface structure

Spatially resolved scratches, on the other hand, have proven elusive due to the highly com-plex wave-optical light transport simulations needed to account for their appearance. In this paper, we propose

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