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**NATIONAL STANDARD OF THE
PEOPLE'S REPUBLIC OF CHINA**

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Replacing GB/T 21649.1-2008

**Particle size analysis - Image analysis methods - Part 1: Static
image analysis methods**

粒度分析 图像分析法 第1部分：静态图像分析法
(English Translation)

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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.

This document is Part 1 of GB/T 21649 "Particle size analysis by image analysis method". GB/T 21649 has been published in the following parts.

--- Part 1: Static image analysis method;

--- Part 2: Dynamic image analysis method.

This document replaces GB/T 21649.1-2008 "Particle size analysis - Image analysis method - Part 1: Static image analysis method" and Compared with GB/T 21649.1-2008, in addition to structural adjustments and editorial changes, the main technical changes are as follows.

- Added the term "(image) contrast" (see 3.1.3);
- Added symbols $x_{10,3}$ and $x_{90,3}$ (see 3.2);
- Added description of sample preparation method (see 5.5);
- Added the analysis method of overlapping measurement frames (see 8.3.3);
- Added image distortion recognition (see 10.2.2);
- Added the "Accuracy" chapter (see Chapter 11).

This document is equivalent to ISO 13322-1:2014 "Particle size analysis - Image analysis method - Part 1: Static image analysis method".

Introduction

The purpose of this document is to provide guidance on the determination of particle size by image analysis.

Image analysis is a popular technique in different fields of application. This document provides the standardization of the techniques used and their validation.

describe.

This part of GB/T 21649 does not refer to a specific instrument and is limited to the image acquisition part related to the accuracy of particle size analysis.

This document describes various calibration verification methods and recommends the use of a standard grid as a particle size calibration scale.

However, measuring particles of known size, such as those from validation studies or other marker materials, can provide an estimate of the possible systemic effects introduced by the instrument.

System uncertainty.

From sample splitting to the analysis of the final result, the error introduced in each step is accumulated into the total measurement uncertainty.

Therefore, it is very important to estimate the uncertainty introduced at each step.

To ensure that the measurements made are consistent with this document and can be traced back to the source, basic operations are specified in this document.

GB/T 21649 consists of two parts, which regulate the image analysis method based on static images and dynamic images respectively.

- Part 1: Static image analysis method. It specifies the velocity of the particle to be measured relative to the axis velocity of the imaging device optical system is zero.

Image analysis method for the purpose of determining particle size distribution. The method only stipulates that the image is analyzed by the complete pixel counting method.

method.

--- Part 2: Dynamic image analysis method. It specifies the method of transferring images from particles with relative motion to the binary image in the actual system.

A method of making an image in which the particles in the image are individually isolated.

The first part characterizes stationary particles, with high image accuracy but few particles.

The second part characterizes moving particles, which can measure. However, the movement of particles will cause image blur and affect the analysis accuracy.

Particle size analysis image analysis method Part 1: Static image analysis method

1 Scope

This document specifies the image analysis method used to measure the particle size distribution when the velocity of the particle to be measured relative to the optical axis of the imaging device is zero.

Method. The particles to be tested are well dispersed and fixed on the object surface of the test instrument. By moving the stage or camera, the field of view of the instrument can be realized the particle image on the object surface is collected without causing motion blur of the particle image. The image is then analyzed.

This method is applicable to the analysis of digital images acquired by optical or electronic detection systems. This method does not involve the method of acquiring the image.

Although the detection parameter setting and calibration have a great influence on the accuracy of particle size determination, this method only involves the complete pixel counting method.

Methods for analyzing images.

The type of particle size distribution (number-based or volume-based) and the width of the distribution are important for ensuring that the expected test accuracy is achieved within a specified confidence interval.

The number of particles measured has a significant influence on the accuracy of the measurement. See Appendix A for examples.

In order to measure a sufficient number of particles to achieve the required measurement precision, automatic analysis technology can be used.

This document does not cover sample preparation. To ensure the accuracy and precision of the test results, the sampling, dispersion and representative sampling of the particles to be tested. They are all crucial links in the operation process.

NOTE Details on sampling and sample preparation are given in ISO 14887 and ISO 14488.

2 Normative references

The contents of the following documents constitute essential clauses of this document through normative references in this document.

For referenced documents without a date, only the version corresponding to that date applies to this document; for referenced documents without a date, the latest version (including all amendments) applies to this document.

Note: GB/T 15445.1-2008 Presentation of particle size analysis results Part 1: Graphical representation (ISO 9276-1:1998, IDT) ISO 9276-2 Presentation of particle size analysis results Part 2: Calculation of mean particle diameter and moments from particle size distribution (Repre-Note. GB/T 15445.2-2006 Presentation of particle size analysis results Part 2: Calculation of average particle size/diameter and moments from particle size distribution (ISO 9276-2:2001, IDT))

3 Terms, definitions and symbols

The following terms and definitions apply to this document.