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

GB/T 29023.2-2016

**Measurement and characterization of particles by acoustic
method -- Part 2: Guidelines for linear theory**

超声法颗粒测量与表征 第2部分：线性理论准则

(English Translation)

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Table of Contents

Preface
Introduction
1 Scope
2 Normative reference document
3 Terms and definitions
4 Symbols and abbreviations
5 Attenuation mechanism (for low concentration system)
6 Particle size measurement
7 Instrument Requirements
8 Results report
Appendix A (informative) Viscous loss model
Appendix B (informative) ECAH theory and its limitations
Appendix C (informative) semi-empirical model example
Appendix D (informative) Iterative fitting
Appendix E (informative) The physical properties of the selected material
Appendix F (informative) Example of particle size distribution (PSD) measurement
Reference

Foreword

GB/T 29023 "ultrasonic particle measurement and characterization" is divided into three parts.

Part 1. Concept and process of ultrasonic attenuation spectroscopy;

Part 2. Linear Theory Criteria;

Part 3. Non - linear theoretical guidelines.

This part is part 2 of GB/T 29023.

This part is drafted in accordance with the rules given in GB/T 1.1-2009.

This part uses the translation method equivalent to ISO . 20998-2..2013 "Ultrasonic particle measurement and characterization Part 2. Linear theory then".

This part of the National Particle Characterization and Separation and Screen Standardization Technical Committee (SAC/TC168) proposed and centralized.

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Introduction

It is well known that ultrasound spectroscopy can be used to measure particle size distribution in colloids, dispersions and emulsions (see [1] [2] [3] [4]). Basic the principle is to measure the ultrasonic attenuation or velocity dependent on the frequency change when the ultrasound passes through the sample. This attenuation spectrum is controlled by the particles in the sample the effect of scattering or absorption of waves is a function of the particle size distribution and concentration of the dispersed particles (see [5] [6] [7]). Once experienced through experience or management on the basis of calculations, the particle size distribution can be determined from the ultrasonic data. Ultrasound technology for dynamic on-line measurement of high concentrations the slurry and the emulsion are very useful.

In the past, this test was carried out offline at the Quality Control Laboratory, subject to instrument conditions, and the sample was diluted to detect. In the original the initial concentration was measured using ultrasound on-line without changing the state of the original sample. In addition, dynamic processes (such as flocculation, dispersion, research) Grinding, etc.) for real-time observation ([8]). Test data can be used directly in process control to improve process and product performance.

Ultrasonic Particle Measurement and Characterization Part 2. Linear Theory Criteria

1 Scope

This part of GB/T 29023 describes the ultrasonic attenuation spectrum used to measure the particle size distribution of particles in a liquid at low concentrations in this case, the ultrasonic attenuation spectrum is a linear function of the particle volume concentration, and the interaction between the particles can be neglected. This part of the scope Including colloids, low concentration dispersions and emulsions, the typical size of the particle size represented by the ultrasound method ranges from 10 nm to 3 mm, More than this range of particles have been successfully measured. For solid particle suspension systems, the typical volume concentration range of the particles is usually measured 0.1% to 5%, depending on the density ratio of particles and dispersion medium [9,10], particle size and frequency range.

Note: see references [9], [10].

This type of ultrasound can be used to monitor the dynamic changes in particle size in real time. For emulsions, it can be used to measure higher concentrations.

Although both the ultrasonic attenuation spectrum and the phase velocity spectrum can be used to analyze the particle size distribution of the particles, only ultrasonic attenuation methods are recommended. due to the relative change in the phase velocity caused by the change in particle size is small compared to the average speed, so it is difficult to accurately determine the magnitude of the phase velocity, Warm under the environment. Likewise, it is not recommended to combine the attenuation spectra and the velocity spectrum to measure particle size. The measurement error in the amplitude and phase spectra increases Plus the pathological nature of the problem, reducing the inversion stability.

2 Normative reference documents

The following documents are indispensable for the application of this document. For dated references, only the dated edition applies to this article Pieces. For undated references, the latest edition (including all modifications) applies to this document.

GB/T 29023.1-2012 Ultrasonic method for particle measurement and characterization - Part 1. Concepts and processes of ultrasonic attenuation spectroscopy (ISO 20998.1.:2006, IDT) ISO 14488.:2007 Particleat materials - Sampling and Sampling samplesplittingforthedeterminationofparticulateproperties

3 Terms and definitions

GB/T 29023.1-2012 Definitions and the following terms and definitions apply to this document.

Coefficient of variation the ratio of standard deviation to mean value.

Dimensionless particle size parameter dimensionless size parameter Represents the dimensionless number of particles, the product of the wave number and the particle radius.

Particle radius Particle diameter of one-half.