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Measurement and characterization of particles by acoustic methods —

Part 2: Guidelines for linear theory

*Caractérisation des particules par des méthodes acoustiques —
Partie 2: Théorie linéaire*



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ISO copyright office
Case postale 56 • CH-1211 Geneva 20
Tel. + 41 22 749 01 11
Fax + 41 22 749 09 47
E-mail copyright@iso.org
Web www.iso.org

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Foreword

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The committee responsible for this document is ISO/TC 24, *Particle characterization including sieving*, Subcommittee SC 4, *Particle characterization*.

ISO 20998 consists of the following parts, under the general title *Measurement and characterization of particles by acoustic methods*:

- *Part 1: Concepts and procedures in ultrasonic attenuation spectroscopy*
- *Part 2: Guidelines for linear theory*

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Introduction

It is well known that ultrasonic spectroscopy can be used to measure particle size distribution (PSD) in colloids, dispersions, and emulsions (References [1][2][3][4]). The basic concept is to measure the frequency-dependent attenuation or velocity of the ultrasound as it passes through the sample. The attenuation spectrum is affected by scattering or absorption of ultrasound by particles in the sample, and it is a function of the size distribution and concentration of particles (References [5][6][7]). Once this relationship is established by empirical observation or by theoretical calculations, one can estimate the PSD from the ultrasonic data. Ultrasonic techniques are useful for dynamic online measurements in concentrated slurries and emulsions.

Traditionally, such measurements have been made off-line in a quality control lab, and constraints imposed by the instrumentation have required the use of diluted samples. By making in-process ultrasonic measurements at full concentration, one does not risk altering the dispersion state of the sample. In addition, dynamic processes (such as flocculation, dispersion, and comminution) can be observed directly in real time (Reference [8]). These data can be used in process control schemes to improve both the manufacturing process and the product performance.

ISO 20998 consists of two parts:

- 20998-1 introduces the terminology, concepts, and procedures for measuring ultrasonic attenuation spectra;
- 20998-2 provides guidelines for determining particle size information from the measured spectra for cases where the spectrum is a linear function of the particle volume fraction.

A further part addressing the determination of particle size for cases where the spectrum is not a linear function of volume fraction is planned.