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

GB/T 47069.1-2026

**Determination of particle density - Sedimentation methods -
Part 1: Isopycnic interpolation approach**

颗粒密度测定 沉降法 第1部分：等密度插值法

(English Translation)

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Foreword

This document complies with the provisions of GB/T 1.1-2020 "Standardization Work Guidelines Part 1: Structure and Drafting Rules of Standardization Documents".

Drafting.

This document is Part 1 of GB/T 47069, "Determination of Particle Density - Sedimentation Method". GB/T 47069 has already published the following parts.

---Part 1: Iso-density interpolation.

This document is equivalent to ISO 18747-1:2018 "Determination of particle density by sedimentation method - Part 1: Isodensity interpolation method".

The following minimal editorial changes have been made to this document.

---The footnotes 2) to 7) concerning instrument manufacturers and product information have been removed (see Appendices A, B.2 and B.3).

Please note that some content in this document may involve patents. The issuing organization of this document assumes no responsibility for identifying patents.

This document was proposed and is under the jurisdiction of the National Technical Committee on Standardization of Particle Characterization, Sorting and Screening (SAC/TC168).

Introduction

Dispersion systems are widely used in industry and daily life. It is necessary to know the density of the dispersed particles or droplets, for example, for the transport of dispersion systems.

Kinetic viscosity physical-chemical calculation (ISO 3105), determination of particle size distribution by separation techniques, characterization of core/shell or capsule-shaped particles, and determination of particle size distribution.

Compressibility or dispersion stability can be optimized through density matching.

The density of an object is its mass divided by its volume. This definition is simple for the mass of larger objects or particles. However, for macroscopic objects...

The experimental determination of volume is very difficult. Geometric volume (length, width, and thickness) and the volume related to density determination can be affected by surface irregularities, Cracks, fissures, and open and closed holes can vary depending on the measurement techniques used.

The density determination of microparticles, especially nanoparticles, dispersed in liquids is due not only to their small size, but also primarily to the interaction between the liquid and the particles.

The boundaries become more blurred. The molecular portions of the continuous phase are fixed to the surface, blurring the surface's physicochemical properties (e.g., viscosity, ionic properties).

Concentration, etc., may also differ from the bulk. This is especially important for small particles and nanoparticles dispersed separately in polymers or biofluids.

Yes. The so-called coronal layer can be interpreted as a component of the particles, increasing the effective/apparent space compared to the space occupied by the original particle material.

Volume. The thickness of this layer is approximately a few nanometers to tens of

nanometers. If the particles become smaller, the deviation between the effective/apparent volume and the "geometric" volume will increase.

The larger the density, the more it will affect traditional density measurement methods.

GB/T 47069 aims to determine the density of granular materials by sedimentation method, and provides the basic principles, sample preparation, and measurement techniques of the test method.

The content, including techniques and data analysis, is planned to consist of two parts.

---Part 1: Isodensity Interpolation. This method analyzes liquids dispersed in densities lower and higher than the particle density.

The velocity and direction of particle migration determine particle density;

---Part 2: Multi-velocity method. This method involves precisely measuring particles dispersed in at least two continuous phases with different densities.

The migration rate determines the density.

Particle density determination sedimentation method Part 1: Iso-density interpolation

1 Scope

This document specifies a method for determining the density of solid particles or droplets (hereinafter collectively referred to as "particles") dispersed in a liquid.

Based on Archimedes' principle, the buoyant force on a particle fully submerged in a liquid is equal to the weight of the fluid displaced by the particle. If the particle's weight...

When the force equals the buoyant force, the particles will stop settling or floating due to gravity or centrifugal force and remain suspended. Under this condition, the particle density...

This is equal to the density of the liquid. This document analyzes the migration velocity of particles dispersed in liquids with densities lower and higher than the particle density.

The particle density is determined by the orientation. All particles have the same material composition.

2 Normative references

The contents of the following documents, through normative references within the text, constitute essential provisions of this document. Dated citations are not included.

For references to documents, only the version corresponding to that date applies to this document; for undated references, the latest version (including all amendments) applies.

This document.

ISO 14887:2000 Sample preparation - Dispersing process of powders in liquids

3 Terms and Definitions

The following terms and definitions apply to this document.

dynamic viscosity

It measures the resistance of a fluid when it deforms under shear stress.

Note: Dynamic viscosity is calculated by dividing shear stress by shear rate and is used to determine the dynamics of incompressible Newtonian fluids.

migration

Directional movement of particles caused by gravity or centrifugal force (sedimentation or emulsification/floating).

Note: When the particle density is greater than the liquid density, sedimentation will occur. When the particle density is less than the liquid density, emulsification/floating will occur. In both of these processes...

During the process, the particles move in opposite directions.

migration velocity

The absolute value of the final velocity of sedimentation or emulsification/floatation.

Note: The rate of milk separation/floating is indicated by a negative sign.

True particle density the ratio of particle mass to particle volume excluding all pores (closed or open) and surface cracks.