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Sample preparation — Dispersing procedures for powders in liquids

Préparation de l'échantillon — Procédures pour la dispersion des poudres dans les liquides

Reference number
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Foreword

ISO (the International Organization for Standardization) is a worldwide federation of national standards bodies (ISO member bodies). The work of preparing International Standards is normally carried out through ISO technical committees. Each member body interested in a subject for which a technical committee has been established has the right to be represented on that committee. International organizations, governmental and non-governmental, in liaison with ISO, also take part in the work. ISO collaborates closely with the International Electrotechnical Commission (IEC) on all matters of electrotechnical standardization.

International Standards are drafted in accordance with the rules given in the ISO/IEC Directives, Part 3.

Draft International Standards adopted by the technical committees are circulated to the member bodies for voting. Publication as an International Standard requires approval by at least 75 % of the member bodies casting a vote.

Attention is drawn to the possibility that some of the elements of this International Standard may be the subject of patent rights. ISO shall not be held responsible for identifying any or all such patent rights.

International Standard ISO 14887 was prepared by Technical Committee ISO/TC 24, *Sieves, sieving and other sizing methods*, Subcommittee SC 4, *Sizing by methods other than sieving*.

Annexes A and B of this International Standard are for information only.

Introduction

The evaluation of particle size distribution is of crucial importance for research projects, product development, process control, quality control, and other technical activities where particle size effects are important. Paints, inks, filled plastics, ore processing, pharmaceuticals, agricultural and cosmetic products depend on accurate particle size analysis for their commercial production.

A typical powder is composed of clumps of “primary" particles that are held together by weak or strong forces. The size of clumps remaining after the powder has been wetted into a liquid depends in part on how much energy has been expended in breaking up these clumps. Since a clump responds to most particle sizing methods as a large particle would, the presence of clumps in incompletely dispersed samples skews the reported particle size distribution to larger sizes than if all the clumps were broken up. A particle size analysis is useful only if the sample is prepared so that the particles are in a well-defined degree of dispersion, preferably one in which most clumps are fully deagglomerated and in which the particles do not reagglomerate or adhere to the walls of the sample container during the time required for analysis.

While "complete" dispersion to primary particles is often desired, it is important to remember that in many cases the most useful information is obtained when the sample is not fully dispersed. For example, if a customer blends the powder into a liquid using a low-shear process that does not break moderately strong bonds in the clumps, the quality control tests for powder intended for that customer should use similarly low shear during sample preparation and analysis.

Because of the impurities present, the equipment available for breaking up clumps, the methods used for particle size analysis, and the dispersing agents available for testing may vary from one site to another, the procedure developed at one site by applying the guidelines in this International Standard may differ from (but be as valid and as useful as) that developed at another site for the same powder.

A list of references for further study, including standards for evaluation of some of these more complex systems, is given in the bibliography.

Annex A discusses some of the complications that arise

- when the powder has a surface treatment or soluble components;
- when the liquid contains ionic or polymeric solutes;
- when the dispersing agent contains minor ingredients.

Annex B covers the classification of commercial dispersing agents in the various dispersing agent categories.

Sample preparation — Dispersing procedures for powders in liquids

1 Scope

This International Standard was developed to help particle size analysts make good dispersions from powder/liquid combinations with which they are not experienced. It provides procedures for

- wetting a powder into a liquid;
- deagglomerating the wetted clumps;
- determining if solution composition can be adjusted to prevent reagglomeration;
- selecting dispersing agents to prevent reagglomeration;
- evaluating the stability of the dispersion against reagglomeration.

This International Standard is applicable to particles ranging in size from approximately 0,05 to 100 µm. It provides a series of questions on the nature of the powder and liquid involved. The answers are used with charts that guide the user to generic dispersing agents that are likely to be suitable for dispersing the powder in the liquid.

This International Standard applies only to the preparation of simple, dilute dispersions (less than 1 % by volume solids) for particle size analysis. It does not deal with the formulation of complex and commercial mixtures highly loaded with solids, such as paints, inks, pharmaceuticals, herbicides and composite plastics.

2 Normative reference

The following normative document contains provisions which, through reference in this text, constitute provisions of this International Standard. For dated references, subsequent amendments to, or revisions of, any of these publications do not apply. However, parties to agreements based on this International Standard are encouraged to investigate the possibility of applying the most recent edition of the normative document indicated below. For undated references, the latest edition of the normative document referred to applies. Members of ISO and IEC maintain registers of currently valid International Standards.

ISO 8213:1986, *Chemical products for industrial use — Sampling techniques — Solid chemical products in the form of particles varying from powders to coarse lumps.*

3 Terms and definitions

For the purposes of this International Standard, the following terms and definitions apply.

3.1
agglomerate
assemblage of particles which are loosely coherent

SEE **floc** (3.5)