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Fine bubble technology — Measurement technique matrix for the characterization of fine bubbles

Technologie des fines bulles — Matrice de méthodes de mesure pour la caractérisation des fines bulles

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ISO copyright office
CP 401 • Ch. de Blandonnet 8
CH-1214 Vernier, Geneva
Phone: +41 22 749 01 11
Email: copyright@iso.org
Website: www.iso.org

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Foreword

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The procedures used to develop this document and those intended for its further maintenance are described in the ISO/IEC Directives, Part 1. In particular, the different approval criteria needed for the different types of ISO documents should be noted. This document was drafted in accordance with the editorial rules of the ISO/IEC Directives, Part 2 (see www.iso.org/directives).

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This document was prepared by Technical Committee ISO/TC 281, *Fine bubble technology*.

Any feedback or questions on this document should be directed to the user's national standards body. A complete listing of these bodies can be found at www.iso.org/members.html.

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Introduction

Fine bubble technology has numerous applications across industries such as cleaning, transport, maintenance, agriculture, aquaculture, food and drink, cosmetics as well as biomedical. The detection, characterization and quantification of properties of fine bubble mixtures are central to the development of this horizontal general purpose technology.

A number of techniques used for particle detection and characterization may be applicable to the characterization of fine bubble mixtures in liquids. Some techniques may have a number of special sample handling, sample preparation or equipment settings to yield quantifiable and reliable results.

This document lists a number of techniques and discusses their applicability for the characterization of fine bubble mixtures as well as their limitations. Fine bubbles are able to exist in opaque liquids or liquids of high viscosity. Some fine bubble samples are turbid due to a large number of bubbles. All fine bubble samples are dynamic in nature and their properties change with time. For this reason, the acquisition time of each technique is of great relevance. Most fine bubble samples contain particles as well as fine bubbles. Distinguishing particles and bubbles and then additionally characterizing them by size and number or vice-versa may not be possible with all particle characterization equipment.

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Fine bubble technology — Measurement technique matrix for the characterization of fine bubbles

1 Scope

This document focuses on listing most commonly used preparation and characterization techniques for fine bubbles and their interpretation. The merits and limitations of each of the techniques are outlined.

2 Normative references

There are no normative references in this document.

3 Terms and definitions

No terms and definitions are listed in this document.

ISO and IEC maintain terminological databases for use in standardization at the following addresses:

— ISO Online browsing platform: available at https://www.iso.org/obp

— IEC Electropedia: available at http://www.electropedia.org/

4 Abbreviated terms

CCD	Charge coupled device
DLS	Dynamic light scattering
EZ	Electrical sensing zone method
LD	Laser diffraction methods
PSD	Particle size distribution
PTA	Particle tracking analysis method
RMM	Resonance mass measurement
SPOS	Single particle light interaction methods
SMLS	Static multiple light scattering
USS	Ultrasonic attenuation spectroscopy
ZP	Methods for Zeta-potential determination

5 Fine bubble characterization

5.1 General

A number of general particle counting and sizing techniques are available commercially. Some of them are applicable for the characterization of fine bubble dispersions and ultrafine bubble dispersions. Such dispersions may be in liquid of any kind. Some liquids may not be transparent (e.g. printer ink) or stable

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