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Fine bubble technology — Sampling and sample preparation for measurement —

Part 1: Ultrafine bubble dispersion in water

Technologie des fines bulles — Échantillonnage et préparation des échantillons pour la réalisation de mesures —

Partie 1: Dispersion de bulles ultrafines dans l'eau

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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.

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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For an explanation of the voluntary nature of standards, the meaning of ISO specific terms and expressions related to conformity assessment, as well as information about ISO's adherence to the World Trade Organization (WTO) principles in the Technical Barriers to Trade (TBT) see www.iso.org/iso/foreword.html.

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

A list of all the parts in the ISO 20480 series can be found on the ISO website.

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 technologies offer performance enhancement in a number of processes and applications such as cleaning, aquaculture and agriculture.

Characterization of ultrafine bubbles is critical to the further development of industrial applications. A number of characteristics such as bubble size, bubble number stability, bubble number concentration as well as other physical and chemical characteristics are important in such applications. In order to provide a verifiable characterization platform for these applications, a set of sampling and sample preparation procedures has been developed. This approach results in the most reliable correlation between the characteristics of the fine bubbles in dispersion and their application effectiveness.

It is commonly accepted that the sample preparation technique will depend on the characterization technique used.

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Fine bubble technology — Sampling and sample preparation for measurement —

Part 1: Ultrafine bubble dispersion in water

1 Scope

This document specifies procedures and requirements for sampling and sample preparation of ultrafine bubble dispersions in water.

This document is applicable to relatively stable dispersions where the size and number of bubbles are relatively constant for the duration of the sampling, sample preparation and measurement.

This document is not applicable to less stable fine bubble dispersions or microbubble dispersions.

2 Normative references

The following documents are referred to in the text in such a way that some or all of their content constitutes requirements of this document. For dated references, only the edition cited applies. For undated references, the latest edition of the referenced document (including any amendments) applies.

ISO 20480-1, *Fine bubble technology — General principles for usage and measurement of fine bubbles — Part 1: Terminology*

3 Terms and definitions

For the purposes of this document, the terms and definitions given in ISO 20480-1 and the following apply.

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/

3.1
fine bubble dispersion
FBD
liquid which contains fine bubbles

3.2
water diluent
homogeneous water which is used for dilution without causing any deleterious effects and whose number concentration of ultrafine bubbles is known

Note 1 to entry: Water diluent is used to decrease the number concentration of ultrafine bubbles in a dispersion without changing their total number, state of aggregation with particles, size or surface chemistry.

Note 2 to entry: Water diluent is called blank water when its number concentration of ultrafine bubbles is known to be zero and when it is used for the evaluation of ultrafine bubbles.

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3.3
ultrafine bubble dispersion
UFBD
liquid which contains ultrafine bubbles

3.4
microbubble dispersion
MBD
liquid which contains microbubbles

4 Liquids for sampling and sample preparation

The liquids for sampling and sample preparation shall be UFBD, with sufficient stability in size and number concentration of ultrafine bubbles and in other characteristics during the process including sampling, sample preparation and measurement.

5 Sampling

5.1 General

This procedure is applicable to static samples such as those contained in a tank. It is not applicable to running or flowing samples.

5.2 Apparatus

5.2.1 **Tank**, where UFBD are generated or UFBD are kept temporarily after being generated.

5.2.2 **Container**, closed by a lid to receive and keep the sample from the tank.

5.2.3 **Pipette**, to take the sample from the tank and transfer it to the container.

5.2.4 **Motor-driven stirrer**, for homogenization in the tank, capable of operating at approximately 50 rpm to 200 rpm.

See example in Figure A.1.

5.2.5 **Motor-driven drum roller**, for homogenization after taking the sample in a cylindrical container with a lid, capable of rotating a drum at approximately 10 rpm to 20 rpm and capable of seesaw motion.

See example in Figure A.2.

5.3 Cleaning of apparatus

Clean the surface of the tank (5.2.1) by rinsing it several times with water diluent.

Clean the surface of the container (5.2.2), the pipette (5.2.3) and the motor-driven stirrer (5.2.4) by rinsing several times with UFBD or water diluent.

5.4 Sampling procedure

Take the UFBD from the tank (5.2.1) and transfer it to the container (5.2.2) using the pipette (5.2.3), to slowly drawn it down.

Flow the contents of the pipette gently down along the inside wall of the container.

Do not add the last drop of the UFBD in the pipette to the container as this may introduce large bubbles.

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