DRAFT INTERNATIONAL STANDARD
ISO/DIS 20480-3

ISO/TC **281** Secretariat: **JISC**

Voting begins on: **2020-12-21** Voting terminates on: **2021-03-15**

Fine bubble technology — General principles for usage and measurement of fine bubbles —

Part 3: Terminology and methods for the generation of fine bubbles

ICS: 01.040.07; 07.030

Reference number
ISO/DIS 20480-3:2020(E)

Contents

Page

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).

Attention is drawn to the possibility that some of the elements of this document may be the subject of patent rights. ISO shall not be held responsible for identifying any or all such patent rights. Details of any patent rights identified during the development of the document will be in the Introduction and/or on the ISO list of patent declarations received (see www.iso.org/patents).

Any trade name used in this document is information given for the convenience of users and does not constitute an endorsement.

For an explanation on 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 the following URL: www.iso.org/iso/foreword.html.

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

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

Introduction

Until now the terminology, method and corresponding technology for the generation of fine bubbles have not been standardized and due to this fact the market of fine bubble industries has not expanded as rapidly as expected. So we propose the new project to standardize the terminology of fine bubble generating systems and the corresponding technology, which is thought to have significant influences on the market as shown follows:

— The convenience of customers when purchasing or using fine bubble generating system and its techniques will be improved, and owing to the improvement of their convenience it can be expected to boost fine bubble industries.

— Terminology standardization will enhance commonality in generating system performance fields and also the performance improvement on hardware and software will prospectively lead to the market growth of the manufacturing industries for fine bubble generating system.

— Terminology standardization will make it possible to boost the application markets when new markets launch and also existing markets are unified.

In addition to existing fine bubble technology standards, by specifying "common terms" of generation principles, best practices to use common terms for fine bubble generating systems will be formed and market expansion will be expected.

Fine bubble technology — General principles for usage and measurement of fine bubbles —

Part 3:
Terminology and methods for the generation of fine bubbles

1 Scope

This document describes terminology and definitions used in the technology and method for the fine bubble generating system and components.

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*

ISO 20480-2, *Fine bubble technology — General principles for usage and measurement of fine bubbles — Part 2: Categorization of the attributes of fine bubbles*

3 Terms and definitions

For the purposes of this document, the terms and definitions given in ISO 20480-1 and ISO 20480-2 and the following apply..

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

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

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

3.1
flow path
passage that conveys fluid (3.2.305)

[SOURCE: ISO 5598:2008(en), 3.2.291]

3.2
cavitation
formation and collapse of bubbles in a liquid when the pressure falls to or below the liquid vapour pressure; the collapse releases energy, sometimes with an audible sound and vibration

[SOURCE: ISO 16904:2016(en), 3.7]

3.3
venturi tube
device which consists of a convergent inlet which is conical connected to a cylindrical part called the "throat" and an expanding section called the "divergent" which is conical

[SOURCE: ISO 5167-1:2003(en), 3.2.5]

3.5
impeller
spinning disc in a centrifugal pump with protruding vanes, used to accelerate the fluid in the pump casing

[SOURCE: ISO 13501:2011(en), 3.1.51]

3.6
solubility
maximum mass of a solute that can be dissolved in a unit volume of solution measured under equilibrium conditions

[SOURCE: ISO 17327-1:2018(en), 3.16]

3.7
surfactant
surface active substance that reduces the surface tension of the solution

[SOURCE: ISO 8124-7:2015(en), 3.7]

3.8
critical micelle concentration
concentration of dispersing agent above which micelles will form

[SOURCE: ISO 14887:2000(en), 3.4]

3.9
ultrasound
high frequency (over 20 kHz) sound waves which propagate through fluids and solids

[SOURCE: ISO 20998-1:2006(en), 2.22]

3.10
pressure reduction section
portion where the flow passage area of the venturi tube becomes small

3.11
self-priming
suction of fluid into flow path without using pressure feed means

3.12
pressurizing pump
pump to increase pressure (Antonym: Vacuum pump)

3.13
nozzle
structure that accelerates and releases fluid

3.14
porous membrane
membrane containing pores (voids)

3.15
non-condensable gas
air and/or other gas which will not be liquefied under the conditions of a saturated steam

3.16
electrolysis
process in which electric current is used to promote a chemical reaction

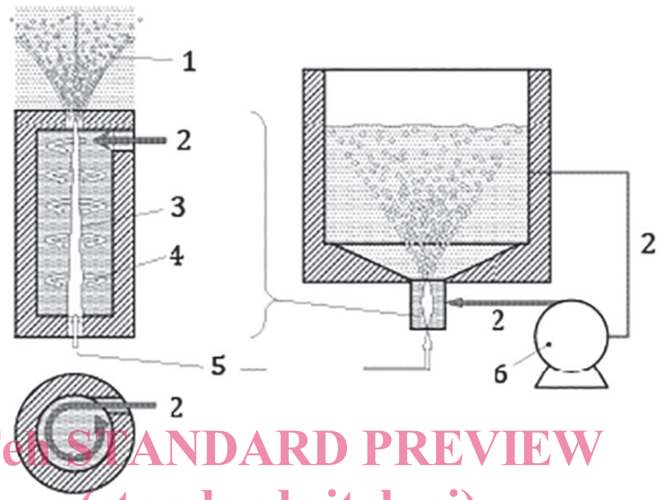
Note 1 to entry: In the case of water, an example is the separation of hydrogen from oxygen.

[SOURCE: ISO/TR 15916:2015(en), 3.34]

4 Examples of terminology and methods for the generation of fine bubbles

4.1 Swirling flow system

Liquid is made to swirl around the interior of a cylinder at high speed, reducing the pressure near the central axis of the cylinder and thereby causing gas to be sucked in from the outside. Within the cylinder, centrifugal separation occurs in which low-density gas is located in the centre and high-density liquid is located at the cylinder wall. The gas column is pulverized by the fierce shear flow, producing fine bubbles.



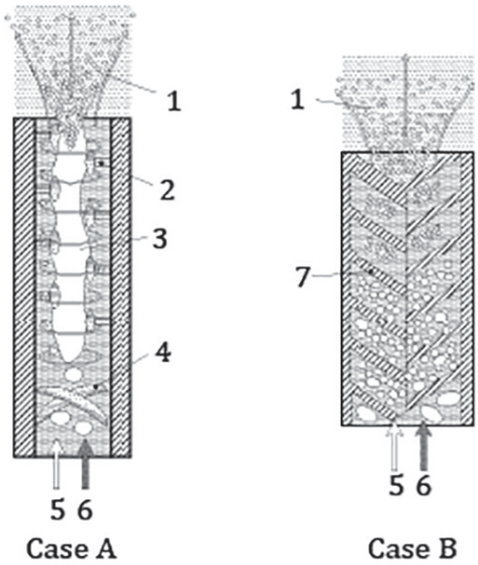
Key

1 fine bubbles
2 liquid
3 gas column
4 swirling flow
5 gas
6 pump

Figure 1 — Schematic diagram of fine bubble generation using swirling flow system

4.2 Static mixer system

This system does not use mechanical pulverization. The flow path has a complex structure, and the circulatory drive force of the liquid produces a vortex flow which is primarily responsible for creating a large viscous shear force that pulverizes the gas. Protrusions on the inner wall of the cylinder produce vortex in the liquid flow, and the large bubbles that are carried along with the liquid are pulverized by the shear force, producing fine bubbles.



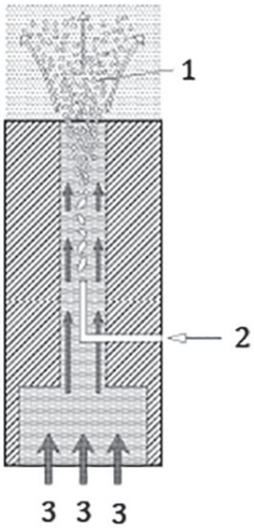
Key

1 fine bubbles
2 blade
3 gas column
4 guide vanes
5 gas
6 liquid
7 obstructions

Figure 2 — Schematic diagram of fine bubble generation using static mixer system

4.3 Ejector system

This system utilizes sudden narrowing and widening of the flow path, produces negative pressure and sucks air passively. The negative pressure produced when a fluid is passed through a narrow flow path at high speed is used to suck in gas. And the gas that is sucked in is pulverized thoroughly by cavitation caused by the widening of the downstream path, resulting in the formation of bubbles.



Key

1 fine bubbles

2 suction gas

3 liquid

Figure 3 — Schematic diagram of fine bubble generation using ejector system

4.4 Venturi system

When a liquid that contains large bubbles is passed through a Venturi tube with narrowed cross-sectional area and widened one, the sudden drop in pressure produced when the liquid passes the throat section causes the bubbles to be expanded temporarily, and the subsequent sudden restoration of pressure and the shock wave cause a forceful breakup of the large bubbles. This method does not necessarily require the self-priming using of a pressure reduction section.