



**International
Standard**

ISO 23335

**Natural gas — Upstream area
— Determination of hydrate
equilibrium temperature**

*Gaz naturel — Zone en amont — Détermination de la
température d'équilibre des hydrates*

**First edition
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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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This document was prepared by Technical Committee ISO/TC 193, *Natural gas*, Subcommittee SC 3, *Upstream area*.

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.

Introduction

Natural gas hydrate is a crystalline structure formed under specific conditions (high pressure and low temperature), in which gas molecules (primarily methane) are surrounded by water molecules. Due to its immense potential energy value and environmental significance, research on natural gas hydrates has been ongoing internationally. The phase equilibrium point is a crucial parameter for the formation and decomposition of natural gas hydrates and its determination is of great importance for hydrate management. Common methods for measuring the phase equilibrium point of hydrates are mainly divided into the observation method and the pressure, volume and temperature (PVT) method.

The observation method requires a high-pressure resistant transparent material (e.g. sapphire) for the reaction device to clearly observe the formation and decomposition process of the hydrate. With this method, the formation and decomposition process of the hydrate is directly observed and the results are intuitive and reliable. However, this method is limited by the pressure resistance and transparency of the reaction device.

The PVT method measures the phase equilibrium of hydrates by varying any two of the parameters of PVT in the reaction system while keeping the other parameter constant. Depending on the parameter that is kept constant, it can be categorized into constant pressure, constant volume and constant temperature methods. The constant volume method is suitable for measuring the phase equilibrium of hydrates in multi-component systems and under complex conditions. It provides more comprehensive phase equilibrium information but requires precise instrument control and data analysis. This document is compiled to meet the demand for measuring the phase equilibrium point of hydrates in natural gas hydrate research under the constant volume method.

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Natural gas — Upstream area — Determination of hydrate equilibrium temperature

1 Scope

This document specifies a method for determining the phase equilibrium point of natural gas hydrates in a laboratory setting under constant volume conditions, including the principle, reagents and materials, apparatus, procedure, expression of results, test report and precision.

This document applies to laboratory simulations of hydrate formation and decomposition processes. It involves the analysis of collected temperature and pressure data to determine the phase equilibrium temperature of hydrates.

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 5725-2, *Accuracy (trueness and precision) of measurement methods and results — Part 2: Basic method for the determination of repeatability and reproducibility of a standard measurement method*

ISO 10715, *Natural gas — Gas sampling*

ISO 14532, *Natural gas — Vocabulary*

3 Terms and definitions

For the purposes of this document, the terms and definitions given in ISO 14532 and the following terms apply.

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

- ISO Online browsing platform: available at <https://www.iso.org/obp>
- IEC Electropedia: available at <https://www.electropedia.org/>

3.1

hydrate

solid crystalline substance resembling ice formed by gas molecules and water molecules

[SOURCE: ISO 14532:2026, 3.1.16, modified — The preferred term has been modified from "gas hydrate" to "hydrate".]

3.2

equilibrium

limit state of each phase change in a multiphase system, where all phases in the reaction system reach balance

3.3

phase equilibrium point

intersection of the cooling curve and the heating curve in the phase diagram formed by temperature and pressure data