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Analiza plinov - Slovar

Gas analysis - Vocabulary

Analyse des gaz - Vocabulaire

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ISO 7504

Third edition
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Gas analysis — Vocabulary

Analyse des gaz — Vocabulaire

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.

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 meaning of ISO specific terms and expressions related to conformity assessment, as well as information about ISO's adherence to the WTO principles in the Technical Barriers to Trade (TBT), see the following URL: Foreword — Supplementary information.

The committee responsible for this document is ISO/TC 158, *Analysis of gases*.

This third edition cancels and replaces the second edition (ISO 7504:2001), which has been technically revised for alignment with the terminology used in other International Standards, including ISO/IEC Guide 98-3 and ISO/IEC Guide 99:2007.

Gas analysis — Vocabulary

1 Scope

This International Standard defines terms related to gas analysis, with the main focus on terms related to calibration gas mixtures for use in gas analysis and gas measurements. It does not cover terms which relate only to specific applications.

2 Normative references

The following documents, in whole or in part, are normatively referenced in this document and are indispensable for its application. For dated references, only the edition cited applies. For undated references, the latest edition of the referenced document (including any amendments) applies.

ISO/IEC Guide 98-3:2008, *Uncertainty of measurement — Part 3: Guide to the expression of uncertainty in measurement (GUM:1995)*

ISO/IEC Guide 99:2007, *International vocabulary of metrology — Basic and general concepts and associated terms (VIM)*

ISO 10715:1997, *Natural gas — Sampling guidelines*

3 Terms relating to general concepts

Terms used in the field of gas analysis that are well defined by either ISO/IEC Guide 98-3 or ISO/IEC Guide 99 are included in Annex A.

3.1
homogeneity
state of a gas mixture wherein all of its *components* (3.3) are distributed uniformly throughout the volume occupied by the gas mixture

3.2
stability
attribute of a gas mixture, under specified conditions, to maintain its *composition* (3.5) within specified uncertainty (Annex A) limits for a specified period of time (*maximum storage life* (7.5))

3.3
component
chemical entity at a defined physical state present in a material or in a mixture

3.4
content
amount-of-substance fraction (3.5.1.1), *mass fraction* (3.5.1.2), *volume fraction* (3.5.1.3), *amount-of-substance concentration* (3.5.2.1), *mass concentration* (3.5.2.2), *volume concentration* (3.5.2.3) of a *component* (3.3) in a gas or gas mixture

Note 1 to entry: See ISO 14912[7] for further information about this concept.

EXAMPLE 1 The hydrogen content in a mixture of hydrogen and nitrogen, expressed as an *amount-of-substance fraction* (3.5.1.1), is $x(H_2) = 0{,}1$.

EXAMPLE 2 The content of sulfur dioxide in air at p = 101,325 kPa and T = 288,15 K, expressed as a *mass concentration* (3.5.2.2), is $\gamma(SO_2)$ = 1 mg/m^3 .

3.5
composition
identity and *content* (3.4) of each *component* (3.3) that constitute a particular gas mixture

3.5.1 Fractions

3.5.1.1
amount-of-substance fraction
mole fraction
x_B, y_B
quotient of the amount of substance of a component B and the sum of the amounts of substance of all *components* (3.3) of the gas mixture

[SOURCE: ISO 80000-9:2009, 9-14]

3.5.1.2
mass fraction
w_B
quotient of the mass of a component B and the sum of the masses of all *components* (3.3) of the gas mixture

[SOURCE: ISO 80000-9:2009, 9-12]

3.5.1.3
volume fraction
φ_B
quotient of the volume of a component B and the sum of the volumes of all *components* (3.3) of the gas mixture before mixing, all volumes referring to the pressure and the temperature of the gas mixture

[SOURCE: ISO 80000-9:2009, 9-15]

3.5.2 Concentrations

3.5.2.1
amount-of-substance concentration
mole concentration
c_B
quotient of the amount of substance of a component B and the volume of the gas mixture

[SOURCE: ISO 80000-9:2009, 9-13]

3.5.2.2
mass concentration
γ_B
quotient of the mass of a component B and the volume of the gas mixture

[SOURCE: ISO 80000-9:2009, 9-11.2]

3.5.2.3
volume concentration
σ_B
quotient of the volume of a component B before mixing and the volume of the gas mixture, both volumes referring to the same pressure and the same temperature

Note 1 to entry: The volume concentration and the *volume fraction* (3.5.1.3), both referring to the same pressure and the same temperature, have identical values if, and only if, the sum of the component volumes and the volume of the whole gas mixture are identical.

4 Terms relating to physical properties

4.1
equation of state
mathematical relationship between the state variables (pressure and temperature) of a gas or gas mixture and the volume occupied by a given amount of substance, written as $pV = ZnRT$

Note 1 to entry: In this relationship

p is the pressure;

V is the volume;

Z is the *compressibility factor* (4.2);

n is the amount of substance;

R is the molar gas constant;

T is the absolute temperature.

4.2
compressibility factor
compression factor
***Z*-factor**
real-gas factor
quotient of the volume of an arbitrary amount of gas at specified pressure and temperature and the volume of the same amount of gas, at the same state conditions, as calculated from the ideal gas law

4.3
reference conditions
definite values of pressure and temperature (state conditions) of gases and gas mixtures to which the results of measurements and/or calculations should refer

EXAMPLE In the field of gas analysis and gas measurement, the following conditions are commonly preferred:

— normal conditions: p = 101,325 kPa, T = 273,15 K;

— metric standard conditions: p = 101,325 kPa, T = 288,15 K (see ISO 13443[5]).

4.4
density
ρ_B
quotient of the mass and the volume occupied by that mass at specified state conditions

[SOURCE: ISO 80000-9:2009, 9-11.1]

4.4.1
relative density
quotient of the gas density and the density of dry air of standard composition, specified at the same state conditions

[SOURCE: ISO 6976:1995, 2.4, modified — Language aligned with other definitions]

4.5
saturation vapour pressure
pressure exerted by the vapour of a chemical substance in equilibrium with a condensed phase (liquid or solid or both) in a closed system

Note 1 to entry: For each pure substance, saturation vapour pressure is a function of temperature only.

4.6
dew point
temperature at or below which, at a specified pressure, condensation from the gas phase will occur

Note 1 to entry: For pure substances, dew point and *bubble point* (4.7) coincide. At that temperature, the pressure equals the *saturation vapour pressure* (4.5).

4.7
bubble point
pressure and temperature condition at which the liquid phase is in equilibrium with the first appearing bubbles of gas

Note 1 to entry: For pure substances, *dew point* (4.6) and bubble point coincide. At that temperature, the pressure equals the *saturation vapour pressure* (4.5).

4.8
critical point
single point in pressure-temperature space at which the *composition* (3.5) and properties of the gas and liquid phases in equilibrium are identical

Note 1 to entry: The pressure at this point is known as the "critical pressure p_c" and the temperature as the "critical temperature T_c", respectively.

Note 2 to entry: For a pure substance, the critical temperature is that temperature above which only the gas phase can exist irrespective of the applied pressure.

4.9
cricondenbar
maximum pressure at which two-phase separation (condensation) can occur

Note 1 to entry: The phase coordinates cricondenbar and *cricondentherm* (4.10) apply to gas mixtures (with the binary system as the simplest case). For a gas mixture, the *critical point* (4.8) is no longer the maximum pressure, as well as the maximum temperature for vapour-liquid coexistence (see Figure 1).

Note 2 to entry: It is the highest pressure in the two-phase envelope and generally higher than the critical pressure.

Note 3 to entry: For a pure substance, *cricondentherm* (4.10), cricondenbar, and *critical point* (4.8) are represented by a single point, i.e. the critical point.

4.10
cricondentherm
maximum temperature at which two-phase separation (condensation) can occur

Note 1 to entry: The phase coordinates *cricondenbar* (4.9) and cricondentherm apply to gas mixtures (with the binary system as the simplest case). For a gas mixture, the *critical point* (4.8) is no longer the maximum pressure, as well as the maximum temperature for vapour-liquid coexistence (see Figure 1).

Note 2 to entry: It is the highest temperature in the two-phase envelope and generally higher than the critical temperature.

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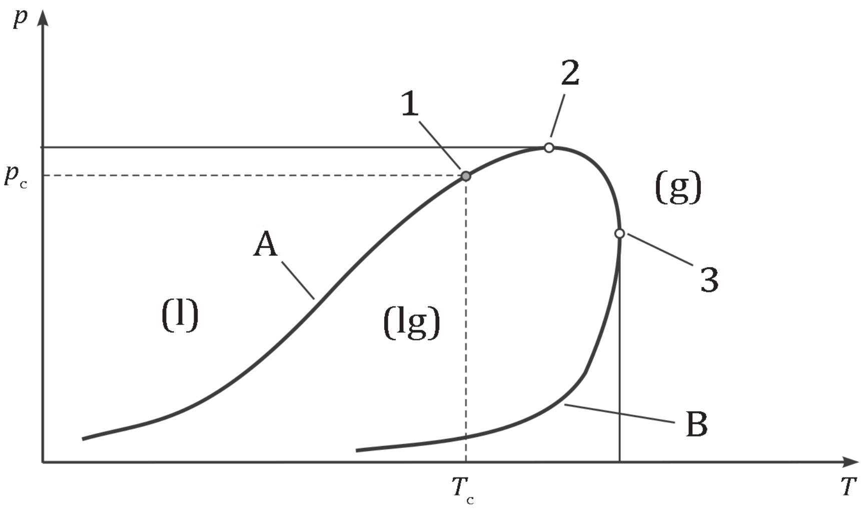

Key

1 critical point
2 cricondenbar
3 cricondentherm
A bubble point curve
B dew point curve
(l) liquid phase
(g) gaseous phase
(lg) two-phase (liquid-vapour) region

Figure 1 — The *p*,*T* phase envelope of a binary system

5 Terms relating to calibration gases

5.1
calibration gas mixture
gas mixture of known *stability* (3.2) and *homogeneity* (3.1) whose *composition* (3.5) is well established for use in the calibration (Annex A) or *verification* (9.2) of a measuring instrument or for the *validation* (9.3) of a measurement

Note 1 to entry: Calibration gas mixtures are measurement standards (Annex A) as defined in ISO/IEC Guide 99.

5.2
reference gas mixture
calibration gas mixture (5.1) whose *composition* (3.5) is well established and stable to be used as a reference standard of composition from which other composition data measurements are derived

Note 1 to entry: Reference gas mixtures are *reference* measurement standards (Annex A) as defined in ISO/IEC Guide 99.

5.3
parent gas
gas, vapour, or gas mixture used for preparation of other gas mixtures