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International Standard



7996

INTERNATIONAL ORGANIZATION FOR STANDARDIZATION • МЕЖДУНАРОДНАЯ ОРГАНИЗАЦИЯ ПО СТАНДАРТИЗАЦИИ • ORGANISATION INTERNATIONALE DE NORMALISATION

Ambient air — Determination of the mass concentration of nitrogen oxides — Chemiluminescence method

Air ambiant — Détermination de la concentration en masse des oxydes d'azote — Méthode par chimiluminescence

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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.

Draft International Standards adopted by the technical committees are circulated to the member bodies for approval before their acceptance as International Standards by the ISO Council. They are approved in accordance with ISO procedures requiring at least 75 % approval by the member bodies voting.

International Standard ISO 7996 was prepared by Technical Committee ISO/TC 146, *Air quality*.

Users should note that all International Standards undergo revision from time to time and that any reference made herein to any other International Standard implies its latest edition, unless otherwise stated.

Ambient air — Determination of the mass concentration of nitrogen oxides — Chemiluminescence method

1 Scope and field of application

This International Standard specifies a chemiluminescence method for the determination of the mass concentration of nitrogen oxides present in ambient air.

The method is applicable to the determination of the mass concentration of nitrogen monoxide present in ambient air up to approximately 12,5 mg/m³ and of nitrogen dioxide up to approximately 19 mg/m³ respectively¹⁾ at 25 °C and 101,3 kPa.

For interferences, see 6.6.

2 References

ISO 6142, *Gas analysis — Preparation of calibration gas mixtures — Weighing methods.*

ISO 6144, *Gas analysis — Preparation of calibration gas mixtures — Static volumetric methods.*

ISO 6349, *Gas analysis — Preparation of calibration gas mixtures — Permeation method.*

ISO 6711, *Gas analysis — Checking of calibration gas mixtures by a comparison method.*

3 Principle

Passage of the air sample through a filter (to prevent mal-operation of the chemiluminescence analyser) at a constant flow rate into the reaction chamber of the analyser, where it is mixed with an excess of ozone. Filtering of the emitted radiation, proportional to the amount of nitrogen monoxide present in the air sample, by means of a selective optical filter and conversion of the filtered radiation into an electric signal by a photomultiplier tube.

Measurement of nitrogen dioxide in the air sample by reducing it to nitrogen monoxide by passage through a converter before it enters the reaction chamber.

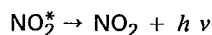
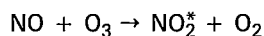
The electric signal obtained is proportional to the total amount of nitrogen oxides, and the nitrogen dioxide contribution is calculated from the difference between this value and that obtained for nitrogen monoxide only — when the air sample does not pass through the converter.

Analysers may be of the dual or cyclic type. In the dual type, the air flow is divided into two streams, one passing directly to the reaction chamber and the other via the converter. There are two reaction chambers and one or two detectors respectively monitoring the nitrogen monoxide and nitrogen oxides content of the air sample. In the cyclic type analyser, there is only one reaction chamber and detector and the output alternates between nitrogen monoxide and total nitrogen oxides measurements, i.e. the air sample alternately bypasses or passes through the converter.

4 Reactions

Luminescence is a characteristic of many substances from which light is emitted when they are excited. This phenomenon is called chemiluminescence when produced as a result of a chemical reaction.

This chemiluminescence method is based on the reaction



Excited nitrogen dioxide emits radiation centred around the near infra-red (1 200 nm).

5 Apparatus

Schematic diagrams of typical analysers are given in figures 1a) and 1b) (dual type) and figure 1c) (cyclic type). An apparatus consists of the following principal components (5.1 to 5.10).

1) At the temperature and pressure given, the following conversion factors apply.

NO: 1 mg/m³ ≅ 0,81 ppm (V/V)
1 ppm (V/V) ≅ 1,23 mg/m³

NO₂: 1 mg/m³ ≅ 0,53 ppm (V/V)
1 ppm (V/V) ≅ 1,88 mg/m³