STANDARD **10313**

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Ambient air — Determination of the mass concentration of ozone — Chemiluminescence method

Air ambiant — Détermination de la concentration en mass d'ozone — Méthode par chimiluminescence

Reference number
ISO 10313:1993(E)

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.

Draft International Standards adopted by the technical committees are circulated to the member bodies for voting. Publication as an International Standard requires approval by at least 75 % of the member bodies casting a vote.

International Standard ISO 10313 was prepared by Technical Committee ISO/TC 146, *Air quality*, Sub-Committee SC 3, *Ambient atmospheres*.

Annexes A and B of this International Standard are for information only.

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Ambient air — Determination of the mass concentration of ozone — Chemiluminescence method

1 Scope

1.1 General

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

The method is applicable to the determination of the mass concentration of ozone between 2 $\mu g/m^3$ [0,001 ppm(*V*/*V*)] and 10 mg/m^3 [5 ppm(*V*/*V*)] at the reference conditions of 25 °C and 101,3 kPa.

Ultraviolet (UV) photometry is specified as the primary calibration method because of its proven accuracy and specificity to ozone. The use of transfer standards is allowed if they have been previously calibrated against the primary calibration method.

1.2 Limitations

The chemiluminescent reaction of ozone with ethylene is not subject to interference from any of the common air pollutants. However, particulate matter, if not removed, will accumulate in the sampling line and may cause a measurable destruction of ozone. If particulate matter is allowed to enter the reaction chamber of the analyser, it will not only scatter the emitted light but will also accumulate on the optical window, thereby causing further attenuation of the emitted light. Also, any nitrogen(II) oxide in the sampled air will to some extent react with the ambient ozone; therefore, the time during which the ambient air remains in the sampling line must be sufficiently short to keep this effect to a minimum.

NOTE 1 It has been reported by some researchers that, at about 80 % relative humidity and 22 °C, the responses for some commercially available chemiluminescence analysers were about 10 % higher than that for dry air. However, comparisons of ambient ozone measurements using commercially available chemiluminescence and UV-photometric analysers showed no significant differences. This suggests that, in practice, any errors associated with calibrations using dry air are compensated by other effects.

2 Definition

For the purposes of this International Standard, the following definition applies.

2.1 transfer standard: An apparatus (transportable) with associated operational procedures that is capable of accurately measuring or reproducing ozone concentration standards which are quantitatively related to the authoritative primary standard.

3 Principle

The air sample is drawn continuously, at a constant flow rate, through a particle filter before it enters the chemiluminescence analyser. It then flows into a reaction chamber where it is mixed with an excess flow of ethylene. Ozone and ethylene react instantaneously to produce light in the visible region with a maximum at a wavelength of about 400 nm. The emitted light intensity is proportional to the concentration of ozone in the air sample and is measured by a photomultiplier tube. The resulting voltage is amplified, displayed, and calibrated in terms of the ambient ozone concentration.

4 Reagents and materials

4.1 Sampling line

The sampling line shall be made of material that is inert to ozone, such as glass or fluorocarbon polymer, and it shall be as short as possible to keep the time the air sample remains there to a minimum. Any ambient nitrogen(II) oxide present in the air sample will react with some of the ozone during the time it remains in the sampling line. This decay of ozone is a complicated function of the mass concentration ratio, $\rho(O_3)/\rho(NO)$, and the difference in mass concentrations, $\rho(O_3) - \rho(NO)$. Calculations have shown that, if the residence time is less than 0,5 s, the decay in initial ozone will be less than 1 % for most ambient ozone and nitrogen(II) oxide concentrations encountered. Hence, it is recommended that the sampling