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STANDARD

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Ambient air — Determination of a black smoke index

Air ambiant — Détermination d'un indice de fumée noire



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Foreword

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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 9835 was prepared by Technical Committee ISO/TC 146, *Air quality*, Sub-Committee SC 3, *Ambient atmospheres*.

Annex A of this International Standard is for information only.

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Ambient air — Determination of a black smoke index

1 Scope

This International Standard specifies a method for measuring the black smoke index of an ambient air sample. The method is based on the staining effect of particles which is produced when a sample of air is drawn through a filter paper.

The method is intended for the measurement of a black smoke index in the range 6 to 375 in the ambient atmosphere. It is based on the measurement of reflectance. The method does not measure the mass concentration of particles directly.

2 Definition

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

2.1 black smoke: Strongly light-absorbing, particulate material suspended in the ambient atmosphere.

NOTE 1 The major contributor to black smoke is soot particles; i.e. particles containing carbon in its elemental form.

3 Principle and theory

Air is drawn through a filter paper and the reflectance of the stain produced is measured. If it is assumed that reflected light from the surface of the filter paper has passed through the layer of light absorbent particles twice, reflectance from the filter surface is analogous to the absorption of light by particles suspended in air in accordance with the equation

$$R = R_0 \exp\left(\frac{-2aV}{A}\right) \quad \dots (1)$$

where

- R is the intensity of reflected light from the surface of a stained paper;
- R_0 is the intensity of reflected light from the surface of a clean paper;
- A is the area of the stain on the filter paper, in square metres;
- V is the volume sampled, in cubic metres;
- a is the absorption coefficient, in reciprocal metres.

Thus, rearranging equation (1):

$$a = \frac{A}{2V} \times \ln\left(\frac{R_0}{R}\right) \quad \dots (2)$$

The method specified in this International Standard can be used to measure the absorption coefficient on any filter material, but the conversion of absorption coefficient or extinction coefficient to what is, by convention, known as the black smoke index, is purely an arbitrary operation which is carried out by reference to tables or graphs. For further explanations, see annex A.

4 Apparatus

4.1 Sampling equipment. The sampler shall be designed for daily operation, or it shall be of an automatic type for continuous operation. Flow diagrams of alternative arrangements of sampling equipment are shown in figure 1. Details of the sampling equipment are given in 4.1.1 to 4.1.6.