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## **Environmental tobacco smoke — Estimation of its contribution to respirable suspended particles — Method based on solanesol**

*Fumée de tabac ambiante — Estimation de sa contribution aux  
particules en suspension respirables — Méthode basée sur le solanesol*



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## Contents

	Page
<b>1 Scope</b> .....	<b>1</b>
<b>2 Normative references</b> .....	<b>1</b>
<b>3 Terms and definitions</b> .....	<b>1</b>
<b>4 Principle</b> .....	<b>2</b>
<b>5 Limits and detection</b> .....	<b>2</b>
<b>6 Reagents</b> .....	<b>2</b>
<b>7 Apparatus</b> .....	<b>3</b>
<b>8 Sampling procedure</b> .....	<b>4</b>
<b>8.1 Calibration of air pumping system</b> .....	<b>4</b>
<b>8.2 Sample collection</b> .....	<b>4</b>
<b>9 Analytical procedure</b> .....	<b>5</b>
<b>9.1 Preparation of samples and blanks</b> .....	<b>5</b>
<b>9.2 Determination of solanesol</b> .....	<b>5</b>
<b>10 Expression of results</b> .....	<b>7</b>
<b>10.1 Calculation of solanesol contents</b> .....	<b>7</b>
<b>10.2 ETS-PM contribution to RSP as estimated by solanesol</b> .....	<b>8</b>
<b>11 Laboratory performance criteria and quality assurance</b> .....	<b>8</b>
<b>12 Repeatability and reproducibility</b> .....	<b>8</b>
<b>13 Test report</b> .....	<b>9</b>
<b>Annex A (informative) Laboratory performance criteria: Quality assurance measures</b> .....	<b>10</b>
<b>Bibliography</b> .....	<b>12</b>

## 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.

International Standards are drafted in accordance with the rules given in the ISO/IEC Directives, Part 2.

The main task of technical committees is to prepare International Standards. 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.

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.

ISO 18144 was prepared by Technical Committee ISO/TC 126, *Tobacco and tobacco products*.

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## Introduction

Environmental tobacco smoke (ETS) is an aerosol consisting of both vapour and particulate phase components. Due to the nature of the two aerosol phases, they rarely correlate well, and an accurate assessment of ETS levels in indoor air requires determining good tracers of both phases. Among the attributes of an ideal ETS tracer, one critical characteristic is that the tracer should "remain in a fairly consistent ratio to the individual contaminant of interest or category of contaminants of interest (e.g. suspended particulates) under a range of environmental conditions..." (see [1]).

NOTE The Bibliography gives full references to the literature cited.

Solanesol, a C<sub>45</sub> isoprenoid alcohol, meets this requirement, since it remains in a constant ratio to respirable suspended particles (RSP) contributed by tobacco smoke over a variety of ventilation conditions and sampling durations (see [2]). Ultraviolet particulate matter (UVPM) and fluorescent particulate matter (FPM), determined in accordance with ISO 15593<sup>[3]</sup>, are tracers or markers which also fulfil this requirement. Airborne solanesol, however, is unique in that it is specific to tobacco smoke and is found only in the particulate phase of ETS. Its high molecular mass and low volatility make it extremely unlikely that any solanesol will be lost from the membrane filter used for sample collection. Solanesol constitutes approximately 3 % by mass of the RSP of ETS (see [4] to [6]), making it suitable for measurement at realistic smoking rates. Of the available ETS particulate phase markers (UVPM, FPM and solanesol), all are currently used and relied upon, but solanesol is considered to be a better marker for the particulate phase of ETS and, as a result, provides the best way of quantifying the contribution of ETS particulate matter (ETS-PM) to RSP (see [7] to [15]).

It is important to be able to quantify the contribution of ETS to RSP with a tobacco-specific marker because RSP is not specific to tobacco smoke. RSP is a necessary indicator of overall air quality; in the United States, the Occupational Safety and Health Administration (OSHA) has previously set a PEL (permissible exposure level) for respirable dust in the workplace of 5 000 µg/m<sup>3</sup>. However, RSP emanates from numerous sources (see [16]) and has been shown to be an inappropriate tracer of ETS (see [4], [17] to [19]). UVPM and FPM are used as more selective markers to estimate the contribution of tobacco smoke to RSP. However, these markers can overestimate the contribution of tobacco smoke to RSP due to potential interference from non-tobacco combustion sources. Although UVPM and FPM are useful in investigations of indoor air quality, solanesol is a better indicator of the tobacco smoke contribution to RSP. The test method described in this International Standard has been used to apportion RSP into ETS and non-ETS components by determining the mass ratio of solanesol to total RSP (see [4], [6], [10], [11], [14], [15], [20], [21]).

The genus *Nicotiana*, which includes tobacco as one of its species, is a member of the *Solanaceae* family of plants. Like tobacco, many plants in this family, particularly those which also contain trace amounts of nicotine, contain solanesol. Examples are tomato, potato, eggplant and pepper. With cooking as the only possible source of interference, the potential for interference is negligible. However, if there were an interference of this type, the mass of solanesol would be biased high and the contribution of ETS to RSP would be overestimated. It is anticipated that the only measurable contribution of solanesol to an indoor environment would come from tobacco combustion. Solanesol concentrations typically range from not detected to 2 µg/m<sup>3</sup> in various indoor environments, with most levels at the lower end of this range.