INTERNATIONAL STANDARD

ISO 3518

Second edition
2002-03-01

Oil of sandalwood (*Santalum album* L.)

*Huile essentielle de bois de santal (*Santalum album *L.)*

Reference number
ISO 3518:2002(E)

ISO copyright office
Case postale 56 • CH-1211 Geneva 20
Tel. + 41 22 749 01 11
Fax + 41 22 749 09 47
E-mail copyright@iso.ch
Web www.iso.ch

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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.

International Standards are drafted in accordance with the rules given in the ISO/IEC Directives, Part 3.

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 International Standard may be the subject of patent rights. ISO shall not be held responsible for identifying any or all such patent rights.

ISO 3518 was prepared by Technical Committee ISO/TC 54, *Essential oils*.

This second edition cancels and replaces the first edition (ISO 3518:1979) and also ISO 7610:1985, which have been technically revised.

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

Oil of sandalwood (*Santalum album* L.)

1 Scope

This International Standard specifies certain characteristics of the oil of sandalwood (*Santalum album* L.), in order to facilitate assessment of its quality.

2 Normative references

The following normative documents contain provisions which, through reference in this text, constitute provisions of this International Standard. For dated references, subsequent amendments to, or revisions of, any of these publications do not apply. However, parties to agreements based on this International Standard are encouraged to investigate the possibility of applying the most recent editions of the normative documents indicated below. For undated references, the latest edition of the normative document referred to applies. Members of ISO and IEC maintain registers of currently valid International Standards.

ISO/TR 210, *Essential oils — General rules for packaging, conditioning and storage*

ISO/TR 211, *Essential oils — General rules for labeling and marking of containers*

ISO 212, Essential oils — Sampling

ISO 279, *Essential oils — Determination of relative density at 20 degrees C — Reference method*

ISO 280, *Essential oils — Determination of refractive index*

ISO 592, *Essential oils — Determination of optical rotation*

ISO 709, *Essential oils —Determination of ester value*

ISO 875, *Essential oils — Evaluation of miscibility in ethanol*

ISO 3793, *Essential oils — Estimation of primary and secondary free alcohols content by acetylation in pyridine*

ISO 7609, *Essential oils — Analysis by gas chromatography on capillary columns — General method*

ISO 11024-1, *Essential oils — General guidance on chromatographic profiles — Part 1: Preparation of chromatographic profiles for presentation in standards*

ISO 11024-2, *Essential oil — General guidance on chromatographic profiles — Part 2: Utilization of chromatographic profiles of samples of essential oils*

3 Term and definition

For the purposes of this International Standard, the following term and definition apply.

3.1
oil of sandalwood
essential oil obtained by steam distillation of the heartwood of *Santalum album* L., of the Santalaceae family

NOTE For information on CAS numbers, see ISO/TR 21092.

4 Requirements

4.1 Appearance

Clear, slightly viscous liquid.

4.2 Colour

Almost colourless to golden yellow.

4.3 Odour

Characteristic, sweet, woody and persistent.

4.4 Relative density at 20 °C, d_{20}^{20}

Minimum: 0,968

Maximum: 0,983

4.5 Refractive index at 20 °C

Minimum: 1,503 0

Maximum: 1,509 0

4.6 Optical rotation at 20 °C

Between –21° and –12°.

4.7 Miscibility in ethanol, 70 % (volume fraction), at 20 °C

It shall not be necessary to use more than 5 volumes of ethanol, 70 % (volume fraction), to obtain a clear solution with 1 volume of essential oil.

4.8 Ester value

Maximum: 10

4.9 Primary free alcohol content, expressed as santalol

Minimum: 90 %

4.10 Chromatographic profile

Analysis of the essential oil shall be carried out by gas chromatography. In the chromatogram obtained, the representative and characteristics components shown in Table 1 shall be identified. The proportions of these components, indicated by the integrator, shall be as shown in Table 1. This constitutes the chromatographic profile of the essential oil.

Table 1 — Chromatographic profile

Component	Minimum %	Maximum %
Z-α-Santalol	41	55
Z-β-Santalol	16	24
NOTE The chromatographic profile is normative, contrary to typical chromatograms given for information in annex A.		

4.11 Flashpoint

Information on the flashpoint is given in annex B.

5 Sampling

See ISO 212.

Minimum volume of test sample: 25 ml.

NOTE This volume allows each of the tests specified in this International Standard to be carried out at least once.

6 Test methods

6.1 Relative density at 20 °C, d_{20}^{20}

See ISO 279.

6.2 Refractive index at 20 °C

See ISO 280.

6.3 Optical rotation at 20 °C

See ISO 592.

6.4 Miscibility in ethanol, 70 % (volume fraction), at 20 °C

See ISO 875.

6.5 Ester value

See ISO 709.

Saponification time: 1 h.

Relative molecular mass of santalyl acetate:

M_r = 262,4.

6.6 Primary free alcohol content, expressed as santalol

See ISO 3793.

Volume of acetic anhydride: 20 ml.

Relative molecular mass of santalol: M_r = 220,4.

6.7 Chromatographic profile

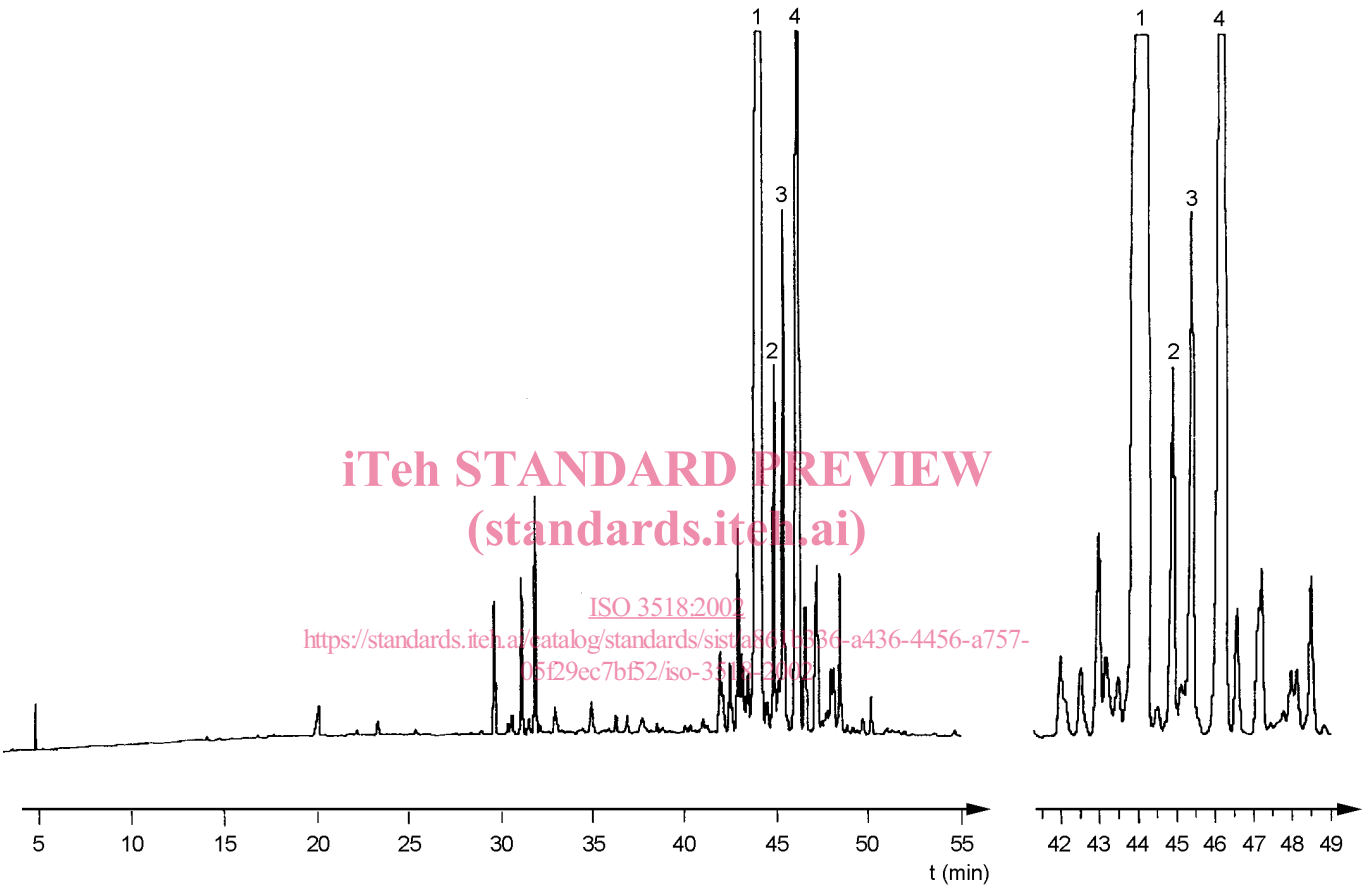
See ISO 7609, ISO 11024-1 and ISO 11024-2.

7 Packaging, labelling, marking and storage

See ISO/TR 210 and ISO/TR 211.

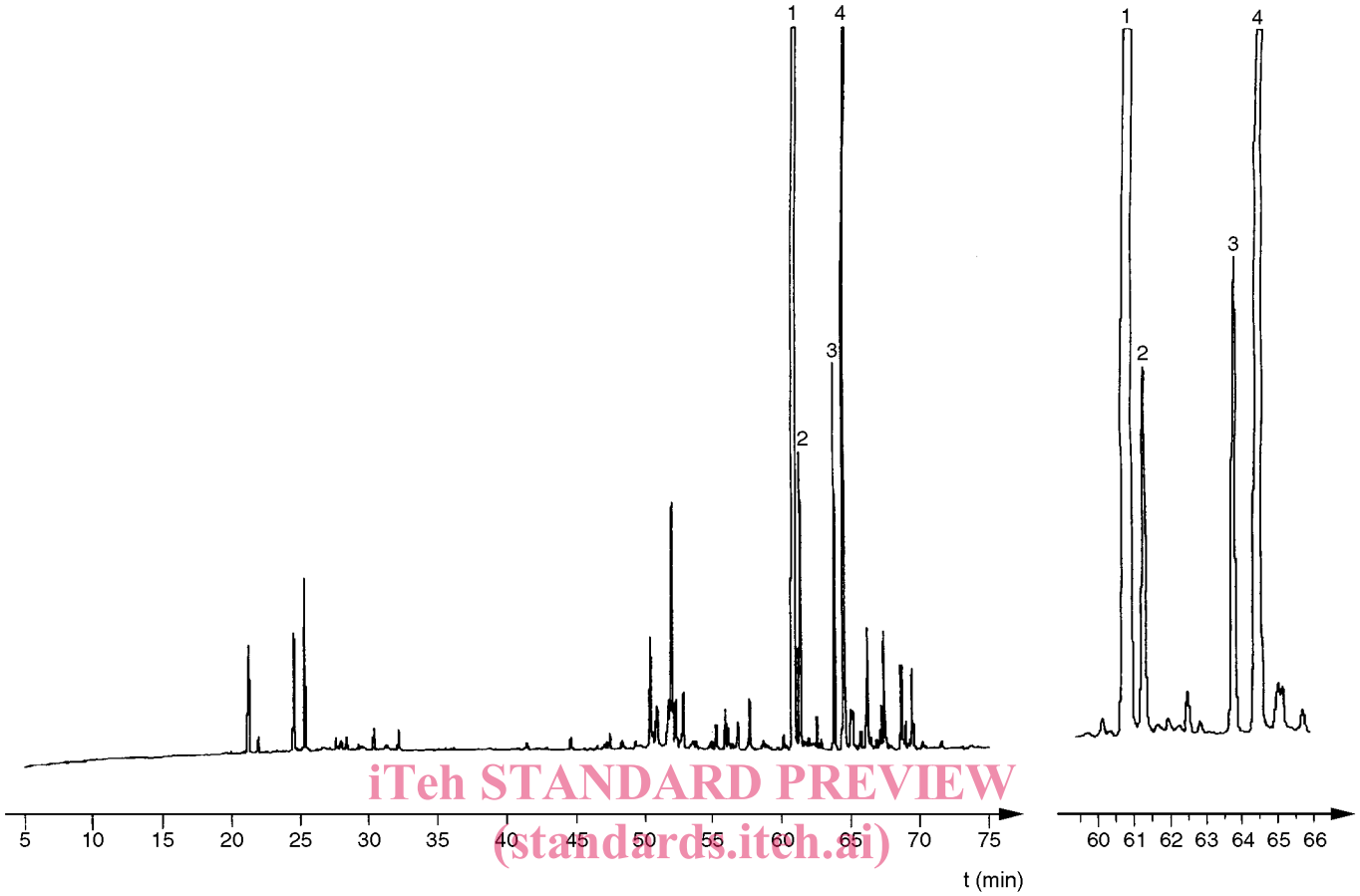
Annex A
(informative)

Typical chromatograms of the analysis by gas chromatography of the essential oil of sandalwood (*Santalum album* L.)



Peak identification		Operating conditions
1	*Z*-α-Santalol	Column: fused silica capillary; length 30 m; internal diameter 0,25 mm
2	*trans*-α-Bergamotol	Stationary phase: polydimethylsiloxane (SE 30®)
3	*epi*-β-Santalol	Film thickness: 0,25 µm
4	*Z*-β-Santalol	Oven temperature: isothermal at 70 °C for 10 min, then temperature programming from 70 °C to 220 °C at a rate of 2 °C/min, then isothermal at 220 °C for 20 min
		Injector temperature: 250 °C
		Detector temperature: 250 °C
		Detector: flame ionization type
		Carrier gas: helium
		Volume injected: 0,3 µl
		Carrier gas flow rate: 1 ml/min
		Split ratio: 1/100

Figure A.1 — Typical chromatogram taken on an apolar column



Peak identification		Operating conditions
1	*Z*-α-Santalol	Column: fused silica capillary; length 30 m; internal diameter 0,25 mm
2	*trans*-α-Bergamotol	Stationary phase: poly(ethylene glycol) (Supelcowax 10 ®)
3	*epi*-β-Santalol	Film thickness: 0,25 µm
4	*Z*-β-Santalol	Oven temperature: isothermal at 70 °C for 10 min, then temperature programming from 70 °C to 220 °C at a rate of 2 °C/min, then isothermal at 220 °C for 20 min
		Injector temperature: 250 °C
		Detector temperature: 250 °C
		Detector: flame ionization type
		Carrier gas: helium
		Volume injected: 0,3 µl
		Carrier gas flow rate: 1 ml/min
		Split ratio: 1/100

Figure A.2 — Typical chromatogram taken on a polar column

Annex B
(informative)

Flashpoint

B.1 General information

For safety reasons, transport companies, insurance companies, and people in charge of safety services require information on the flashpoints of essential oils, which in most cases are flammable products.

A comparative study on the relevant methods of analysis (see ISO/TR 11018) concluded that it was difficult to recommend a single apparatus for standardization purposes, given that:

— there is wide variation in the chemical composition of essential oils;

— the volume of the sample needed for certain requirements would be too costly for high-priced essential oils;

— as there are several different types of equipment which can be used for the determination, users cannot be expected to use one specified type only.

Consequently, it was decided to give a mean value for the flashpoint in an informative annex in each International Standard, for information, in order to meet the requirements of the interested parties.

The equipment with which this value was obtained should be specified.

For further information see ISO/TR 11018.

B.2 Flashpoint of the essential oil of sandalwood

The mean value is + 138 °C.

NOTE Obtained with “Luchaire” equipment.