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**Oil of sweet orange [*Citrus sinensis* (L.)  
Osbeck], obtained by mechanical  
treatment**

*Huile essentielle d'orange douce [*Citrus sinensis* (L.) Osbeck] obtenue  
par des procédés mécaniques*

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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 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 3140 was prepared by Technical Committee ISO/TC 54, *Essential oils*.

This third edition cancels and replaces the second edition (ISO 3140:1990), which has been technically revised.

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# Oil of sweet orange [*Citrus sinensis* (L.) Osbeck], obtained by mechanical treatment

## 1 Scope

This International Standard specifies certain characteristics of the oil of sweet orange [*Citrus sinensis* (L.) Osbeck], in order to facilitate assessment of its quality.

## 2 Normative references

The following referenced documents are indispensable for the application of this document. For dated references, only the edition cited applies. For undated references, the latest edition of the referenced document (including any amendments) applies.

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

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

ISO 212, *Essential oils — Sampling*

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

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

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

ISO 1271, *Essential oils — Determination of carbonyl value — Free hydroxylamine method*

ISO 4715, *Essential oils — Quantitative evaluation of residue on evaporation*

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

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

## 3 Terms and definitions

For the purposes of this document, the following terms and definitions apply.

### 3.1

#### oil of sweet orange

essential oil obtained without heating, by mechanical treatment, from the pericarp of the fruit of *Citrus sinensis* (L.) Osbeck and *djalonis* A. Chevalier, of the Rutaceae family

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

## 4 Requirements

### 4.1 Appearance

Clear mobile liquid.

### 4.2 Colour

Yellow to reddish yellow.

### 4.3 Odour

Characteristic, orange peel odour.

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

Minimum: 0,842 0

Maximum: 0,850 0

### 4.5 Refractive index at 20 °C

Minimum: 1,470 0

Maximum: 1,476 0

### 4.6 Optical rotation at 20 °C

Between +94° and +99°.

#### 4.7 Carbonyl compound content, expressed as decanal

Minimum: 1,1 %  
Maximum: 3,1 %

#### 4.8 Residue on evaporation

Minimum: 1,0 %  
Maximum: 3,0 %

#### 4.9 Chromatographic profile

Analysis of the essential oil shall be carried out by gas chromatography. In the chromatogram obtained, the representative and characteristic 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	Semitropical type (Brazil, Argentina, Florida)		Mediterranean type (California, France, Israel, Italy, Spain)	
	Minimum %	Maximum %	Minimum %	Maximum %
$\alpha$ -Pinene	0,4	0,8	0,4	0,8
$\beta$ -Pinene	0,02	0,15	0,02	0,15
Sabinene	0,2	0,5	0,2	0,5
Myrcene	1,5	3,5	1,5	3,5
Limonene <sup>a</sup>	93,0	96,0	93,0	96,0
<i>n</i> -Octanal	0,1	0,3	0,1	0,45
<i>n</i> -Nonanal	0,01	0,06	0,01	0,06
<i>n</i> -Decanal	0,1	0,6	0,2	0,7
Linalool	0,15	0,7	0,2	0,7
Neral	0,05	0,1	0,05	0,1
Valencene	0,01	0,3	0,03	0,4
Geranial	0,1	0,2	0,1	0,2
$\beta$ -Sinensal	0,01	0,05	0,02	0,06
$\alpha$ -Sinensal	0,01	0,04	0,02	0,05

NOTE The chromatographic profile is normative, contrary to typical chromatograms given for information in Annex A.

<sup>a</sup> The limonene found is regarded to be predominantly D-limonene based on the physical testing. It is believed that there might be a small amount of L-limonene present but the exact quantity is unknown.

**4.10 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 Carbonyl compound content, expressed as decanal**

See ISO 1271.

Test portion: 10 g

Standing time: 15 min

**6.5 Residue on evaporation**

See ISO 4715.

Test portion: 5 g

Evaporation time: 5 h

**6.6 Chromatographic profile**

See ISO 11024-1 and ISO 11024-2.

**7 Packaging, labelling, marking and storage**

See ISO/TR 210 and ISO/TR 211.

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**Annex A**  
(informative)

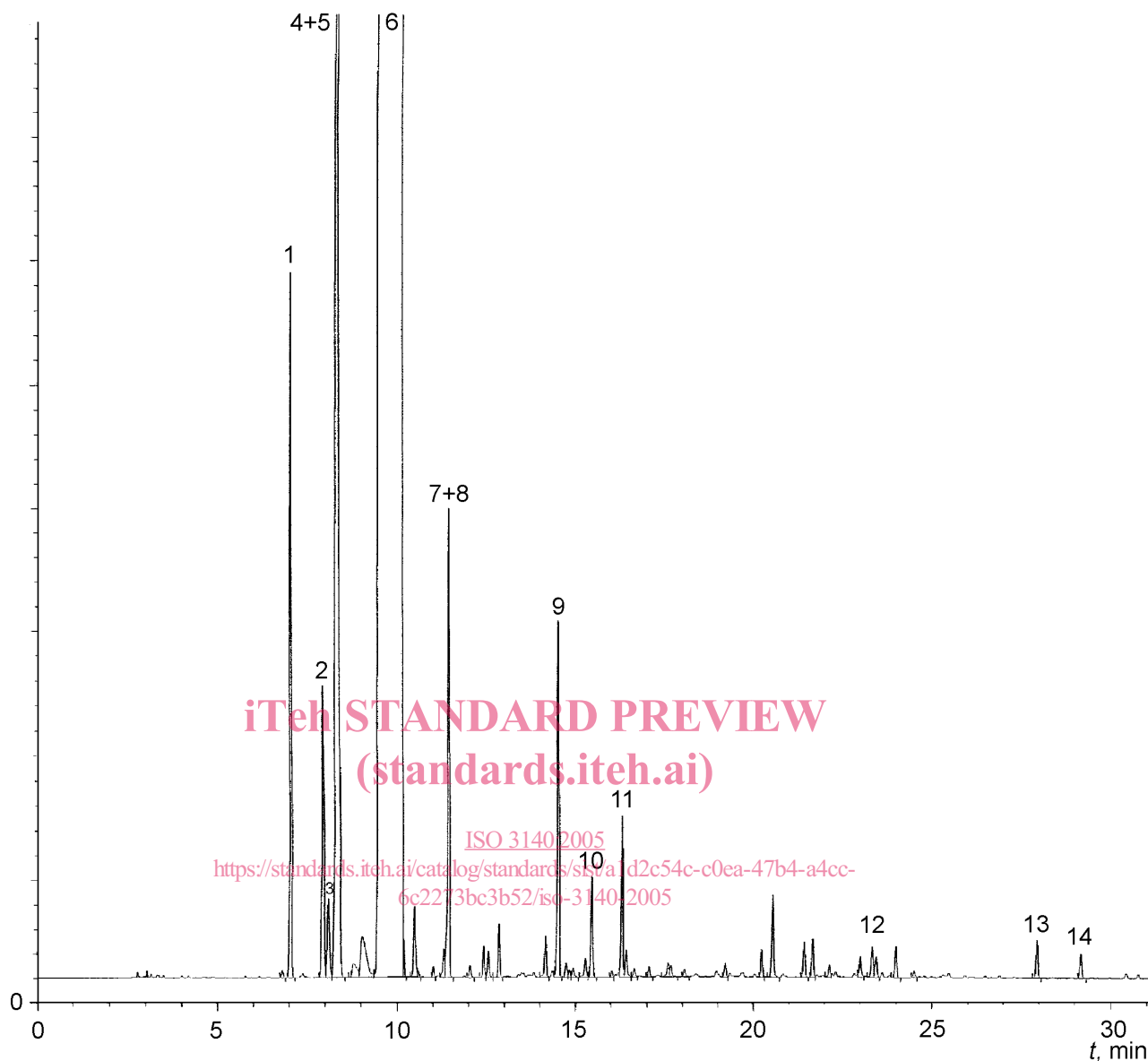
**Typical chromatograms of the analysis by gas chromatography of the essential oil of sweet orange [*Citrus sinensis* (L.) Osbeck], obtained by mechanical treatment**

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Peak identification		Operating conditions
1	$\alpha$ -Pinene	Column: fused silica capillary; length 30 m; internal diameter 0,2 mm
2	Sabinene	Stationary phase: poly(dimethyl siloxane) (SPS®)
3	$\beta$ -Pinene	Film thickness: 0,20 $\mu$ m
4	Myrcene	Oven temperature: isothermal at 80 °C for 4 min, then temperature programming from 80 °C to 250 °C at a rate of 5 °C/min, then isothermal at 250 °C for 10 min
5	<i>n</i> -Octanal	
6	Limonene	Injector temperature: 275 °C
7	<i>n</i> -Nonanal	Detector temperature: 300 °C
8	Linalool	Detector: flame ionization type
9	<i>n</i> -Decanal	Carrier gas: helium
10	Neral	Volume injected: 0,1 $\mu$ l
11	Geranial	Carrier gas flow rate: 0,3 ml/min
12	Valencene	Split ratio: 1/100
13	$\beta$ -Sinensal	
14	$\alpha$ -Sinensal	

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