

# INTERNATIONAL STANDARD

ISO  
856

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## Oil of peppermint (*Mentha × piperita* L.)

*Huile essentielle de menthe poivrée* (*Mentha × piperita* L.)

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Reference number  
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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 856 was prepared by Technical Committee ISO/TC 54, *Essential oils*.

This second edition cancels and replaces the first edition (ISO 856:1981), which has been technically revised.

# Oil of peppermint (*Mentha × piperita* L.)

## 1 Scope

This International Standard specifies certain characteristics of the oil of peppermint (*Mentha × piperita* L.), with a view to facilitate assessment of its quality.

**NOTE** As it is difficult to differentiate the specification of peppermint oils (*Mentha × piperita* L.) from different origins, they have been regrouped in this International Standard. The following origins have been taken into consideration: USA, United Kingdom, France, Italy, India and China.

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

ISO 1242, *Essential oils — Determination of acid value*

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 peppermint

essential oil obtained by steam distillation of the aerial parts of the plant *Mentha × piperita* L., of the Lamiaceae family

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

## 4 Requirements

### 4.1 Appearance

Clear, mobile liquid.

### 4.2 Colour

Almost colourless to pale greenish yellow.

### 4.3 Odour

Characteristic of mint, sweet and menthol-like, with some variations depending on the origin.

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

	Origins other than US	US type
Min.	0,898	0,899
Max.	0,918	0,911

### 4.5 Refractive index at 20 °C

Minimum: 1,459 0

Maximum: 1,465 0

#### 4.6 Optical rotation at 20 °C

Origins other than US	US type
-30° to -14°	-32° to -18°

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

For origins other than US, 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.

For the US type, it shall not be necessary to use more than 3 volumes of ethanol, 70 % (volume fraction), to obtain a clear solution with 1 volume of essential oil.

#### 4.8 Acid value

Maximum: 2

#### 4.9 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.

#### 4.10 Flashpoint

Information on the flashpoint is given in Annex B.

Table 1 — Chromatographic profile

Components	Origins other than US		US type	
	Min. (%)	Max. (%)	Min. (%)	Max. (%)
3-Octanol	0,1	0,5	0,1	0,4
1,8-Cineole	3,0	8,0	4,0	6,0
Limonene <sup>a</sup>	1,0	3,0	1,0	2,5
<i>trans</i> -Sabinene hydrate	0,5	2,0	0,5	2,3
Menthone	13,0	28,0	15,0	25,0
Isomenthone	2,0	8,0	2,0	4,5
Menthofuran	1,0	8,0	1,5	6,0
Neomenthol	2,0	6,0	2,5	4,5
Menthol	32,0	49,0	36,0	46,0
Pulegone	0,5	3	0,5	2,5
Methyl acetate <sup>b</sup>	2,0	8,0	3,0	6,5
β-Caryophyllene	1,0	3,5	1,0	2,5
NOTE The chromatographic profile is normative, contrary to typical chromatograms given for information in Annex A.				
<sup>a</sup> The limonene is regarded to be predominantly L-limonene based on the physical tests. It is believed that there might be a small amount of D-limonene present but the exact quantity is unknown.				
<sup>b</sup> The methyl acetate is regarded to be predominantly L-methyl acetate based on the physical tests. It is believed that there might be a small amount of D-methyl acetate present but the exact quantity is unknown.				

## 5 Sampling

See ISO 212.

Minimum volume of final 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 Acid value

See ISO 1242.

### 6.6 Chromatographic profile

See ISO 11024-1 and ISO 11024-2.

## 7 Packaging, labelling, marking and storage

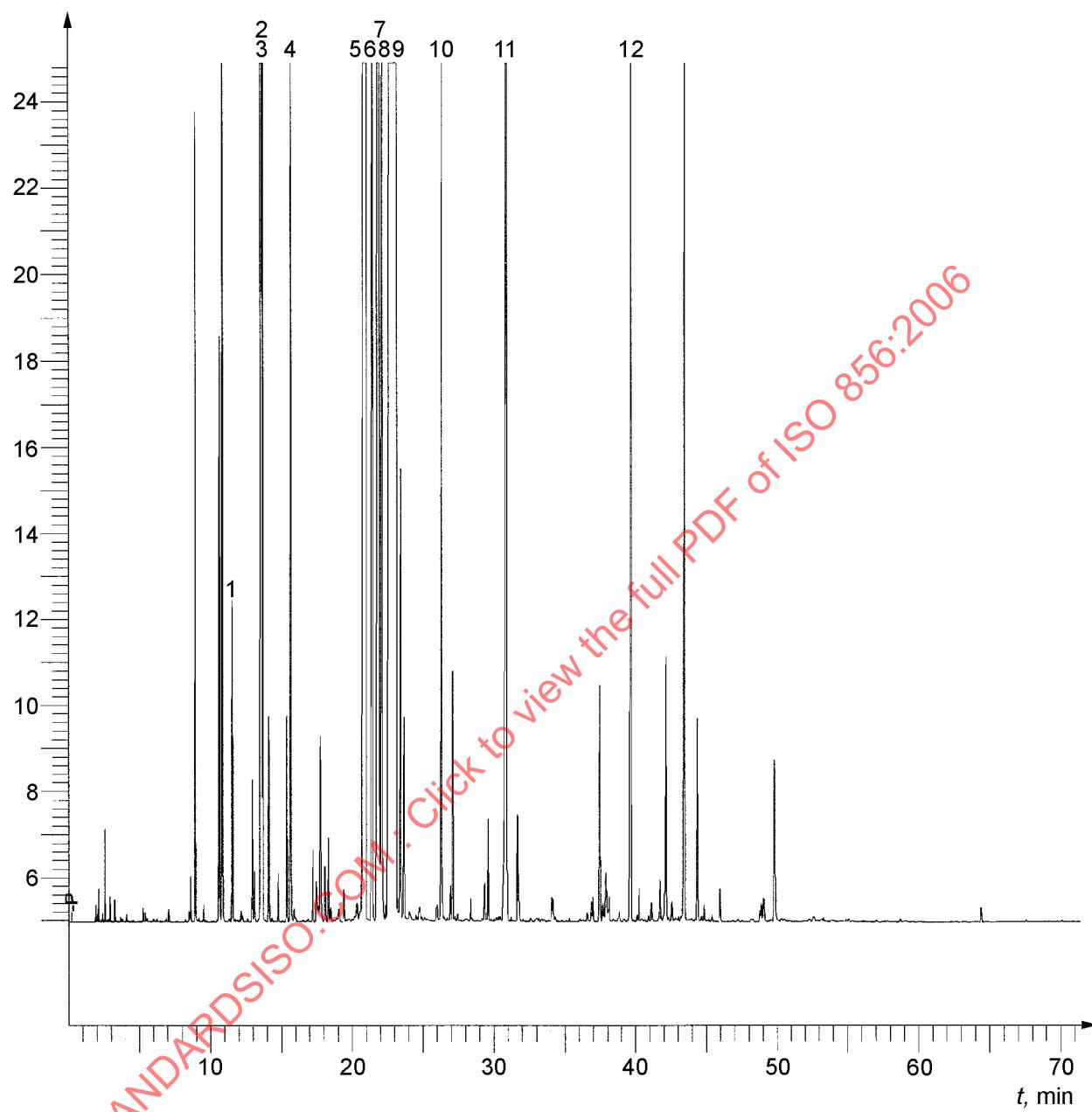
See ISO/TR 210 and ISO/TR 211.

**Annex A**  
(informative)

**Typical chromatograms of the analysis by gas chromatography of the oil of peppermint (*Mentha × piperita* L.)**

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### A.1 Typical chromatograms of the analysis of the oil of peppermint, France (Provence)



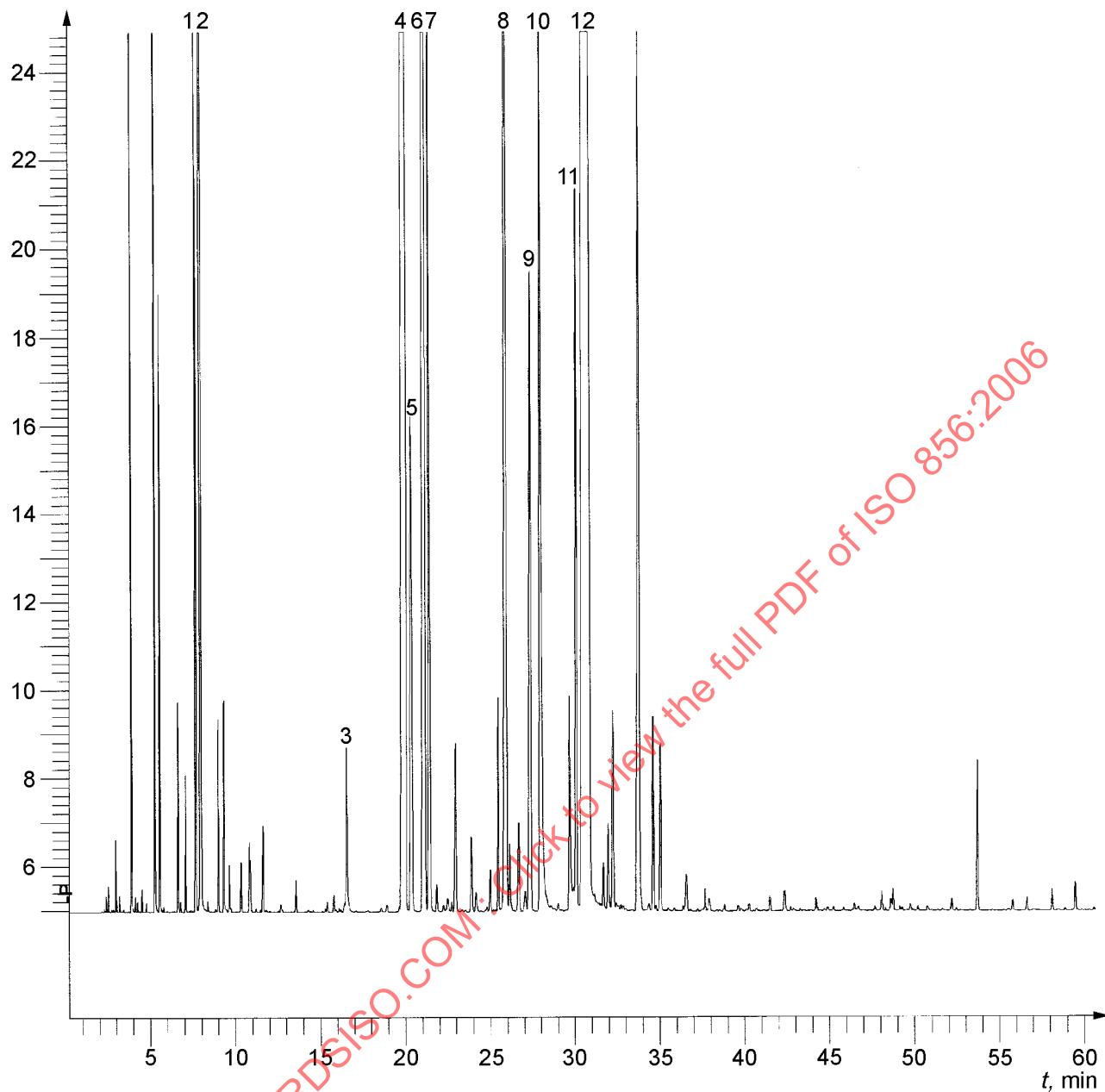
#### Peak identification

- 1 3-Octanol + myrcene
- 2 1,8-Cineole
- 3 Limonene
- 4 *trans*-Sabinene hydrate
- 5 Menthone
- 6 Isomenthone
- 7 Menthofuran
- 8 Neomenthol
- 9 Menthol
- 10 Pulegone
- 11 Menthyl acetate
- 12  $\beta$ -Caryophyllene

#### Operating conditions

- Column: silica capillary; length 50 m; internal diameter 0,2 mm
- Stationary phase: poly(dimethyl siloxane)
- Film thickness: 0,25  $\mu$ m
- Oven temperature: temperature programming from 65 °C to 230 °C at a rate of 2 °C/min
- Injector temperature: 230 °C
- Detector temperature: 250 °C
- Detector: flame ionization type
- Carrier gas: hydrogen
- Volume injected: 0,2  $\mu$ l
- Carrier gas flow rate: 1,1 ml/min
- Split ratio: 1/100

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

**Peak identification**

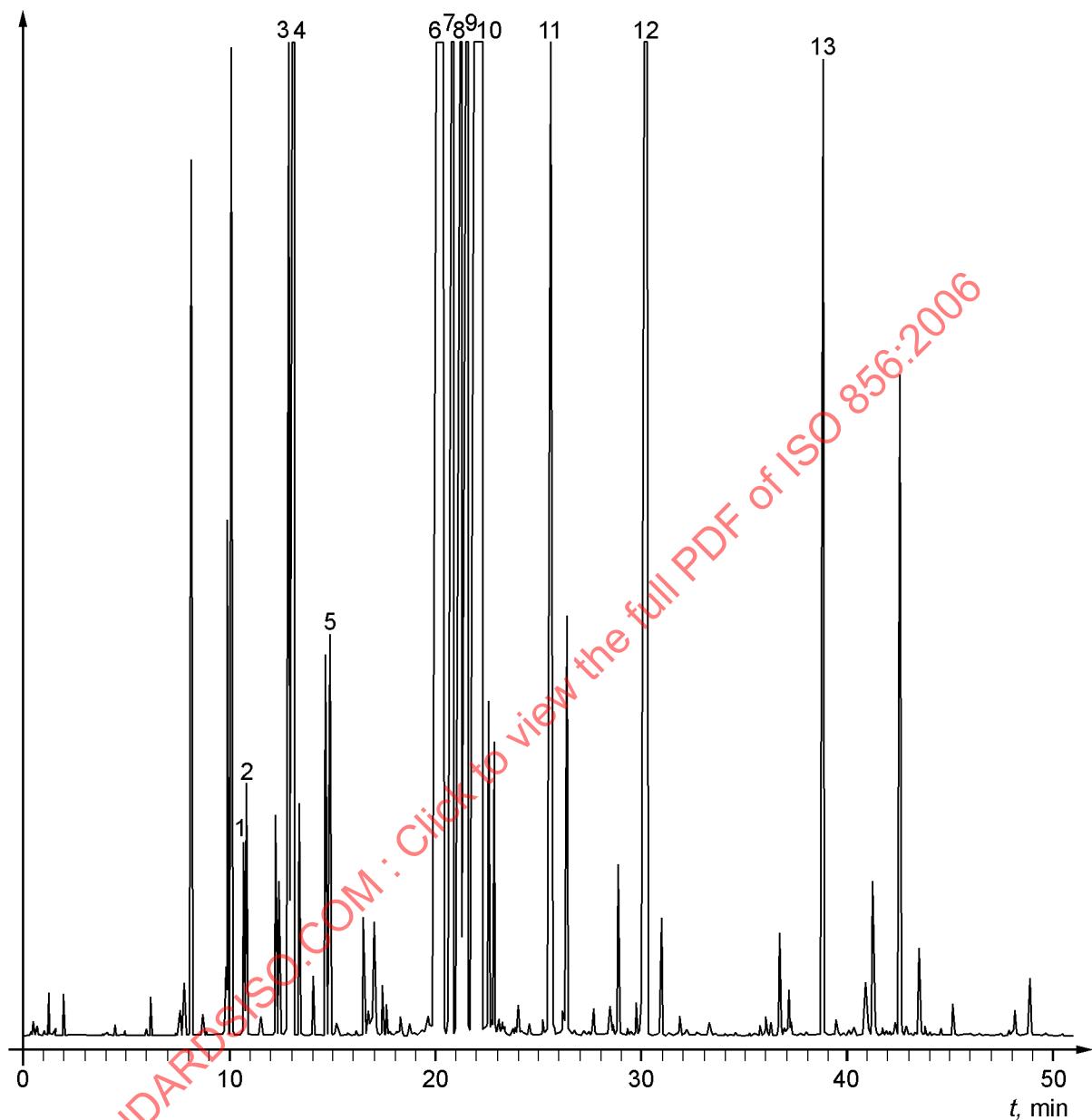
- 1 Limonene
- 2 1,8-Cineole
- 3 3-Octanol
- 4 Menthone
- 5 *trans*-Sabinene hydrate
- 6 Menthofuran
- 7 Isomenthone
- 8 Menthyl acetate
- 9  $\beta$ -Caryophyllene
- 10 Neomenthol + terpinen-4-ol
- 11 Pulegone
- 12 Menthol

**Operating conditions**

- Column: silica capillary; length 50 m; internal diameter 0,2 mm
- Stationary phase: poly(ethylene glycol) (Carbowax 20 M®)
- Film thickness: 0,25  $\mu$ m
- Oven temperature: temperature programming from 65 °C to 230 °C at a rate of 2 °C/min
- Injector temperature: 230 °C
- Detector temperature: 250 °C
- Detector: flame ionization type
- Carrier gas: hydrogen
- Volume injected: 0,2  $\mu$ l
- Carrier gas flow rate: 1,1 ml/min
- Split ratio: 1/100

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

## A.2 Typical chromatograms of the analysis of the oil of peppermint, India



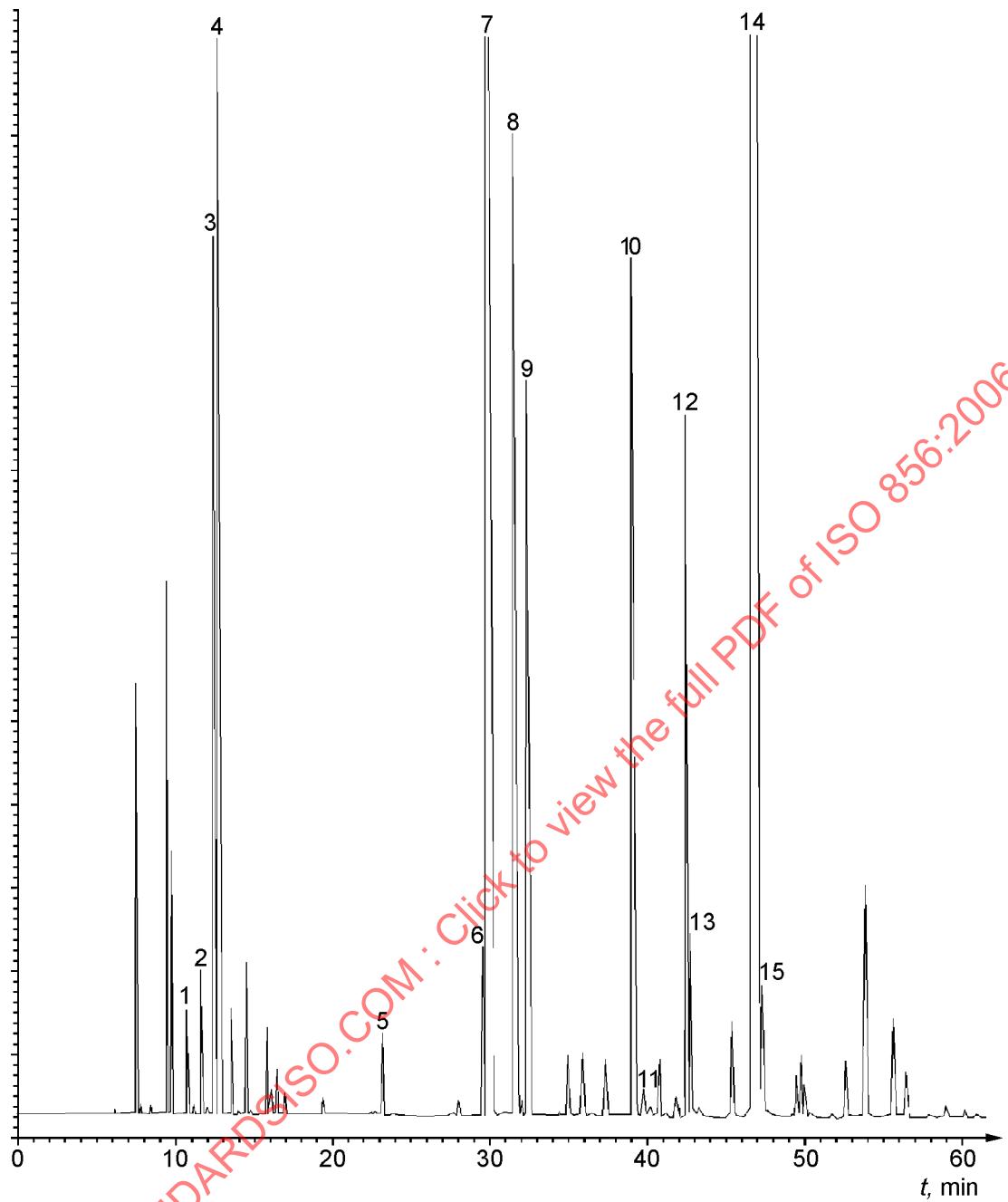
### Peak identification

- 1 3-Octanol
- 2 Myrcene
- 3 1,8-Cineole
- 4 Limonene
- 5 *trans*-Sabinene hydrate
- 6 Menthone
- 7 Isomenthone
- 8 Menthofuran
- 9 Neomenthol
- 10 Menthol
- 11 Pulegone
- 12 Menthyl acetate
- 13  $\beta$ -Caryophyllene

### Operating conditions

- Column: silica capillary; length 50 m; internal diameter 0,2 mm
- Stationary phase: poly(dimethyl siloxane)
- Film thickness: 0,25  $\mu$ m
- Oven temperature: temperature programming from 65 °C to 230 °C at a rate of 2 °C/min
- Injector temperature: 230 °C
- Detector temperature: 250 °C
- Detector: flame ionization type
- Carrier gas: hydrogen
- Volume injected: 0,2  $\mu$ l
- Carrier gas flow rate: 1,1 ml/min
- Split ratio: 1/100

**Figure A.3 — Typical chromatogram taken on an apolar column**

**Peak identification**

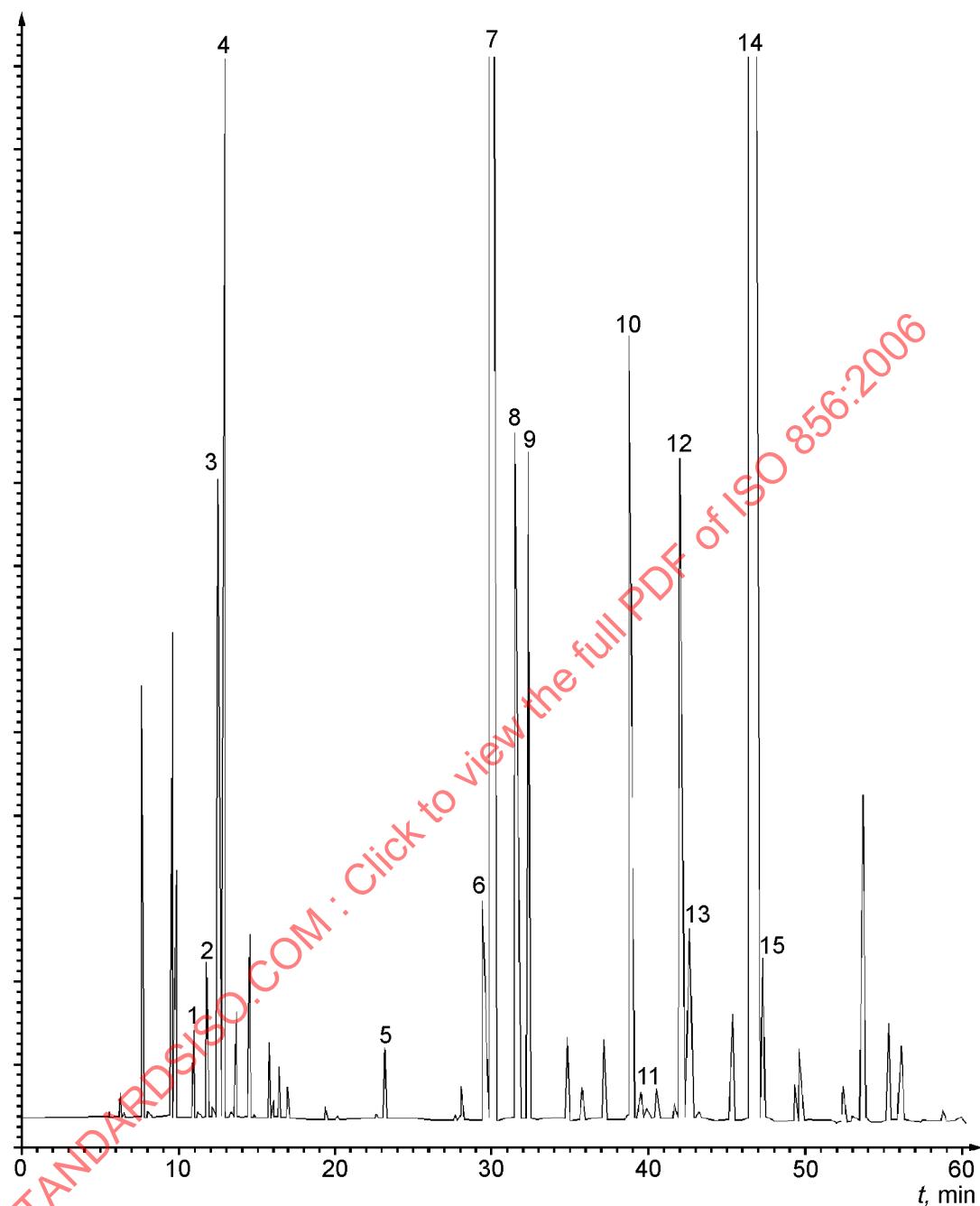
- 1 Myrcene
- 2  $\alpha$ -Terpinene
- 3 Limonene
- 4 1,8-Cineole
- 5 3-Octanol
- 6 *trans*-Sabinene hydrate
- 7 Menthone
- 8 Menthofuran
- 9 Isomenthone
- 10 Menthyl acetate
- 11 Isoneo-isopulegol
- 12 Neomenthol
- 13  $\beta$ -Caryophyllene
- 14 Menthol
- 15 Pulegone

**Operating conditions**

Column: silica capillary; length 60 m; internal diameter 0,2 mm  
 Stationary phase: poly(ethylene glycol) (Supelcowax 10®)  
 Film thickness: 0,20  $\mu$ m  
 Oven temperature: temperature programming from 80 °C to 180 °C at a rate of 1 °C/min  
 Injector temperature: 250 °C  
 Detector temperature: 250 °C  
 Detector: flame ionization type  
 Carrier gas: helium  
 Volume injected: 0,1  $\mu$ l  
 Carrier gas flow rate: 30 ml/min  
 Split ratio: 1/100

**Figure A.4 — Typical chromatogram taken on a polar column**

### A.3 Typical chromatogram of the analysis of the oil of peppermint, USA (Idaho)



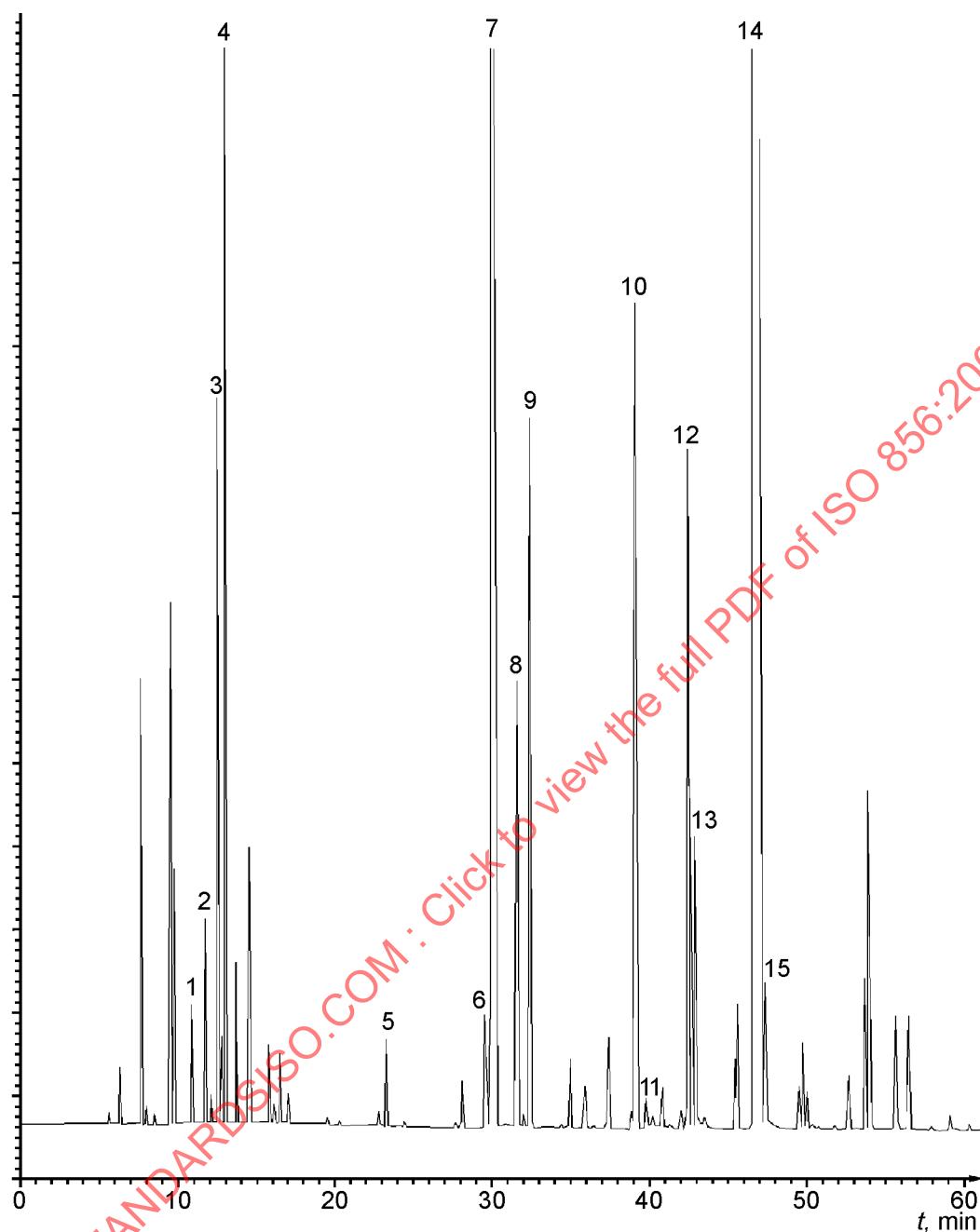
#### Peak identification

1	Myrcene
2	$\alpha$ -Terpinene
3	Limonene
4	1,8-Cineole
5	3-Octanol
6	<i>trans</i> -Sabinene hydrate
7	Menthone
8	Menthofuran
9	Isomenthone
10	Menthyl acetate
11	Isoneo-isopulegol
12	Neomenthol
13	$\beta$ -Caryophyllene
14	Menthol
15	Pulegone

#### Operating conditions

Column: silica capillary; length 60 m; internal diameter 0,2 mm
Stationary phase: poly(ethylene glycol) (Supelcowax 10®)
Film thickness: 0,20 $\mu$ m
Oven temperature: temperature programming from 80 °C to 180 °C at a rate of 1 °C/min
Injector temperature: 250 °C
Detector temperature: 250 °C
Detector: flame ionization type
Carrier gas: helium
Volume injected: 0,1 $\mu$ l
Carrier gas flow rate: 30 ml/min
Split ratio: 1/100

Figure A.5 — Typical chromatogram taken on a polar column

**A.4 Typical chromatogram of the analysis of the oil of peppermint, USA (Willamette)****Peak identification**

- 1 Myrcene
- 2  $\alpha$ -Terpinene
- 3 Limonene
- 4 1,8-Cineole
- 5 3-Octanol
- 6 *trans*-Sabinene hydrate
- 7 Menthone
- 8 Menthofuran
- 9 Isomenthone
- 10 Menthyl acetate
- 11 Isoneo-isopulegol
- 12 Neomenthol
- 13  $\beta$ -Caryophyllene
- 14 Menthol
- 15 Pulegone

**Operating conditions**

- Column: silica capillary; length 60 m; internal diameter 0,2 mm
- Stationary phase: poly(ethylene glycol) (Supelcowax 10®)
- Film thickness: 0,20  $\mu$ m
- Oven temperature: temperature programming from 80 °C to 180 °C at a rate of 1 °C/min
- Injector temperature: 250 °C
- Detector temperature: 250 °C
- Detector: flame ionization type
- Carrier gas: helium
- Volume injected: 0,1  $\mu$ l
- Carrier gas flow rate: 30 ml/min
- Split ratio: 1/100

**Figure A.6 — Typical chromatogram taken on a polar column**