

# Flavourings and Flavour Enhancers

## User guide

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## Background

**In this user guide, the ‘old Code’ means Volume 1 of the *Food Standards Code* (the *Australian Food Standards Code*). The ‘new Code’ means Volume 2 of the *Food Standards Code* (the *Australia New Zealand Food Standards Code*). The ‘New Zealand regulations’ means the *New Zealand Food Regulations 1984*.**

In adopting the new Code in November 2000, the Ministerial Council agreed to a two-year transition period. After this, the new Code will replace both the old Code and the New Zealand regulations.

During this two-year phase-in period, foods in Australia may comply with either the old Code or the new Code (but not a combination of these). In New Zealand, foods may comply with the old Code or the new Code or the New Zealand regulations (but not a combination of these).

It is anticipated that both the old Code and the New Zealand regulations will be repealed in December 2002, and then all food sold in Australia and New Zealand will have to comply with the new Code.

The new Code will mean changes in the way manufacturers and retailers make and present food for sale.

Food Standards Australia New Zealand has developed this user guide, in consultation with Australian and New Zealand government and industry representatives. It provides manufacturers, retailers and food officers with collated information from the standards in the new Code that are relevant to the regulation of flavourings and flavour enhancers. The guide also provides additional information to that contained in those standards.

This user guide, unlike the standards themselves, is not legally binding. If in any doubt about interpreting the standards, you should seek independent legal advice.

As well as complying with food standards requirements, you must also continue to comply with other legislation. In Australia, this legislation includes the *Trade Practices Act 1974*, the *Imported Food Control Act 1992* and State and Territory Fair Trading Acts and Food Acts. In New Zealand, this legislation includes the *Food Act 1981* and *Fair Trading Act 1986*.

## Purpose

This user guide is intended to help manufacturers and other users identify, interpret and apply information relevant to flavourings and flavour enhancers contained in the new Code. The guide explains:

- how the new Code differs from previous regulations with regard to flavourings and flavour enhancers; and
- where and how flavourings and flavour enhancers are regulated in the new Code.

## What has changed?

Both the old Code and the New Zealand regulations included definitions for natural, nature-identical, artificial flavouring substances and flavour enhancers. Because existing provisions in State, Territory and New Zealand Food Acts and Fair Trading Acts adequately regulate representations about food, including representations made about flavourings and flavour

enhancers (e.g., ‘natural’, ‘nature-identical’, ‘artificial’), specific definitions are not included in the new Code. The new Code regulates these substances in a less prescriptive way, as part of the general standard on food additives, namely Standard 1.3.1 – Food Additives and Standard 1.2.4 – Labelling of Ingredients.

The move to include regulations for food additives in a general standard is consistent with international standards, including those of the Codex Alimentarius Commission. Codex has not yet considered the regulation of flavourings in the draft General Standard for Food Additives. Australia and New Zealand are members of this commission, which was established in 1962 by the World Health Organization and the Food and Agriculture Organization of the United Nations. Its purpose is to develop international food standards to protect consumer health and to facilitate fair-trading practices in foods.

Refer to Food Standards Australia New Zealand’s user guide on food additives for specific information about food additives.

## Standards relevant to flavourings and flavouring enhancers

Several standards within the new Code are particularly relevant to flavourings and flavour enhancers. These standards are:

- **Standard 1.2.4 – Labelling of Ingredients**, which sets out specific requirements for the labelling and naming of products containing flavourings and flavour enhancers.
- **Standard 1.3.1 – Food Additives**, which-
  - defines the technological functions of flavourings and flavour enhancers,
  - lists references for permitted synthetic flavourings, and
  - provides permissions for additives used in preparations of food additives.
- **Standard 1.3.3 – Processing Aids**, which-
  - defines the use of processing aids in food manufacture, prohibiting their use unless specific permission is provided within this standard
  - lists permitted solvents, carriers and diluents used in flavourings.
- **Standard 1.3.4 – Identity and Purity**, which provides specifications and approved references to specifications of food additives, processing aids, vitamins and minerals and other added nutrients, that may be added to food in accordance with the new Code.
- **Standard 1.4.1 – Contaminants and Natural Toxicants**, which sets out the maximum levels of metal and non-metal contaminants and natural toxicants permitted in foods, from the addition of flavouring substances.
- **Standard 1.4.4 – Prohibited and Restricted Plants and Fungi**, which lists species of plants and fungi that may not be used in food except as a source of a flavouring substance (subject to the requirements of Standard 1.4.1).

## What are flavourings and flavour enhancers?

Schedule 5 of Standard 1.3.1 – Food Additives lists the range of technological functions that permitted food additives may perform. The list includes separate definitions for the functional classes ‘flavouring’, ‘flavour enhancer’ and ‘intense sweetener’.

Schedule 5 defines ‘flavour enhancer, flavour modifier, tenderiser’ as a substance that:  
*enhances the existing taste and/or odour of a food.*

Schedule 5 of Standard 1.3.1 – Food Additives defines ‘flavouring’ (excluding herbs and spices and intense sweeteners) as:

*intense preparations which are added to foods to impart taste and/or odour, which are used in small amounts and are not intended to be consumed alone, but do not include herbs, spices and substances which have an exclusively sweet, sour or salt taste.*

Herbs and spices are not usually considered to be flavourings and they are covered by Standard 2.3.1 – Fruits and Vegetables.

Intense sweeteners are treated separately from flavourings and flavour enhancers within Standard 1.3.1. Clause 4 of Standard 1.3.1 contains requirements for the use of intense sweeteners.

## **Classification**

Both the old Code and the New Zealand regulations classified flavourings as either natural or nature-identical. This classification has also traditionally been used in European countries. In contrast, the categorisation distinction used in North America is natural and synthetic (which includes both artificial and nature-identical flavourings classifications).

The following paragraphs set out the distinctions between natural, nature-identical and artificial flavourings, which are only meant to be a guide when assessing the representations made about the types of flavouring used in a food.

Refer to Food Standards Australia New Zealand’s user guide on Representations about Food for further information on labelling requirements for flavourings.

### ***Natural flavouring substances***

Natural flavouring substances means flavouring substances obtained from plant or animal raw materials, by physical, microbiological or enzymatic processes. They can be either used in their natural state or processed for human consumption, but cannot contain any nature-identical or artificial flavouring substances.

### ***Nature-identical flavouring substances***

Nature-identical substances means flavouring substances that are obtained by synthesis or isolated through chemical processes, which are chemically identical to flavouring substances naturally present in products intended for human consumption. They cannot contain any artificial flavouring substances.

### ***Artificial flavouring substances***

Artificial flavouring substances means flavouring substances not identified in a natural product intended for human consumption, whether or not the product is processed.

**EXAMPLE**

A strawberry-flavoured milk drink could contain:

- **natural** flavouring substances, whether derived from strawberries or not;
- a **nature-identical** flavouring substance that has been synthesised, but is chemically identical to a substance found in nature, or
- an **artificial** flavour, that has been synthesised and has not yet been identified in any natural product.

***Smoke flavouring substances***

Smoke flavouring is a natural flavouring concentrate obtained by subjecting untreated and uncontaminated hardwood, including sawdust and woody plants, to one or more of the following processes (controlled burning, dry distillation at appropriate temperatures and/or treatment with superheated steam) and obtaining fractions which have the desired flavour potential.

**Permitted flavouring substances**

Clause 11 of Standard 1.3.1 – Food Additives provide permissions for the permitted flavouring substances, that may be added to food.

To assist manufacturers, the Flavour and Fragrance Association of Australia and New Zealand (FFAANZ) compiled a list of artificial flavouring substances, which is included in the Attachment to this guide.

This list will require updating as new artificial flavouring substances are approved by the organizations specified or if substances on the list are identified as occurring in natural products.

**Preparations of food additives**

Standard 1.3.1 – Food Additives specifies the food additives and the maximum permitted levels, at which they can be included in preparations of food additives, such as flavourings (see Schedule 1, Item 0.1 of the Standard). In some cases, the maximum level of food additive permitted is listed as GMP (determined by good manufacturing practice). The use of GMP is intended to promote innovation by manufacturers and increase consumer choice by minimising restrictions on the use of those additives, where dietary exposure estimates have indicated no public health and safety concerns. A specific maximum level is prescribed only where restrictions on the use of an additive are necessary to ensure public health and safety.

Preparations of food additives are sometimes sold as such in supermarkets. In this case, the additives present must be listed on the label of the packaged product. However, most food additive preparations are used for further manufacturing by the food industry.

For flavouring preparations sold by retail, the carriers, diluents, solvents and other additives present in the flavouring product are required to be declared as ingredients on the label if they are performing a technological function in that food (i.e. they are acting as food additives not present as processing aids). Technological functions, which may be performed by food additives, are listed in Schedule 5 of Standard 1.3.1.

The substances present in flavourings sold to be used in food processing are usually considered to be processing aids, because the additives usually perform no technological function in the final product.

*Processing aids are substances used in the processing of raw materials, foods or ingredients, to fulfil a technological purpose relating to treatment or processing, but do not perform a technological function in the final food.* (Refer to later section on processing aids).

Flavouring preparations, sold as such, are usually present as minor constituents in prepared foods.

Refer to the user guide on food additives for further information on GMP and how safety assessments for food additives are carried out.

## **Labelling of flavourings and flavour enhancers**

Labelling of foods containing flavourings and flavour enhancers is covered by Standard 1.2.4 – Labelling of Ingredients. Clause 8 of this Standard, ‘Declaration of food additives’, includes subclauses that relate to flavourings and flavour enhancers, some of which are explained in more detail below.

Subclause 6 of clause 8 provides that a food containing a flavouring must be labelled either with the word ‘flavouring’ or ‘flavour’, or with a specific name or description of the flavouring. It would neither be realistic to require, nor meaningful to consumers to be provided with, the chemical names of the individual flavouring substances present, even if they could all be identified. An apple for example contains over 1000 natural flavouring substances.

Subclause 8(2) of Standard 1.2.4 requires that if an additive can be classified in one of the classes listed in Schedule 1 then the additive must be declared by the name of the class followed by the additive’s specific name or code number in brackets. Flavour enhancer is such a class.

### **EXAMPLES**

The list of ingredients on a tub of vanilla ice cream could include the flavouring by name as ‘vanilla’, or by its technical function as ‘flavouring’ or ‘flavour’.

A product containing ethyl maltol as a flavour enhancer or as a flavouring, should be labelled depending on how it is believed to be acting. If it is acting as a flavour enhancer it can be declared in the ingredient list as either ‘flavour enhancer (ethyl maltol)’, or by its International Numbering System (INS) number as ‘flavour enhancer (637)’.

If it is believed that ethyl maltol is acting as a flavouring then it can be labelled by its technical function as ‘flavouring’ or ‘flavour’ or its name ‘ethyl maltol’.

Exceptions to subclause 6 are provided by the flavouring substances caffeine and quinine. Subclause 9 of clause 8 provides that caffeine must be declared in the ingredient list, not simply described as ‘flavouring’. The Table to clause 2 of Standard 1.2.3 – Mandatory Warning and Advisory Statements and Declarations also requires that foods containing quinine must also carry a statement to the effect that the product contains quinine.

Subclause 7 of clause 8, requires certain flavourings and flavour enhancers (eg, nucleotides and monosodium glutamate (MSG)) to be identified in an ingredient list, by name or INS number, irrespective of the technological function they perform in the final food. The aim is to ensure that consumers are informed that foods contain these particular substances.

#### **EXAMPLE**

The list of ingredients on a frozen chicken curry containing monosodium glutamate acting as a flavour enhancer need to be declared as ‘flavour enhancer (MSG)’ or ‘flavour enhancer (621)’. Monosodium glutamate cannot be declared by technical function alone as ‘flavouring’, ‘flavour’ or ‘flavour enhancer’.

If it was believed that MSG was acting as a flavouring it would need to be declared by its name (‘monosodium glutamate’ or ‘MSG’) or its INS number ‘621’, but again it could not be labelled as ‘flavouring’ or ‘flavour’.

Refer to Food Standards Australia New Zealand’s user guides on ingredient labelling and on food additives for further information about how to label food additives.

### **Processing aids**

The table to clause 10 of Standard 1.3.3 – Processing Aids lists permitted carriers, solvents and diluents and gives the maximum levels, at which they can be added to foods.

Carriers, solvents and diluents may be considered as processing aids if they are used in flavourings that are used as minor components of other foods and meet the definition of a processing aid (refer to earlier section ‘Preparations of food additives’) in the application for which they are being used.

Processing aids do not need to be listed in the list of ingredients (clause 3 (d) of Standard 1.2.4). However allergen labelling is still required for processing aids if they are present in the final food and are derived from the named allergens (Table to clause 4 of Standard 1.2.3).

### **Natural toxicants**

Some common flavourings may contain substances that can be toxic if consumed in excess. The levels of these substances in foods usually remain well below toxic levels and the flavourings containing them are themselves, mostly used in very small quantities. To guard against unsafe levels of toxicants, some maximum levels are specifically listed in the Code.

Standard 1.4.1 – Contaminants and Natural Toxicants, covers natural toxicants that can be present in foods as a result of the use of flavouring agents or from other sources in certain foods. Clause 4 of this Standard contains a table listing certain natural toxicants which can result in foods from the use of flavourings, the foods these substances can be present in or added to, and the maximum level of natural toxicant permitted.

When one or more component of a mixed food contains natural toxicants, these can be carried over into the final mixed food product. A mixed food is one that is prepared from other foods (eg cheese coated with nuts, battered fish, pizza). Clause 1(6) of Standard 1.4.1 gives a formula for calculating how much of a natural toxicant may be present in a mixed food from the addition of a flavouring substance.

Standard 1.4.4 – Prohibited and Restricted Plants and Fungi, lists prohibited plants and fungi (the species that must not be added to food or offered for sale as food) and restricted plants and fungi (species that may not be used in food except as a source of a flavouring substance).

A flavouring substance derived from a restricted plant or fungus may only be added to a food if it meets the requirements relative to natural toxicants and flavourings, in Standard 1.4.1, as described above. That is, the level of use must be below the level that is known to cause a health concern.

### **Where can I get more information?**

For more information on the new standards call the:

**Standards Information Unit**

**1300 652 166** (Australia)

**0800 441 571** (New Zealand), or

**Email:** [advice@foodstandards.gov.au](mailto:advice@foodstandards.gov.au)

### **See also**

Food Standards Australia New Zealand's user guides on:

- Food Additives
- Ingredient Labelling

## Attachment – Artificial Flavouring Substances

(the Flavour and Fragrance Association of Australia and New Zealand prepared this list)

### ARTIFICIAL FLAVOURING SUBSTANCES

	FEMA No	C of E No	21CFR reference
Acetaldehyde benzyl β-methoxyethyl acetal (Benzyl methoxyethyl acetal)	2148	523	172.515
Acetaldehyde butyl phenethyl acetal	3125	10007	
Acetaldehyde phenethyl propyl acetal	2004	511	172.515
4-(p-Acetoxyphenyl)-2-butanone	3652		
4-Acetyl-6-t-butyl-1,1-dimethylindane	3653		
3-Acetyl-2,5-dimethylfuran	3391	10921	
Acetyl nonanoyl (2,3-Undecadione) (Acetyl nonyryl)	3090	155	172.515
Allyl acetic acid (4-Pentenoic acid)	2843	2004	172.515
Allyl anthranilate	2020	254	172.515
Allyl butyrate	2021	280	172.515
Allyl cinnamate	2022	334	172.515
Allyl cyclohexylacetate	2023	2070	172.515
Allyl cyclohexylbutyrate	2024	283	172.515
Allyl cyclohexylhexanoate	2025	2180	172.515
Allyl cyclohexylpropionate	2026	2223	172.515
Allyl cyclohexylvalerate	2027	474	172.515
Allyl 2-ethylbutyrate	2029	281	172.515
Allyl heptanoate	2031	369	
Allyl α-ionone	2033	2040	172.515
Allyl isovalerate	2045	2098	172.515
Allyl nonanoate	2036	390	172.515
Allyl octanoate	2037	400	172.515
Allyl phenoxyacetate	2038	228	172.515
Allyl phenylacetate	2039	2162	172.515
Allyl propionate	2040	2094	172.515
Allyl sorbate	2041	2182	172.515
Allyl thiopropionate	3329	11436	
Allyl tiglate	2043	2183	172.515
Allyl 10-undecenoate	2044	441	172.515
α-Amylcinnamaldehyde dimethyl acetal	2062	47	172.515
α-Amylcinnamyl acetate	2064	216	172.515
α-Amylcinnamyl alcohol	2065	79	172.515
α-Amylcinnamyl formate	2066	357	172.515
α-Amylcinnamyl isovalerate	2067	463	172.515
2-Amyl-5 or 6-keto-1,4-dioxane	2076	2205	
Anisylacetone (4-(p-Methoxyphenyl) butan-2-one)	2672	163	172.515
Anisyl phenylacetate	3740	233	172.515
Benzaldehyde glyceryl acetal	2129	36	172.515
Benzaldehyde propylene glycol acetal	2130	2226	172.515
2-Benzofurancarboxyaldehyde	3128	2247	
Benzoin	2132	162	172.515
Benzyl butyl ether (Butyl benzyl ether)	2139	520	172.515
Benzyl 2,3-dimethylcrotonate	2143	11868	172.515

	<b>FEMA No</b>	<b>C of E No</b>	<b>21CFR reference</b>
(Benzyl methylglutamate)			
3- Benzyl-4-heptanone (Benzyl dipropyl ketone)	2146	2140	172.515
Benzylidene methional (2-(Methylthiomethyl)-3-phenylpropenal)	3717		
Benzylidene methyl acetone (3-Methyl-4-phenyl-3-butene-2-one)	2734	161	172.515
Benzyl isobutyl carbinol (Isobutyl benzyl carbinol) ( $\alpha$ -Isobutylphenethyl alcohol)	2208	2031	172.515
Benzyl isobutyl ketone (4-Methyl-1-phenyl-2-pentanone)	2740	159	172.515
Benzyl isoeugenyl ether (Isoeugenyl benzyl ether) (Benzyl isoeugenol)	3698	522	172.515
Benzyl propyl carbinol ( $\alpha$ -Propylphenethyl alcohol) (1-Phenyl-2-pentanol)	2953	83	172.515
Bis (2,5-dimethyl-3-furyl) disulfide	3476	722	
Bis (2-methyl-3-furyl) tetrasulfide	3260	724	
1,2-Butanedithiol	3528	11909	
1,3-Butanedithiol	3529	11910	
2,3-Butanedithiol	3477	725	
Butyl acetoacetate	2176	241	172.515
Butyl anthranilate	2181	252	172.515
2-Butyl-2-butenal	3392	10324	
Butyl butyryllactate	2190	2107	172.515
$\alpha$ -Butylcinnamaldehyde	2191	127	172.515
2-sec-Butylcyclohexanone	3261	11044	
Butyl 2-decenoate	2194	2100	172.515
2-(2-Butyl)-4,5-dimethyl-3-thiazoline	3619		
Butyl ethyl malonate	2195	384	172.515
2-Butyl-5 or 6-keto-1,4-dioxane	2204	2206	
Butyl levulinate	2207	374	172.515
Butyl 10-undecenoate	2216	2103	172.515
Carvacryl ethyl ether	2246	11840	172.515
Carvyl propionate	2251	424	172.515
Caryophyllene alcohol acetate			172.515
Cedryl acetate		527	
Cinnamaldehyde ethylene glycol acetal	2287	48	172.515
Cinnamyl phenylacetate	2300	235	172.515
Citral diethyl acetal	2304	38	172.515
Citral dimethyl acetal	2305	39	172.515
Citral propylene glycol acetal		2343	172.515
Citronellyl oxyacetaldehyde (Citronelloxyacetaldehyde)	2310	2012	172.515
Citronellyl phenylacetate	2315	2157	172.515
Cyclamen aldehyde (2-Methyl-3-(p-isopropylphenyl) propionaldehyde)	2743	133	172.515
Cyclohexanecarboxylic acid	3531	11911	
Cyclohexylacetic acid (Cyclohexaneacetic acid)	2347	34	172.515
Cyclohexyl anthranilate	2350	257	172.515
Cyclohexyl cinnamate	2352	337	172.515
Cyclohexyl formate	2353	498	172.515
Cyclohexyl hexanoate		528	

	FEMA No	C of E No	21CFR reference
Cyclohexyl isovalerate	2355	459	172.515
Cyclohexylmethyl pyrazine	3631		
Cyclohexyl propionate	2354	421	172.515
Cyclopentanethiol	3262	2321	
δ-Damascone	3622		
ε-Decalactone	3613		
Decanal dimethyl acetal	2363	43	172.515
5- and 6-Decenoic acid	3742		
Dehydrodihydroionol	3446	10195	
Dehydrodihydroionone	3447	11057	
Dibenzyl ether	2371	11856	172.515
Dibenzyl ketone (1,3-Diphenyl-2-propanone)	2397	11839	172.515
Di-(butan-3-one-1-yl) sulfide	3335	11441	
4,4-Dibutyl-γ-butyrolactone	2372	2231	172.515
Dibutyl sebacate	2373	622	172.515
Dicyclohexyl disulfide	3448	2320	
1,2-Di((1'-ethoxy) ethoxy) propane	3534		
Diethyl sebacate	2376	623	172.515
5,7-Dihydro-2-methylthieno (3,4-d) pyrimidine	3338	720	
2,4-Dimethyl-5-acetylthiazole	3267	2336	
2,5-Dimethyl-2,5-dihydroxy-1,4-dithiane	3450	2322	
4,5-Dimethyl-2-ethyl-3-thiazoline	3620		
2,5-Dimethyl-3-furanthiol	3451	11457	
2,6-Dimethyl-6-hepten-1-ol	3663		
2,6-Dimethyl-3-((2-methyl-3-furyl) thio)-4-heptanone	3538	11915	
3,7-Dimethyl-2,6-octadienyl 2-ethylbutyrate	3339		
2,6-Dimethyloctanal	2390	112	172.515
2,4-Dimethyl-2-pentenoic acid	3143	744	
α,α-Dimethylphenethyl acetate (Dimethylbenzyl carbonyl acetate)	2392	2077	172.515
α,α-Dimethylphenethyl butyrate (Dimethylbenzyl carbonyl butyrate)	2394	2084	172.515
α,α-Dimethylphenethyl formate	2395	353	172.515
Dimethyl phenyl carbonyl isobutyrate (α,α-Dimethylbenzyl isobutyrate)	2388	11828	172.515
Dimethyl phenylethyl carbonyl acetate (2-Methyl-4-phenyl-2-butyl acetate)	2735	219	172.515
Dimethyl phenylethyl carbonyl isobutyrate (2-Methyl-4-phenyl-2-butyl isobutyrate)	2736	2086	172.515
2,5-Dimethyl-3-thiofuroylfuran	3481	2323	
2,5-Dimethyl-3-thioisovaleryl furan	3482	2324	
Diphenyl disulfide	3225	11757	
Spiro (2,4-Dithia-1-methyl-8-oxabicyclo (3.3.0) octane-3,3'-(1'-oxa-2'-methyl)-cyclopentane)	3270	2335	
2,2'-Dithiodithiophene (2-Thienyl disulfide)	3323	2333	
Dodeca-3,6-dienal		2121	
ε-Dodecalactone	3610		
o-(Ethoxymethyl) phenol	3485	11905	
2-Ethoxythiazole	3340	11611	
Ethyl-2-acetyl-3-phenylpropionate	2416	2241	172.515
Ethyl aconitate	2417	11845	172.515
Ethyl benzoylacetate	2423	627	172.515
α-Ethylbenzyl butyrate	2424	628	172.515
2-Ethylbutyl acetate	2425	215	172.515

	<b>FEMA No</b>	<b>C of E No</b>	<b>21CFR reference</b>
Ethyl cresoxyacetate (Ethyl (p-tolyloxy) acetate)	3157	2243	
Ethyl cyclohexylpropionate	2431	2095	172.515
Ethyl 2,4-dioxohexanoate	3278	11903	
Ethylene glycol tridecanedioic acid cyclic diester (Ethylene brassylate) (Ethyl brassylate)	3543	10571	172.515
Ethyl N-ethylanthranilate		629	
Ethyl 2-ethyl-3-phenylpropanoate	3341	10587	
Ethyl 3-(furfurylthio) propionate	3674		
2-Ethyl-2-heptenal	2438	120	172.515
1-Ethylhexyl tiglate	3676		
Ethyl isoeugenyl ether (Isoeugenyl ethyl ether)	2472	190	172.515
N-Ethyl-2-isopropyl-5-methyl-cyclohexane carboxamide	3455	2298	
Ethyl maltol	3487	692	172.515
Ethyl 2-methyl-3,4-pentadienoate	3678		
Ethyl 2-methylpentanoate	3488	10616	
Ethyl 2-methyl-3-pentenoate	3456	10612	
Ethyl 2-methyl-4-pentenoate	3489	10613	
Ethyl methylphenylglycidate	2444	11949	182.60
Ethyl 4-(methylthio)-butyrate	3681		
Ethyl methyl-p-tolylglycidate	3757		
Ethyl nitrite	2446	11869	172.515
Ethyl octine carbonate (Ethyl 2-nonynoate)	2448	480	172.515
Ethyl 3-oxohexanoate	3683		
Ethyl 4-phenylbutyrate	2453	307	172.515
Ethyl phenylglycidate (Ethyl 3-phenylglycidate)	2454	11844	172.515
2-Ethylthiophenol	3345	11666	
2-Ethyl-1,3,3-trimethyl-2-norbornanol	3491	10208	
Ethyl 10-undecenoate	2461		172.515
Ethyl vanillin	2464	108	182.60
Ethyl vanillin $\beta$ -D-glucopyranoside	3801		
Eugenyl formate	2473	355	172.515
2-Furanmethanethiol formate	3158	11770	
2-Furfurylidene butanal (2-Furfurylidene butyraldehyde)	2492	11885	
Furfuryl isopropyl sulfide	3161	2248	
$\alpha$ - Furfuryl octanoate	3396	10645	
Furfuryl thiopropionate	3347	11484	
Geranyl acetoacetate	2510	243	172.515
Geranyl phenylacetate	2516	231	172.515
Glucose pentaacetate	2524		172.515
Glyceryl 5-hydroxydecanoate	3685	10648	
Glyceryl 5-hydroxydodecanoate	3686	10649	
Glyceryl tripropanoate	3286		
Guaiacyl phenylacetate	2535	238	172.515
Heptanal dimethyl acetal	2541	2015	172.515
Heptanal glyceryl acetal	2542	2016	172.515
4-Heptenal diethyl acetal	3349	10011	
trans-3-Heptenyl acetate	3493	10662	
trans-3-Heptenyl isobutyrate (trans-3-Heptenyl-2-methylpropanoate)	3494	10663	
Heptyl cinnamate	2551	2104	172.515

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3-Heptyl-5-methyl-2(3H)-furanone	3350	10953	
Hexyl 2-furoate	2571	361	
2-Hexylidene cyclopentanone	2573	167	172.515
Hexyl 2-methyl-3 and 4-pentenoate	3693		
Hydroquinone monoethyl ether	3695	2258	
Hydroxycitronellal	2583	100	172.515
Hydroxycitronellal diethyl acetal	2584	44	172.515
Hydroxycitronellal dimethyl acetal	2585	45	172.515
3-(Hydroxymethyl)-2-octanone	3292	11113	
5-Hydroxy-8-undecenoic acid $\delta$ -lactone	3758	11198	
Isoamyl acetoacetate	3551	227	172.515
Isoamyl furylbutyrate (Isoamyl 4(2-furan) butyrate) (Isoamyl 2-furanbutyrate)	2070	2080	172.515
Isoamyl furylpropionate (Isoamyl 3(2-furan) propionate) (Isoamyl 2-furanpropionate)	2071	2092	172.515
Isoamyl pyruvate	2083	431	172.515
Isobornyl phenylacetate (exo-2-Bornyl phenylacetate)		566	
Isobutyl acetoacetate	2177	242	172.515
Isobutyl anthranilate	2182	253	172.515
Isobutyl furylpropionate (Isobutyl 2-furanpropionate)	2198	2093	172.515
Isobutyl N- methylanthranilate		649	
Isoeugenyl acetate	2470	220	172.515
Isoeugenyl formate	2474	356	172.515
Isoeugenyl phenylacetate	2477	237	172.515
Isojasmone (Mixture of 2-Hexylidene cyclopentanone and 2-Hexyl-2-cyclopenten-1-one)	3552	167	172.515
$\alpha$ -Isomethylionone (Isomethyl- $\alpha$ -ionone)	2714	169	172.515
$\beta$ -Isomethylionone (Isomethyl- $\beta$ -ionone)		650	
Isopropyl cinnamate	2939	325	172.515
p-Isopropyl phenylacetaldehyde	2954	132	172.515
Isopropyl phenylacetate	2956	2158	172.515
3-(p-Isopropyl)-phenyl propanal (3-(p-Isopropylphenyl) propionaldehyde)	2957	2261	172.515
2-Isopropyl-N,2,3-trimethylbutyramide	3804		
Linalyl anthranilate	2637	256	172.515
Linalyl cinnamate	2641	329	172.515
Linalyl phenylacetate	3501	655	
Maltyl isobutyrate	3462	10739	
p-Menthan-2-ol	3562	2228	
<i>l</i> -Menthol ethylene glycol carbonate	3805		
<i>l</i> -Menthol 1-and 2-propylene glycol carbonate	3806		
<i>d,l</i> -Menthone 1,2-glycerol ketal	3808		
3-(1-Menthoxy)propane-1,2-diol	3784		
<i>l</i> -Menthyl lactate	3748		
3-Mercapto-2-butanol	3502	760	
4-Mercapto-2-butanone (2-Keto-4-butanethiol)	3357	11498	
3-((2-Mercapto-1-methylpropyl)thio)-2-butanol ( $\alpha$ -Methyl- $\beta$ -hydroxypropyl $\alpha$ -methyl- $\beta$ -	3509		

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mercaptopropyl sulfide)			
3-Mercapto-2-pentanone	3300	2327	
2, 3 or 10-Mercaptopinane	3503	2332	
2-Mercaptopropionic acid	3180	11790	
2, 5 or 6-Methoxy-3-ethylpyrazine (2-Ethyl (or methyl)-(3, 5 and 6)-methoxypyrazine)	3280	11329	
2-Methoxy-5 or 6-isopropylpyrazine	3358		
5 or 6-Methoxy-3-methylpyrazine	3183		
1-(4-Methoxyphenyl)-4-methyl-1-penten-3-one	3760	719	172.515
1-(p-Methoxyphenyl)-1-penten-3-one	2673	164	172.515
Methyl 1-acetoxycyclohexyl ketone	3701		
2-Methylallyl butyrate	2678	572	
p-Methylbenzyl acetone (4-(p-Tolyl)-2-butanone)	3074	160	172.515
$\alpha$ -Methylbenzyl butyrate	2686	2083	172.515
$\alpha$ -Methylbenzyl formate	2688	574	172.515
$\alpha$ -Methylbenzyl propionate	2689	425	172.515
4-Methylbiphenyl	3186	2292	
Methyl p-tert-butylphenylacetate	2690	577	172.515
p-Methylcinnamaldehyde	3640	10352	172.515
6-Methylcoumarin	2699	579	
2-Methyl-1, 3-cyclohexadiene			172.515
Methyl decine carbonate (Methyl 2-undecynoate)	2751	2111	172.515
2-Methyl-3,5 or 6-ethoxypyrazine	3569	11921	
2-Methyl-3,5 or 6-(furfurylthio) pyrazine	3189	2287	
3-(5-Methyl-2-furyl) butanal	3307	10355	
3-((2-Methyl-3-furyl)-thio)-4-heptanone	3570	11922	
4-((2-Methyl-3-furyl)-thio)-5-nonanone	3571	11923	
Methyl heptine carbonate (Methyl 2-octynoate)	2729	481	172.515
5-Methyl-5-hexen-2-one	3365	11150	
$\alpha$ -Methyl ionone	2711	143	172.515
$\beta$ -Methyl ionone	2712	144	172.515
$\delta$ -Methyl ionone	2713	11852	172.515
Methyl-isobutylcarbonyl acetate (1,3-Dimethylbutyl acetate)		2073	
$\alpha$ -Methyl-p-methoxy-cinnamaldehyde (p-Methoxy- $\alpha$ - methylcinnamaldehyde)	3182	584	
2-Methyl-5-methoxythiazole	3192	736	
Methyl-4-(methylthio)butyrate	3412	11526	
2-Methyl-3, 5 or 6-methylthio-pyrazine	3208	2290	
Methyl $\beta$ -naphthyl ketone	2723	147	172.515
2-Methyloctanal	2727	113	172.515
Methyl octine carbonate (Methyl 2-nonynoate)	2726	479	172.515
Methyl 2-oxo-3-methylpentanoate	3713		
2-Methyl-4-pentenoic acid	3511	10148	
4-Methyl-2-pentyl-1, 3-dioxolan	3630		
2-Methyl-4-phenylbutanal (2- Methyl-4-phenylbutyraldehyde)	2737	134	
3-Methyl-2-phenylbutanal (3-Methyl-2-phenylbutyraldehyde) ( $\alpha$ -Isopropyl phenylacetaldehyde)	2738		172.515
2-Methyl-4-phenyl-2-butanol (Dimethylphenylethyl carbinol)	3629	10281	

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Methyl 4-phenylbutyrate	2739	308	172.515
3-Methyl-5-propyl-2-cyclohexene-1-one	3577		172.515
3-(2-Methylpropyl) pyridine	3371	11396	
7-Methyl-4,4a, 5, 6-tetrahydro-2(3H)-naphthalenone	3715		
4-Methyl-5-thiazoleethanol acetate	3205	11620	
2-Methyl-3-thioacetoxy-4,5-dihydrofuran	3636		
Methylthio 2-(acetyloxy) propionate	3788		
4-(Methylthio) butanal	3414	11542	
4-(Methylthio)-4-methyl-2-pentanone	3376	11551	
Methylthio 2-(propionyloxy) propionate	3790		
2-Methyl-3-tolyl-propanal (2-Methyl-3-tolyl- propionaldehyde)	2748	587	172.515
Methyl 9-undecenoate (Methyl undecylenate)	2750	2101	172.515
Mono-menthyl succinate	3810		
$\beta$ -Naphthyl anthranilate	2767	11862	
$\beta$ -Naphthyl ethyl ether	2768	2058	
$\beta$ -Naphthyl isobutyl ether	3719	11886	
Neohesperidin dihydrochalcone	3811		
2,6-Nonadienal diethyl acetal	3378	660	
1,3-Nonanediol acetate	2783	2075	172.515
1,4-Nonanediol diacetate	3579	11927	
1,9-Nonanedithiol	3513	11558	
Octahydrocoumarin	3791		
Octanal dimethyl acetal	2798	42	172.515
1,8-Octanedithiol	3514	2331	
3-Octanon- 1-o1	2804	592	172.515
6-Octenal		664	
3-Octen-2-o1	3602		
trans-2-Octenyl butanoate	3517	11907	
Octyl formate	2809	342	172.515
Octyl 2-furoate	3518		
Octyl heptanoate	2810	366	172.515
Octyl phenylacetate	2812	230	172.515
3-Oxobutanal dimethyl acetal	3381	10029	
3-Oxodecanoic acid glyceride	3767		
3-Oxododecanoic acid glyceride	3768		
3-Oxohexadecanoic acid glyceride	3769		
3-Oxohexanoic acid glyceride	3770		
3-Oxooctanoic acid glyceride	3771		
3-Oxotetradecanoic acid glyceride	3772		
2-Pentyl-1-buten-3-one	3725		
Pentyl 2-furoate (Amyl 2-furoate)	2072	2109	
Pentyl 2-furyl ketone	3418	11180	
Phenethyl anthranilate	2859	258	172.515
Phenethyl 2-furoate	2865	362	
Phenoxyethyl isobutyrate	2873	2089	172.515
Phenylacetaldehyde 2,3-butylene-glycol acetal	2875	669	172.515
Phenylacetaldehyde diisobutyl acetal	3384	595	
Phenylacetaldehyde glyceryl acetal	2877	41	172.515
2-Phenyl-3-carbethoxy furan	3468	2309	
Phenylethyl methyl ethyl carbinol (1-Phenyl-3-methyl-3-pentanol)	2883	86	172.515
2-Phenyl-3-(2-furyl)-prop-2-enal	3586	11928	
5-Phenyl-pentanol	3618	674	

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2-Phenyl-4-pentenal	3519	10377	
3-Phenyl-4-pentenal	3318	10378	
2-Phenylpropanal dimethyl acetal (2-Phenylpropionaldehyde dimethyl acetal) (Hydratropic aldehyde dimethyl acetal)	2888	2017	172.515
2-Phenyl-1-propanol (Hydratropic alcohol) ( $\beta$ -Methylphenethyl alcohol)	2732	2257	172.515
1-Phenyl-2-propyl butyrate ( $\alpha$ -Methylphenethyl butyrate)	3197	2276	
2-Phenylpropyl butyrate	2891	285	172.515
3-Phenylpropyl formate	2895	351	172.515
3-Phenylpropyl hexanoate	2896	321	172.515
2-Phenylpropyl isobutyrate	2892	2087	172.515
3-Phenylpropyl isovalerate	2899	462	172.515
3-Phenylpropyl propionate	2897	419	172.515
1-Phenyl-3 or 5-propylpyrazole	3727		
2-(3-Phenylpropyl) pyridine	3751		
2-(3-Phenylpropyl) tetrahydrofuran	2898	489	172.515
Piperonyl isobutyrate	2913	305	172.515
Potassium 2-(1'-ethoxy) ethoxypropanoate	3752		
1, 2-Propanedithiol	3520	11564	
Propenylguaethol	2922	170	172.515
Propyleneglycol dibenzoate	3419	10890	
Propyl 2-furoate	2946	359	
Propyl furylacrylate (Propyl 2-furanacrylate)	2945	11842	172.515
Propyl 2-methyl-3-furyl disulfide	3607		
o-Propylphenol	3522	11908	
Pyrazine ethanethiol	3230	2285	
Pyrazine methanethiol	3299	11502	
Pyrazinyl methyl sulfide	3231	2288	
2-Pyridine methanethiole	3232	2279	
Rhodinyl acetate	2981	223	172.515
Rhodinyl phenylacetate	2985	2163	172.515
Santalyl acetate	3007	224	172.515
Santalyl phenylacetate	3008	239	172.515
$\alpha$ -Terpinyl anthranilate	3048	259	172.515
Terpinyl cinnamate	3051	330	172.515
Terpinyl isovalerate	3054	456	172.515
1,2,5,6-Tetrahydrocuminic acid	3731		
Tetrahydrofurfuryl acetate	3055	2069	172.515
Tetrahydrofurfuryl butyrate	3057	11841	172.515
Tetrahydrofurfuryl cinnamate	3320	11821	
Tetrahydrofurfuryl propionate	3058	11843	172.515
Tetrahydrolinalool	3060	77	172.515
Tetrahydro-pseudo-ionone	3059	2053	172.515
Tetramethyl ethylcyclohexenone (mixture of isomers)	3061	168	172.515
2-Thienyl mercaptan	3062	478	172.515
Thiogeraniol	3472	11583	
Tolualdehyde glyceryl acetal	3067	46	172.515
o-Tolyl acetate	3072	2078	172.515
o- Tolyl isobutyrate	3753	681	
p- Tolyl isobutyrate	3075	304	172.515
p- Tolyl laurate	3076	378	172.515

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p- Tolyl 3-methylbutyrate (p-Cresyl isovalerate)	3387		
p- Tolyl octanoate	3733		
p- Tolyl phenylacetate	3077	236	172.515
o- Tolyl salicylate	3734		
Tributyl acetyl citrate	3080		172.515
Tributylin	2223	747	
3,5,5-Trimethylhexanal	3524	10384	
1,2,3,-Tris((1'-ethoxy)-ethoxy)-propane	3593	11930	
9-Undecenal	3094	123	172.515
10-Undecen-1-yl acetate	3096	2062	172.515
Vanillyl butyl ether	3796		