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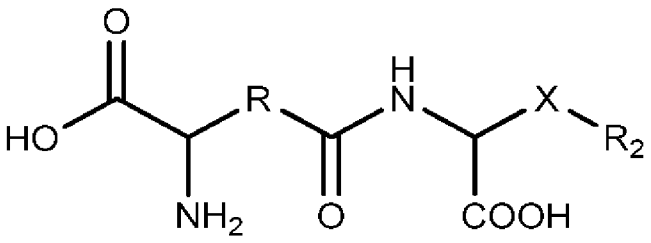
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(54) **Title**: FLAVOR COMPOUNDS



(I)

(57) **Abstract**: The invention provides a flavor compound according to formula (I), wherein R independently represents (-CH2-)x where x is an integer from 1 to 5, X independently represents S, NH or O, and R2 independently represents methyl or a C1 to C7 straight or branched alkyl or alkenyl group.

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FLAVOR COMPOUNDS

Technical Field

The present invention relates to the flavor industry and more particularly it concerns flavor compounds and compositions capable of contributing to the flavor and palatability of a food substance.

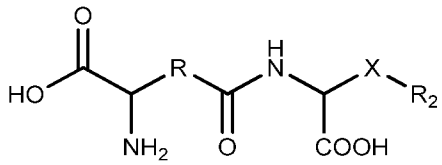
Background and Prior art

Flavors are used to provide an olfactive and gustatory experience when consuming food. However, many foods require one or more processing steps which involve the use of heat to fulfil various needs, e.g. cooking, sterilization or pasteurization, generation of reaction flavors and so on. This can have adverse consequences upon volatile flavors which can be lost or even destroyed by such heating processes. For this reason, it is known to encapsulate flavors by such methods as extrusion, spray-drying, spray-chilling, coacervation and the like. Such methods can be effective but they can retard undesirably or interfere with the flavor itself, they add complexity to the flavor system and they can even be visible to the naked eye which may in certain circumstances be undesirable. Thus, it would be desirable to provide a flavor that, even if volatile, can survive food manufacture and storage.

Sulfur-containing compounds in food applications are well known. For instance, several derivatives of 2-methyl-3-furanthiol are described in the prior art in relation to the flavor industry. Similarly alkyl sulfides are described in US 3,933,863 and thioalkanones are reported in US 5,145,703. Nevertheless, we have found no mention or suggestion of any of the compounds of formula (I) below. To the best of our knowledge, there is no disclosure in the prior art of any of the flavor compounds according to the invention, nor of their potential usefulness to create new flavoring compositions capable of modifying or improving the palatability of edible consumer products.

Summary of the Invention

Accordingly, the present invention provides a flavor compound according to formula (I)



(Formula I)

wherein R independently represents (-CH2-)x where x is an integer from 1 to 5, X independently represents S, NH or O, and R2 independently represents methyl or a C1 to C7 straight or branched alkyl or alkenyl group.

In a further aspect there is provided a flavor compound according to formula (I) in combination with at least one ingredient selected from the group consisting of a flavor carrier, flavor base and optionally at least one flavor adjuvant, the combination providing a flavored article.

In yet a further aspect there is provided a flavor compound according to formula (I) as part of a foodstuff.

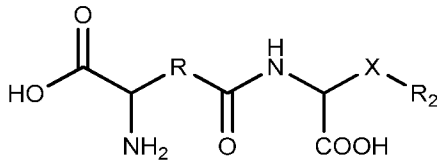
In still a further aspect there is provided a method to enhance, improve or modify the flavor or taste of a flavoring composition or a flavored product, which comprises adding thereto a flavor compound according to formula (I).

Brief Description of the Drawings

Figure 1 shows a flavor time-intensity curve for a flavor compound according to the invention.

Detailed Description of the Invention

The flavor compound, as herein defined, is a compound according to the following formula:



(Formula I)

wherein R independently represents (-CH2-)x where x is an integer from 1 to 5, X independently represents S, NH or O, and R2 independently represents methyl or a C1 to

C_7 straight or branched alkyl or alkenyl group. In a preferred aspect, R preferably represents a $–CH_2–$, a $–CH_2CH_2–$ or a –CH=CH– group.

Additionally or alternatively, in another preferred aspect, R_2 represents a methyl or a C_2 to C_4 alkyl or alkenyl group, more preferably a C_2 to C_4 alkyl or alkenyl group even more preferably a C_3 alkyl or alkenyl group, most preferably a cis- or trans-propenyl group.

Additionally or alternatively, in another preferred aspect, X represents S.

Most preferably, the flavor compound is 2-amino-5-(carboxy(prop-1-enylthio)methylamino)-5-oxopentanoic acid.

In the context of the present invention, the flavor compound according to formula I includes all isomers and salts thereof as well as any mixture of the isomers and/or salts.

The flavor compound according to formula I may be a flavor precursor. That is, it may release an additional flavor compound when subjected to a triggering event. For instance, it may release a flavor compound according to formula II where n represents an integer from 1 to 2 dependent on X which may be S, N or O and R_2 represents a methyl or a C_2 to C_4 alkyl or alkenyl group, more preferably a C_2 to C_4 alkyl or alkenyl group even more preferably a C_3 alkyl or alkenyl group, most preferably a cis- or trans-propenyl group.

$$H_nXR_2$$

(Formula II)

When the flavor compound according to formula I is brought into contact with an enzyme, additional flavor compounds according to formula II may be released. Such enzymes can, for example, be present in the mouth of a consumer or can be present in or added to the food product.

In the aspect where the flavor compound according to formula I acts as a flavor precursor, this enhances the flavor perception yet further and is particularly desirable.

Flavor Compound Mixture

The flavor compound is preferably used in a food product requiring an alliaceous character. For instance, savory foods, where a garlic or onion-like note is desired, can benefit from the presence of these flavor compounds according to the present invention. Additionally, savory foods where the flavor of the Chinese vegetable *Toona sinensis* is

desired can benefit from the presence of these flavor compounds according to the present invention.

A flavor composition according to the invention is a composition that comprises a flavor compound according to formula (I) and an additional different flavor ("flavor co-ingredient") and/or a flavor adjuvant. Flavors for use as the flavor co-ingredient are described in numerous literature references such as S. Arctander, Perfume and Flavour Chemicals, 1969, Montclair, New Jersey, USA; Flavor Base 2010 from Leffingwell and Associates; Fenaroli's Handbook of Flavor Ingredients, Sixth Edition; or in other works of a similar nature, as well as in the abundant patent literature in the field of flavor and the skilled flavorist is readily capable of selecting suitable flavor co-ingredients based on his general knowledge and according to the intended application or desired organoleptic effect.

Flavor adjuvants are well known and may be selected from, for example, without limitation, solvents, binders, diluents, disintegrating agents, lubricants, coloring agents, preservatives, antioxidants, emulsifiers, stabilizers, flavor-enhancers, sweetening agents, anti-caking agents, enzymes, enzyme-containing preparations and the like. Examples of carriers or diluents for flavor or fragrance compounds can be found in, for instance, "Perfume and Flavor Chemicals", S. Arctander, Ed., Vol. I & II, "Perfume and Flavor Materials of Natural Origin, S. Arctander, 1960; in "Flavorings", E. Ziegler and H. Ziegler (ed), Wiley-VCH Weinheim, 1998, and "CTFA Cosmetic Ingredient Handbook".

The flavor composition may be added to a foodstuff in any suitable form, for example as a liquid, as a paste, as a solid or in encapsulated form bound to or coated onto carriers/particles or as a powder.

Foodstuffs

The nature and type of the constituents of the foodstuffs, beverages and other edible or chewable consumer products do not warrant a more detailed description here, which in any case would not be exhaustive, the skilled person being able to select them on the basis of its general knowledge and according to the nature of said product.

Nevertheless, the types of end products where the flavor compounds of the present invention are useful include, but are not limited to powdered soups, powdered, instant noodles, dried pesto mixes, dried savory dishes and stable in-dough flavoring for noodles.

Suitable encapsulation systems for the flavor compounds of the present invention are described below.

The proportions in which the compounds according to the invention can be incorporated into the various aforementioned articles or products vary within a wide range of values. These values are dependent on the nature of the article to be flavored and on the desired organoleptic effect, as well as the nature of the co-ingredients in a given base, when the compounds according to the invention are mixed with flavoring co-ingredients, solvents or additives commonly used in the art.

In the case of flavored products, the concentration of flavor compound (I) is preferably from 1 ppm to 100 ppm, more preferably from 10 ppm to 80 ppm, most preferably from 20 ppm to 70 ppm. Below 1 ppm the effect becomes significantly weaker whereas above 100 ppm the risk of undesirable off-notes increases.

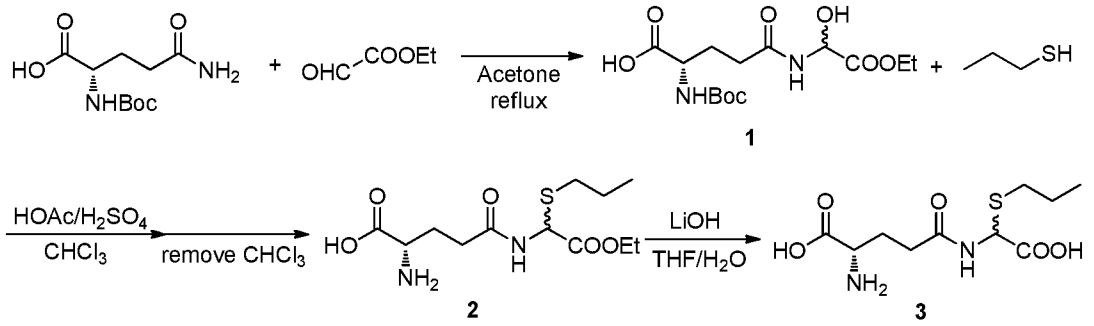
Examples

The invention will now be illustrated by way of the following examples, wherein the abbreviations have the usual meaning in the art, the temperatures are indicated in degrees centigrade (°C), all amounts are % by weight unless otherwise indicated.

Example 1

Preparation of flavor compound 2-amino-5-(carboxy(propylthio)methylamino)-5-oxopentanoic acid

Unless stated otherwise, chemicals were purchased from commercial suppliers and used as such. All reactions were carried out under an inert atmosphere of nitrogen, unless stated otherwise. Column chromatography was performed on an HLB SPE cartridge purchased from Waters. Nuclear magnetic resonance (NMR) data were obtained on a Bruker spectrometer (500 MHz). Spectra are reported in units of ppm on the δ scale, relative to the solvent used. When a diastereomeric mixture of products was obtained, all relevant NMR signals for the mixture were listed. LC-MS measurements were performed on a Thermo Accela HPLC system with a Thermo Finnigan LXQ ion trap spectrometer equipped with electrospray ionization (ESI).



N-Boc-L-glutamyl-D,L-2-hydroxy-glycine ethyl ester (**1**).

To a solution of N-Boc glutamine (49.0 mg, 0.199 mmol) in acetone (2 mL) was added ethyl glyoxalate (50.4 mg, 0.247 mmol) under an N_2 atmosphere. After refluxing for 6 h, the mixture was concentrated in vacuo, and then isolated by HLB-column to give **1** as a gum (63.6 mg, 91% yield, 1:1 mixture of diastereomers). Only one peak, which contained two diastereomers, was detected by LC-MS without further optimization.

^{1}H NMR (500 MHz, CD_3OD): δ 5.55, 5.54 (1H, s), 4.21 (2H, q, J = 7.0 Hz), 4.10 (1H, br s), 2.34 (2H, t, J = 7 Hz), 2.14 (1H, m), 1.90 (1H, m), 1.43 (9H, s), 1.29 (3H, t, J = 7 Hz);

^{13}C NMR (125 MHz, CD_3OD): δ 175.9, 175.1, 171.6, 158.4, 80.9, 73.0, 63.1, 54.7, 33.4, 29.0, 28.9, 14.7; ESI-MS: m/z = 349 $[M+H]^+$.

L-glutamyl-D,L-2-propylthio-glycine ethyl ester (**2**).

To a solution of **1** (1.00 g, 2 mmol) and concentrated sulfuric acid (0.1 mL) in $CHCl_3$ (20 mL) and AcOH (2 mL) was added propylmercaptan (0.36 mL, 3.99 mmol) dropwise at 0°C. The mixture was stirred for 0.5 h at 0 °C, then 6 h at room temperature. After **1** had been consumed, the mixture was evaporated to remove the chloroform, and then stirred vigorously for 1 day at room temperature. The resulting mixture was concentrated in vacuo, and then separated by HLB-column to give **2** as a white solid (388 mg, 63% yield, 1:1 mixture of diastereomers). Two peaks attributed to diastereomers were detected by LC-MS.

^{1}H NMR (500 MHz, CD_3OD): δ 5.40, 5.39 (1H, s), 4.22 (2H, q, J = 7.0 Hz), 3.63 (1H, m), 2.67 (1H, m), 2.62 (1H, m), 2.50 (2H, m), 2.10 (2H, m), 1.63 (2H, m), 1.28 (3H, t, J = 7.0 Hz), 0.98 (3H, t, J = 7.0 Hz);

^{13}C NMR (125 MHz, CD_3OD): δ 174.8, 174.7, 173.9, 170.6, 63.2, 55.7, 55.1, 55.0, 34.0, 33.1, 32.9, 28.1, 28.0, 24.1, 14.7, 13.9; ESI-MS: m/z = 307 $[M+H]^+$.

L-glutamyl-D,L-2-propylthio-glycine (**3**).

To a solution of **2** (138 mg, 0.45 mmol) in THF (5 mL) at 0 °C was added drop-wise a precooled solution (0 °C) of lithium hydroxide hydrate (0.3 M in water) to adjust the pH to around 12. The mixture was stirred for 1.5 h at 0 °C and then was adjusted to pH 2 with 1N HCl and separated by HLB column to give **3** as a white solid (97.6 mg, 78% yield, 1:1 mixture of diastereomers). Only one peak, which should contain two diastereomers, was detected by LC-MS without further optimization.

^{1}H NMR (500 MHz, DMSO-D_6): δ 8.53 (1H, m, interchangeable H), 5.20 (1H, d, J = 8.5 Hz), 3.46 (1H, br s), 2.57 (1H, m), 2.52 (1H, m), 2.35 (2H, m), 1.98 (1H, m), 1.90 (1H, m), 1.52 (1H, m), 0.89 (3H, t, J = 7.5 Hz);

^{13}C NMR (125 MHz, DMSO-D_6): δ 171.1,170.9, 170.2, 54.1, 52.9, 31.7, 31.5, 27.0, 22.4, 13.3; ESI-MS: m/z = 279 $[M+H]^+$.

Example 2

Evaluation of Flavor Compound from Example 1

A trained panel of around 20 judges were asked to evaluate the perceived intensity over time of the overall flavor generated by 2-amino-5-(carboxy(propylthio)methylamino)-5-oxopentanoic acid, the flavor compound from Example 1.

The tasting protocol was as follows:

The flavor compound from Example 1 was dissolved in water at a concentration of 16 ppm. 20 panelists received a 15 mL aliquot of the aqueous solution and were asked to take the entire sample in mouth and to simultaneously start a timer. The sample was spat out after 5 seconds and the panelists were asked to report the time of flavour perception onset (T_{start}), the maximum perceived intensity and its corresponding time (I_{max} and T_{max}) and finally the perceived intensity 3 minutes after sipping the sample (I_{3min}) or the time when the flavour disappeared, if it was before 3 minutes (T_{end}). Each evaluation was rated on a linear scale from 0 to 10 where 0 represents “not at all” and 10 represents “very strong”. Tests were performed twice.

Results:

The 40 answers were combined. The flavour was perceived at T_{start} 6 (±2) seconds, with the maximum perceived intensity I_{max} = 6 (±1) at T_{max} 22 (±4) seconds. Finally, the odour

disappeared at 153 (±13) seconds. The perceived flavour intensity over time is represented below (panel average and confidence interval at 5%) in table 1 and Figure 1.

Table 1

	Imax (seconds)	I_{3min} (seconds)	*Tstart* (seconds)	*Tmax* (seconds)	*Tend* (seconds)
Mean	6	1	6	22	153
Standard Error	0	0	1	2	6
Standard Deviation	2	1	7	13	40

The panelists' descriptive comments were also noted. The flavor of the compound prepared in example 1 was described most commonly as onion, sulfury and garlic.

Example 3

Onion Soup Preparations

Two flavoring compositions, (A) and (B), for onion soup, were prepared by admixing the following ingredients:

Table 2

	Composition (A)	Composition (B)
Ingredient	Parts by weight	Parts by weight
Dimethyl sulfide	50	50
Diallyl disulfide	5	5
4-Hydroxy-2,5-dimethyl-3(2H)-furanone	200	200
2-Methyl-3-thiol-furane	2	2
Decenal	10	10
Dipropyldisulfide	20	20
Decadienal	5	5
1,2,3-Propanetriyl triacetate	708	658
Flavor Extract*	-----	500
Total	1000	1000

* An extract of the root of *Tooni Sinensis* enriched in the compound prepared in example 1.

To a portion of a standard unflavored canned onion soup were added 20 ppm, relative to the weight of the soup, of the flavoring composition (A).

To the other portion of the above unflavored canned onion soup were added 20 ppm, relative to the weight of the soup, of the flavoring composition (B).

There were thus obtained two flavored canned onion soups, one containing flavor compound from example 1 and the other not containing it.

The soup containing composition (A) had an aggressive, roasted onion and caramelized character.

By comparison, the soup containing composition (B) had a flavor with a rounded alliaceous, oniony character.

Example 4

Garlic Flavor Preparations

A typical flavor having a garlic roast type flavor character was prepared by admixing the following ingredients in the amounts indicated:

Table 3

Ingredients	Parts by weight
Acetylpyrazine at 1.00%*	30.000
Ethyl acrylate at 10.00%*	10.000
Heptanal at 10.00%*	15.000
Benzylmercaptan at 10.00%*	15.000
Caryophyllene at 10.00%*	10.000
Cis-3-hexenol formate at 1.00%*	20.000
2,3,5-Trimethylpyrazine at 10.00%*	70.000
2-Ethyl-3-methylpyrazine at 10.00%*	60.000
Thiol at 10.00%*	40.000
Decanoic acid redist.	5.000
Garlic essential oil	20.000
Isovalerianic aldehyde	5.000
3-Propylidene-1-benzo(C)furanone	10.000
Benzothiazole	20.000

Furaneol® 1)	25.000
Methylfurfural	40.000
Methylnussol at 10.00%**	10.000
Mustard essential oil	30.000
(E)-2-hexenal	5.000
Diallyl sulfide	350.000
Dipropyl disulfide	50.000
5-Ethyl-3-hydroxy-4-methyl-2(5H)-furanone at 1.00%*	5.000
Nussol extra	10.000
Propylmercaptan at 10.00%*	100.000
Sulfurobase 1)	30.000
Dimethyl trisulfide at 10.00%*	15.000
Total	1000.000

* In triacetine

** In ethyl citrate

1) Origin: Firmenich SA, Geneva, Switzerland

To this flavor composition there was added the Flavor Extract as defined in example 3 in an amount sufficient to provide a final concentration of 1 ppm of this extract in a tasting saline solution (salt 0.5%, MSG 0.05% w/w) where the flavor was used in an amount of 0.001 ppm. A blind test evaluation of the flavor showed that the compound of the invention was found to increase the rounded alliaceous character of the flavor.

Example 5

Beef bouillon preparation

A beef bouillon had the following ingredients in the amounts shown. The bouillon was prepared by thoroughly mixing the ingredients.

Table 4

Ingredient	% by weight
Onion powder (1)	1.0
Table Salt	25.0

Caramel Color (2)	1.0
Light Yeast (3)	5.0
Ground white pepper	0.05
Sugar	3.0
Beaded palm oil	12.0
Parsley	0.10
Yeast Enhancer (4)	2.5
Butter Oil	5.0
Maltodextrin (5)	44.35

(1) ex Firmenich, ref. 967746

(2) ex Firmenich, ref. 927409

(3) ex Firmenich, ref. 946686

(4) ex Firmenich, ref. 992444

(5) ex Firmenich, ref 909251

The bouillon was then prepared for evaluation by adding 20 g of the mixture to 1 litre of hot water and stirring until dissolved. Next 20 ppm of the Flavor Extract as defined in example 3 was added. A skilled panel evaluated taste and flavor as excellent, meaty, sulfury, umami enhancing, lasting, rounder and alliaceous.

Example 6

Instant vegetable cream soup

An instant vegetable cream soup had the following ingredients in the amounts shown. The soup was prepared by thoroughly mixing the ingredients.

Table 5

Ingredient	% by weight
Creaming agent (1)	22.0
Table Salt	7.5
Yeast extract (2)	3.0
Skimmed milk powder	12.0
Onion powder	2.7
Modified starch (3)	33.0
Beaded palm oil (4)	1.6
Monosodium glutamate	1.5

Garlic powder (5)	0.15
Tomato powder (6)	2.4
Carrot powder (7)	1.2
Leek powder (8)	2.0
Red bell pepper (9)	0.45
Rubbed parsley	0.25
Maltodextrin	10.25

(1) ref. 936110

(2) ref. 946686

(3) VA70T, ex Prejel.

(4) ref. 948082

(5) ref. 905113

(6) ref. 988136

(7) ref. 920511

(8) ref. 974504

(9) ref. 974548

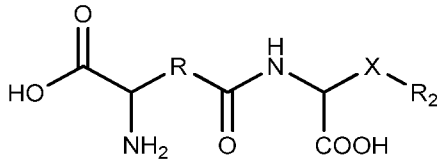
(10) ref. 909251

The soup was prepared by mixing the ingredients thoroughly. Samples for evaluation were prepared by adding 100g of the mixture to 1 litre of hot water and stirring until dissolved. The soup was then divided into 2 portions, to one of which was added 20ppm of the Flavor Extract as defined in example 3.

The soups were tested by a skilled panel of 6 flavorists. The portion containing no compound did not have any umami character. The soup containing the compound of example 1 was described as umami and alliaceous.

Claims

1. A flavor compound according to formula (I):



(Formula I)

wherein R independently represents (-CH_2-)$_x$ where x is an integer from 1 to 5, X independently represents S, NH or O, and R_2 independently represents methyl or a C_1 to C_7 straight or branched alkyl or alkenyl group.

2. A flavor compound according to claim 1 wherein R represents a –CH_2– or -CH_2CH_2– group.

3. A flavor compound according to any one of the preceding claims wherein R_2 represents a C_2 to C_4 alkyl or alkenyl group.

4. A flavor compound according to any one of the preceding claims wherein R_2, represents a C_3 alkyl or alkenyl group.

5. A flavor compound according to any one of the preceding claims wherein R_2 represents a cis- or trans-propenyl group.

6. A flavor compound according to any one of the preceding claims wherein X represents S.

7. A flavor compound according to any one of the preceding claims wherein the compound is 2-amino-5-(carboxy(prop-1-enylthio)methylamino)-5-oxopentanoic acid.

8. A flavor compound according to any one of the preceding claims in combination with at least one ingredient selected from the group consisting of a flavor

carrier, flavor base and optionally at least one flavor adjuvant, the combination providing a flavored article.

9. A flavor compound according to any one of the preceding claims in the form of a powder mixture, the mixture further comprising an enzyme.

10. Use of a flavor compound according to any one of claims 1 to 8 in a foodstuff to provide an alliaceous flavor.

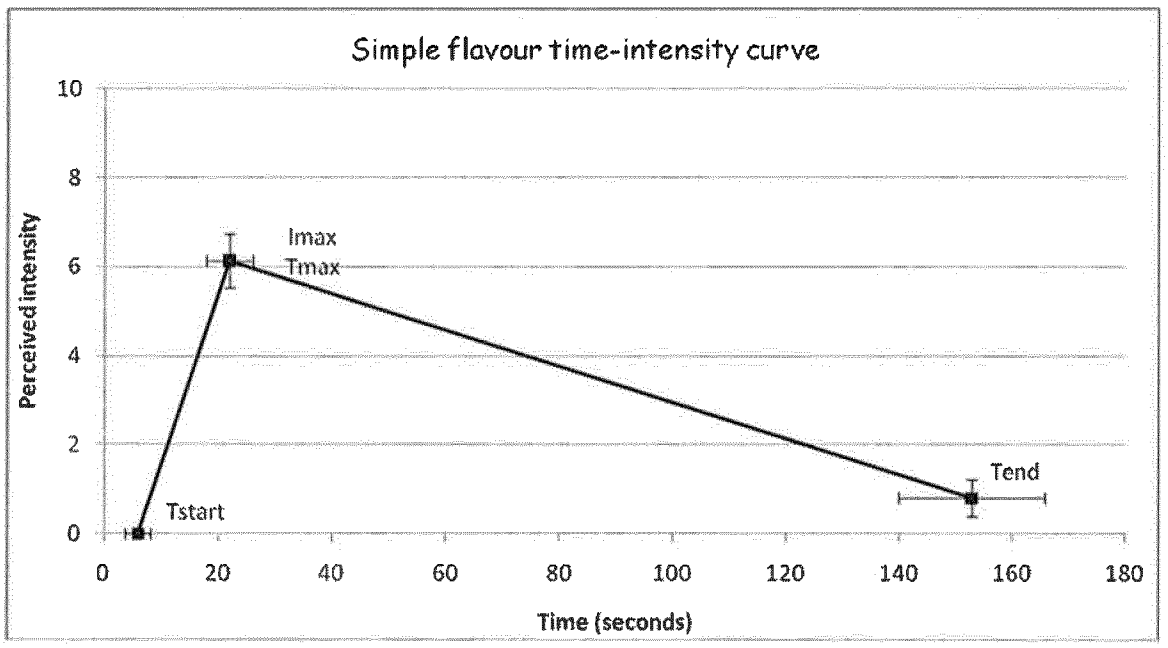

Simple flavour time-intensity curve
Perceived intensity
Time (seconds)
Imax
Tmax
Tstart
Tend
0
2
4
6
8
10
0
20
40
60
80
100
120
140
160
180

Figure 1

INTERNATIONAL SEARCH REPORT

International application No
PCT/EP2012/053054

A. CLASSIFICATION OF SUBJECT MATTER
INV. A23L1/226 A23L1/227 A23L1/228 C07C237/04
ADD.

According to International Patent Classification (IPC) or to both national classification and IPC

B. FIELDS SEARCHED

Minimum documentation searched (classification system followed by classification symbols)
A23L C07C

Documentation searched other than minimum documentation to the extent that such documents are included in the fields searched

Electronic data base consulted during the international search (name of data base and, where practicable, search terms used)
EPO-Internal, BIOSIS, FSTA, WPI Data, EMBASE

C. DOCUMENTS CONSIDERED TO BE RELEVANT

Category*	Citation of document, with indication, where appropriate, of the relevant passages	Relevant to claim No.
A	WO 2007/042288 A2 (THOMAS FRANK HOFMANN & ANDREAS [DE]; HOFMANN THOMAS FRANK [DE]; DUNKEL) 19 April 2007 (2007-04-19) page 2, line 4 - page 3, line 20	1-10
A	US 2009/239310 A1 (OHSU TAKEAKI [JP] ET AL) 24 September 2009 (2009-09-24) paragraph [0019] - paragraph [0020] paragraph [0033] - paragraph [0034]	1-10
A	EP 1 075 798 A1 (AJINOMOTO KK [JP]) 14 February 2001 (2001-02-14) paragraph [0001] paragraph [0021]	1-10
A	EP 2 253 227 A1 (NIPPON SUISAN KAISHA LTD [JP]) 24 November 2010 (2010-11-24) paragraph [0007] - paragraph [0008]	1-10

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[X] Further documents are listed in the continuation of Box C.

[X] See patent family annex.

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Date of the actual completion of the international search	Date of mailing of the international search report
17 July 2012	02/08/2012

Name and mailing address of the ISA/	Authorized officer
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C(Continuation). DOCUMENTS CONSIDERED TO BE RELEVANT

Category*	Citation of document, with indication, where appropriate, of the relevant passages	Relevant to claim No.
A	US 4 399 163 A (BRENNAN THOMAS M [US] ET AL) 16 August 1983 (1983-08-16) column 2, line 30 - column 4, line 16	1-10
A	MASSIERE F ET AL: "Design, synthesis, and evaluation of the first mechanism-based inhibitor of glucosamine 6-phosphate synthase", JOURNAL OF THE AMERICAN CHEMICAL SOCIETY 1997 US LNKD- DOI:10.1021/JA970254T, vol. 119, no. 24, 1997, pages 5748-5749, XP002680159, ISSN: 0002-7863 Scheme 1, Compound 1	1-10

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INTERNATIONAL SEARCH REPORT

Information on patent family members

International application No
PCT/EP2012/053054

Patent document cited in search report	Publication date	Patent family member(s)	Publication date
WO 2007042288 A2	19-04-2007	AT 474463 T	15-08-2010
		EP 1937088 A2	02-07-2008
		JP 4885228 B2	29-02-2012
		JP 2009511031 A	19-03-2009
		US 2009130282 A1	21-05-2009
		WO 2007042288 A2	19-04-2007
US 2009239310 A1	24-09-2009	EP 1946110 A1	23-07-2008
		EP 2175273 A1	14-04-2010
		EP 2299271 A2	23-03-2011
		EP 2327986 A1	01-06-2011
		JP 4553052 B2	29-09-2010
		JP 4798293 B2	19-10-2011
		JP 2009514791 A	09-04-2009
		JP 2010154862 A	15-07-2010
		JP 2011115186 A	16-06-2011
		US 2009239310 A1	24-09-2009
		US 2011097805 A1	28-04-2011
		WO 2007055393 A1	18-05-2007
EP 1075798 A1	14-02-2001	AT 354974 T	15-03-2006
		AU 3538999 A	23-11-1999
		BR 9910212 A	27-11-2001
		CA 2331218 A1	11-11-1999
		CN 1299242 A	13-06-2001
		DE 69935320 T2	27-09-2007
		EP 1075798 A1	14-02-2001
		ID 26255 A	07-12-2000
		JP 4075307 B2	16-04-2008
		TW 542701 B	21-07-2003
		WO 9956566 A1	11-11-1999
EP 2253227 A1	24-11-2010	AU 2009224376 A1	17-09-2009
		CN 102014669 A	13-04-2011
		EP 2253227 A1	24-11-2010
		US 2011064861 A1	17-03-2011
		WO 2009113563 A1	17-09-2009
US 4399163 A	16-08-1983	NONE	