(12) INTERNATIONAL APPLICATION PUBLISHED UNDER THE PATENT COOPERATION TREATY (PCT)

(19) World Intellectual Property Organization
International Bureau

(43) International Publication Date
15 June 2017 (15.06.2017)

WIPO | PCT

(10) International Publication Number
WO 2017/100426 A1

(51) **International Patent Classification**:
A23L 27/00 (2016.01) *C07C 45/44* (2006.01)
A23L 27/20 (2016.01) *C07C 45/67* (2006.01)
A23L 27/201 (2006.01) *C07C 47/21* (2006.01)

(21) **International Application Number**:
PCT/US2016/065573

(22) **International Filing Date**:
8 December 2016 (08.12.2016)

(25) **Filing Language**: English

(26) **Publication Language**: English

(30) **Priority Data**:
62/266,404 11 December 2015 (11.12.2015) US

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(81) **Designated States** *(unless otherwise indicated, for every kind of national protection available)*: AE, AG, AL, AM, AO, AT, AU, AZ, BA, BB, BG, BH, BN, BR, BW, BY, BZ, CA, CH, CL, CN, CO, CR, CU, CZ, DE, DJ, DK, DM, DO, DZ, EC, EE, EG, ES, FI, GB, GD, GE, GH, GM, GT, HN, HR, HU, ID, IL, IN, IR, IS, JP, KE, KG, KH, KN, KP, KR, KW, KZ, LA, LC, LK, LR, LS, LU, LY, MA, MD, ME, MG, MK, MN, MW, MX, MY, MZ, NA, NG, NI, NO, NZ, OM, PA, PE, PG, PH, PL, PT, QA, RO, RS, RU, RW, SA, SC, SD, SE, SG, SK, SL, SM, ST, SV, SY, TH, TJ, TM, TN, TR, TT, TZ, UA, UG, US, UZ, VC, VN, ZA, ZM, ZW.

(84) **Designated States** *(unless otherwise indicated, for every kind of regional protection available)*: ARIPO (BW, GH, GM, KE, LR, LS, MW, MZ, NA, RW, SD, SL, ST, SZ, TZ, UG, ZM, ZW), Eurasian (AM, AZ, BY, KG, KZ, RU, TJ, TM), European (AL, AT, BE, BG, CH, CY, CZ, DE, DK, EE, ES, FI, FR, GB, GR, HR, HU, IE, IS, IT, LT, LU, LV, MC, MK, MT, NL, NO, PL, PT, RO, RS, SE, SI, SK, SM, TR), OAPI (BF, BJ, CF, CG, CI, CM, GA, GN, GQ, GW, KM, ML, MR, NE, SN, TD, TG).

Declarations under Rule 4.17:

— *of inventorship (Rule 4.17(iv))*

Published:

— *with international search report (Art. 21(3))*

— *before the expiration of the time limit for amending the claims and to be republished in the event of receipt of amendments (Rule 48.2(h))*

WO 2017/100426 A1

(54) **Title**: FRAGRANCE AND FLAVOR COMPOSITIONS CONTAINING ISOMERIC ALKADIENALS OR ISOMERIC ALKADIENENITRILES

(57) **Abstract**: A composition containing at least one isomeric alkadienal or at least one isomeric alkadienenitrile in an amount effective to impart a fragrance or flavor to the composition. A fragrance or flavor composition containing at least one isomeric alkadienal or at least one isomeric alkadienenitrile in an amount effective to impart a fragrance or flavor to the composition. A consumer product containing the fragrance or flavor composition having at least one isomeric alkadienal or at least one isomeric alkadienenitrile in an amount effective to impart a fragrance or flavor to the composition. A method of imparting a fragrance or flavor to a consumer product by adding to the consumer product a fragrance or flavor composition containing at least one isomeric alkadienal or at least one isomeric alkadienenitrile in an amount effective to impart a fragrance or flavor to the consumer product.

FRAGRANCE AND FLAVOR COMPOSITIONS CONTAINING ISOMERIC ALKADIENALS OR ISOMERIC ALKADIENENITRILES

BACKGROUND OF THE DISCLOSURE

1. Field of the Disclosure

[0001] This disclosure relates to fragrance and flavor compositions containing isomeric alkadienals or isomeric alkadienenitriles. This disclosure also relates to a method of imparting a fragrance or flavor to a consumer product by adding fragrance and flavor compositions containing isomeric alkadienals or isomeric alkadienenitriles to the consumer product.

2. Description of the Related Art

[0002] Various alkenals and alkadienals having eight or more carbon atoms are known as fragrance materials or flavorings. For example, S. Arctander in "Perfume and Flavor Chemicals", names 2,4-decadienal and 2-decenal as fragrance materials but without any reference to cis or trans configuration, and 8-, 9- and 10-undecenal , of which 8- and 9-undecenal have the cis configuration. In U.S. Patent Nos. 3,821,421 and 3,686,003, it is reported that both cis-4-decenal and cis, cis-4,7-tridecadienal and other polyunsaturated aldehydes containing 11-17 carbon atoms are suitable for imparting an aroma of chicken meat to foodstuffs.

[0003] In another publication, Meijboom et al (J. AM. Oil Chem. Soc. (1981), 58(6), 680-2) describes flavor perceptibility of straight chain, unsaturated aldehydes. These aldehydes include materials such as E,E-2,4-heptadienal (rancid hazelnuts), E,E-2,4-nonadienal (Nutty), E,E-2,5-octadienal (cucumber-like), E,E-2,6-nonadienal (tallowy, green), and E,E-2,7-decadienal (green, plant like). There is no reference to the corresponding E,Z isomers or use of these materials in fragrances.

[0004] Other dienals such as 2E,4E-decadienal, 2E,4E-undecadienal and 2E,6Z-dodecadienal have been reported and used in chicken meat flavor preparations. Further, Gerard Moschiano (Perfumer & Flavorist 23, No. 3, 55, 1998) describes the alkyl dienal, 2,4-decadienal as having fatty, chicken, fried, citrus, coriander and brothy odor. More recently, Delort et al. reported the identification and synthesis of several alkadienals found in extracts obtained from distinct parts of chicken (J. Agric. Food Chem. 2011, 59, 11752-11763).

[0005] In U.S. Patent No. 3,928,402, a method of synthesis is described for γ-δ-unsaturated carbonyl compounds including aldehydes. Only compounds with a 2,4-diene system and/or an ester or keto group are disclosed.

[0006] In U.S. Patent No. 3,920,752, it is reported that certain γ-δ-unsaturated aldehydes are valuable fragrance materials. From the structural formulae, only branched C-11 dienals with a trans-double bond at carbon 4 are disclosed. In U.S. Patent No. 4,687,599, it is reported that cis,cis-4,7-decadienal, cis,cis-4,7,9-decatrienal and cis,cis-4,7,12-tridecatrienal are useful fragrance materials, but the trans-isomers are excluded.

[0007] There is an ongoing interest in the fragrance and flavor industry to use new compounds that enhance or improve organoleptic character and impart new notes to help perfumers and flavorists create exciting new fragrance and flavor experience desired by consumers. There remains a need and demand for unique fragrance and flavor compositions.

[0008] The present disclosure provides many advantages, which shall become apparent as described below.

SUMMARY OF THE DISCLOSURE

[0009] This disclosure relates in part to fragrance and flavor compositions containing isomeric alkadienals or isomeric alkadienenitriles. This disclosure also relates in part to a method of imparting a fragrance or flavor to a consumer product

by adding fragrance and flavor compositions containing isomeric alkadienals or isomeric alkadienenitriles to the consumer product.

[0010] This disclosure also relates in part to a composition comprising at least one isomeric alkadienal or at least one isomeric alkadienenitrile in an amount effective to impart a fragrance or flavor to the composition.

[0011] This disclosure further relates in part to a fragrance or flavor composition comprising at least one isomeric alkadienal or at least one isomeric alkadienenitrile in an amount effective to impart a fragrance or flavor to the composition.

[0012] This disclosure yet further relates in part to a consumer product containing the fragrance or flavor composition comprising at least one isomeric alkadienal or at least one isomeric alkadienenitrile in an amount effective to impart a fragrance or flavor to the consumer product.

[0013] This disclosure also relates in part to a method of imparting a fragrance or flavor to a consumer product comprising adding to the consumer product a fragrance or flavor composition comprising at least one isomeric alkadienal or at least one isomeric alkadienenitrile in an amount effective to impart a fragrance or flavor to the consumer product.

[0014] Further objects, features and advantages of the present disclosure will be understood by reference to the following drawings and detailed description.

DESCRIPTION OF THE PREFERRED EMBODIMENTS

[0015] As used herein, the term "fragrance composition" refers to a mixture comprising one or more fragrance components, in any of their forms, and one or more solvents or perfuming co-ingredients. As known in the art, a fragrance composition will contain one or more fragrance components (e.g., perfuming co-ingredients) in order to impart an olfactory note to the composition (e.g., a

household cleaner, perfume, or other commercial product) to which it is added. In one embodiment, the fragrance composition contains two or more fragrance components which, collectively and in combination with the solvent to which they are added, impart an intended olfactory note (e.g., a hedonically pleasing note) to a human in close proximity to the fragrance composition.

[0016] In general terms, perfuming co-ingredients belong to chemical classes as varied as alcohols, aldehydes, ketones, esters, ethers, acetates, nitriles, terpene hydrocarbons, nitrogenous or sulphurous heterocyclic compounds and essential oils of natural or synthetic origin, and are known to perfumists of ordinary skill in the art. Many of these ingredients are listed in reference texts such as S. Arctander, Perfume and Flavor Chemicals, 1969, Montclair, N.J., USA or any of its more recent versions, each of which are hereby incorporated by reference.

[0017] As used herein, the term "perfume composition" refers a mixture of fragrance materials and optionally auxiliary substances, dissolved in a suitable solvent or mixed with a powdery substrate which is used to impart a desired odor to the skin and/or all types of products. Examples of such products include soaps, detergents, air fresheners, room sprays, pomanders, candles, cosmetics, such as creams, ointments, toilet waters, pre- and aftershave lotions, talcum powders, hair-care agents, body deodorants and anti-perspirants.

[0018] As used herein, the term "flavor composition" refers to a composition that contains one or more compound(s) (e.g., co-ingredients) that provide(s) a desired taste when combined with a solvent that is suitable for oral administration and oral consumption. Examples of flavoring co-ingredients that are generally included in a flavor composition are listed in S. Arctander, Perfume and Flavor Chemicals, 1969, Montclair, N.J., USA. The skilled person in the art of flavors is able to select them on the basis of its general knowledge and according to the nature of the product to be flavored and the desired taste.

[0019] As used herein, the term "flavor composition" refers to a mixture of flavor materials and optionally auxiliary substances, dissolved in a suitable solvent or

mixed with a powdery substrate which is used to impart a desired taste to all types of products. Examples of such products include beverages, dairy products, confectionaries, cereals, snacks, soups and the like.

[0020] As used herein, the phrase "consumer product" refers to composition that is in a form ready for use by the consumer for the marketed indication. A solvent suitable for use in a consumer product is a solvent that, when combined with other components of the end product, will not render the consumer product unfit for its intended consumer use.

[0021] Any one of the isomeric alkadienal or isomeric alkadienenitrile compositions of this disclosure can be included in a fragrance or flavor composition. In one embodiment, any one of the isomeric alkadienal or isomeric alkadienenitrile compositions of this disclosure is provided in a fragrance composition. In an alternative embodiment, any one of the isomeric alkadienal or isomeric alkadienenitrile compositions of this disclosure is provided in a flavor composition.

[0022] As described herein, this disclosure relates to a composition comprising at least one isomeric alkadienal or at least one isomeric alkadienenitrile in an amount effective to impart a fragrance or flavor to the composition.

[0023] Also, as described herein, this disclosure relates to a fragrance or flavor composition comprising at least one isomeric alkadienal or at least one isomeric alkadienenitrile in an amount effective to impart a fragrance or flavor to the composition.

[0024] In the composition and the fragrance or flavor composition, the at least one isomeric alkadienal or the at least one isomeric alkadienenitrile has from about 0.1 percent to about 99.5 percent of E,Z isomers, from about 0.1 percent to about 99.5 percent of Z,E isomers, from about 0.1 percent to about 99.5 percent of E,E isomers, and from about 0.1 percent to about 99.5 of Z,Z isomers, based on the total Z and E isomers in the composition or in the fragrance or flavor composition.

[0025] In an embodiment, in the composition and the fragrance or flavor composition, the at least one isomeric alkadienal or the at least one isomeric alkadienenitrile has from about 10 percent to about 98 percent of E,Z isomers, preferably from about 15 percent to about 98 percent of E,Z isomers, and more preferably from about 20 percent to about 98 percent of E,Z isomers; from about 0.5 percent to about 40 percent of Z,E isomers, preferably from about 0.5 percent to about 38 percent of Z,E isomers, and more preferably from about 0.5 percent to about 35 percent of Z,E isomers; from about 0.1 percent to about 40 percent of E,E isomers, preferably from about 0.1 percent to about 38 percent of E,E isomers, and more preferably from about 0.1 percent to about 35 percent of E,E isomers; and from about 2 percent to about 40 percent of Z,Z isomers, preferably from about 2 percent to about 38 percent of Z,Z isomers, and more preferably from about 2 percent to about 35 percent of Z,Z isomers; based on the total Z and E isomers in the composition or in the fragrance or flavor composition.

[0026] Further, in an embodiment, the at least one isomeric alkadienal or the at least one isomeric alkadienenitrile has from about 10 percent to about 98 percent of E,Z isomers, preferably from about 20 percent to about 90 percent of E,Z isomers, and more preferably from about 30 percent to about 80 percent of E,Z isomers, based on the total Z and E isomers in the composition.

[0027] In an embodiment, this disclosure relates in part to isomeric alkadienals and isomeric alkadienenitriles and their use in fragrance and flavor compositions. In particular, this disclosure provides isomeric 2,6-, 2,7-, 2,8-, 2,9-, 2,10-, 2,11-, 2,12-, 2,13- and 2,14-alkadienals and isomeric 2,6-, 2,7-, 2,8-, 2,9-, 2,10-, 2,11-, 2,12-, 2,13- and 2,14-alkadienenitriles and their use in fragrance and flavor compositions. More, in particular, this disclosure provides the use of 2-trans and 6-,7-,8-,9-,10-, 11-, 12-, 13- and 14-cis alkadienal isomers and 2-trans and 6-,7-,8-,9-,10-, 11-, 12-, 13- and 14-cis alkadienenitrile isomers for use in perfumery and flavor applications.

[0028] In another embodiment, this disclosure relates in part to a fragrance or flavor composition comprising an effective amount of at least one isomeric alkadienal or at least one isomeric alkadienenitrile. The at least one isomeric alkadienal includes, for example, E,Z-2,6-octadienal, E,Z-2,7-nonadienal, E,Z-2,6-decadienal, E,Z-2,7-decadienal, E,Z-2,7-undecadienal, E,Z-2,8-undecadienal, E,Z-2,10-tridecadienal, E,Z-2,7-tetradecadienal, E,Z-2,11-tetradecadienal, 5-methyl-E,Z-2,7-nonadienal, or 5-methyl-E,Z-2,7-decadienal. The at least one isomeric alkadienenitrile includes, for example, E,Z-2,6-octadienenitrile, E,Z-2,7-nonadienenitrile, E,Z-2,7-decadienenitrile, E,Z-2,8-decadienenitrile, E,Z-2,8-undecadienenitrile, E,Z-2,9-dodecadienenitrile, E,Z-2,10-tridecadienenitrile, or E,Z-2,11-tetradecadienenitrile. The composition may also have smaller amounts of other isomers related to each alkadienal or alkadienenitrile as described herein.

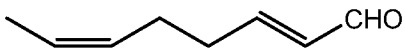
[0029] Illustrative isomeric alkadienals of this disclosure include, for example, isomers of 2,6-alkadienal, 2,7-alkadienal, 2,8-alkadienal, 2,9-alkadienal, 2,10-alkadienal, 2,11-alkadienal, 2,12-alkadienal, 2,13-alkadienal, 2,14-alkadienal, and the like.

[0030] More particularly, illustrative isomers of 2,6-alkadienal include, for example, the isomers of 2,6-heptadienal, 2,6-octadienal, 2,6-nonadienal, 2,6-decadienal, 2,6-undecadienal, 2,6-dodecadienal, 2,6-tridecadienal, 2,6-tetradecadienal, 2,6-pentadecadienal, and the like. Illustrative isomers of 2,7-alkadienal include, for example, the isomers of 2,7-octadienal, 2,7-nonadienal, 2,7-decadienal, 2,7-undecadienal, 2,7-dodecadienal, 2,7-tridecadienal, 2,7-tetradecadienal, 2,7-pentadecadienal, and the like. Illustrative isomers of 2,8-alkadienal include, for example, the isomers of 2,8-nonadienal, 2,8-decadienal, 2,8-undecadienal, 2,8-dodecadienal, 2,8-tridecadienal, 2,8-tetradecadienal, 2,8-pentadecadienal, and the like. Illustrative isomers of 2,9-alkadienal include, for example, the isomers of 2,9-decadienal, 2,9-undecadienal, 2,9-dodecadienal, 2,9-tridecadienal, 2,9-tetradecadienal, 2,9-pentadecadienal, and the like. Illustrative isomers of 2,10-alkadienal include, for example, the isomers of 2,10-undecadienal, 2,10-dodecadienal, 2,10-tridecadienal, 2,10-tetradecadienal, 2,10-pentadecadienal, and the like. Illustrative isomers of 2,11-alkadienal include, for example, the

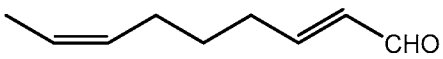
isomers of 2,11-dodecadienal, 2,11-tridecadienal, 2,11-tetradecadienal, 2,11-pentadecadienal, and the like. Illustrative isomers of 2,12-alkadienal include, for example, the isomers of 2,12-tridecadienal, 2,12-tetradecadienal, 2,12-pentadecadienal, and the like. Illustrative isomers of 2,13-alkadienal include, for example, the isomers of 2,13-tetradecadienal, 2,13-pentadecadienal, and the like. Illustrative isomers of 2,14-alkadienal include, for example, the isomers of 2,14-pentadecadienal, and the like.

[0031] Preferred isomeric alkadienals of this disclosure include, for example, E,Z-2,6-octadienal, E,Z-2,7-nonadienal, E,Z-2,6-decadienal, E,Z-2,7-decadienal, E,Z-2,7-undecadienal, E,Z-2,8-undecadienal, E,Z-2,10-tridecadienal, E,Z-2,7-tetradecadienal, E,Z-2,11-tetradecadienal, 5-methyl-E,Z-2,7-nonadienal, and 5-methyl-E,Z-2,7-decadienal.

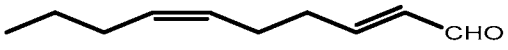
[0032] Preferred isomeric alkadienals of this disclosure can be represented by the formula



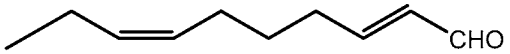
E,Z-2,6-octadienal



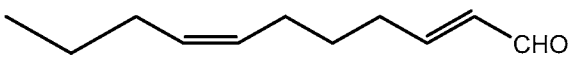
E,Z-2,7-nonadienal



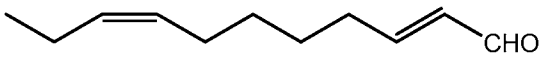
E,Z-2,6-decadienal



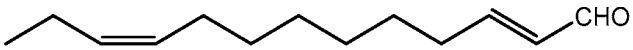
E,Z-2,7-decadienal



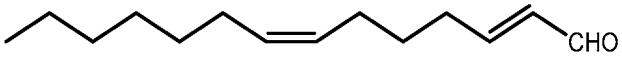
E,Z-2,7-undecadienal



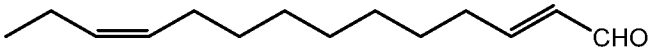
E,Z-2,8-undecadienal



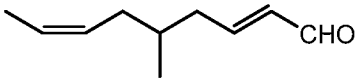
E,Z-2,10-tridecadienal



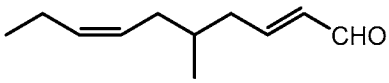
E,Z-2,7-tetradecadienal



E,Z-2,11-tetradecadienal



5-methyl-E,Z-2,7-nonadienal



5-methyl-E,Z-2,7-decadienal

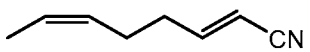
[0033] Illustrative isomeric alkadienenitriles of this disclosure include, for example, isomers of 2,6-alkadienenitrile, 2,7-alkadienenitrile, 2,8-alkadienenitrile, 2,9-alkadienenitrile, 2,10-alkadienenitrile, 2,11- alkadienenitrile, 2,12-alkadienenitrile, 2,13-alkadienenitrile, 2,14-alkadienenitrile, and the like.

[0034] More particularly, illustrative isomers of 2,6-alkadienenitrile include, for example, the isomers of 2,6-heptadienenitrile, 2,6-octadienenitrile, 2,6-nonadienenitrile, 2,6-decadienenitrile, 2,6-undecadienenitrile, 2,6-dodecadienenitrile, 2,6-tridecadienenitrile, 2,6-tetradecadienenitrile, 2,6-pentadecadienenitrile, and the like. Illustrative isomers of 2,7-alkadienenitrile include, for example, the isomers of 2,7-octadienenitrile, 2,7-nonadienenitrile, 2,7-decadienenitrile, 2,7-undecadienenitrile, 2,7-dodecadienenitrile, 2,7-

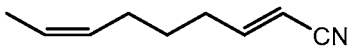
tridecadienenitrile, 2,7-tetradecadienenitrile, 2,7-pentadecadienenitrile, and the like. Illustrative isomers of 2,8-alkadienenitrile include, for example, the isomers of 2,8-nonadienenitrile, 2,8-decadienenitrile, 2,8-undecadienenitrile, 2,8-dodecadienenitrile, 2,8-tridecadienenitrile, 2,8-tetradecadienenitrile, 2,8-pentadecadienenitrile, and the like. Illustrative isomers of 2,9-alkadienenitrile include, for example, the isomers of 2,9-decadienenitrile, 2,9-undecadienenitrile, 2,9-dodecadienenitrile, 2,9-tridecadienenitrile, 2,9-tetradecadienenitrile, 2,9-pentadecadienenitrile, 2,9-pentadecadienenitrile, and the like. Illustrative isomers of 2,10-alkadienenitrile include, for example, the isomers of 2,10-undecadienenitrile, 2,10-dodecadienenitrile, 2,10-tridecadienenitrile, 2,10-tetradecadienenitrile, 2,10-pentadecadienenitrile, and the like. Illustrative isomers of 2,11-alkadienenitrile include, for example, the isomers of 2,11-dodecadienenitrile, 2,11-tridecadienenitrile, 2,11-tetradecadienenitrile, 2,11-pentadecadienenitrile, and the like. Illustrative isomers of 2,12-alkadienenitrile include, for example, the isomers of 2,12-tridecadienenitrile, 2,12-tetradecadienenitrile, 2,12-pentadecadienenitrile, and the like. Illustrative isomers of 2,13-alkadienenitrile include, for example, the isomers of 2,13-tetradecadienenitrile, 2,13-pentadecadienenitrile, and the like. Illustrative isomers of 2,14-alkadienenitrile include, for example, the isomers of 2,14-pentadecadienenitrile, and the like.

[0035] Preferred isomeric alkadienenitriles of this disclosure include, for example, E,Z-2,6-octadienenitrile, E,Z-2,7-nonadienenitrile, E,Z-2,7-decadienenitrile, E,Z-2,8-decadienenitrile, E,Z-2,8-undecadienenitrile, E,Z-2,9-dodecadienenitrile, E,Z-2,10-tridecadienenitrile, and E,Z-2,11-tetradecadienenitrile.

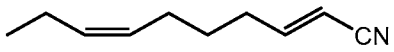
[0036] Preferred isomeric alkadienenitriles of this disclosure can be represented by the formula



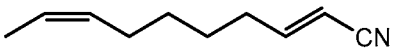
E,Z- 2,6-octadienenitrile



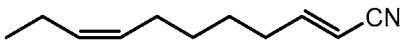
E,Z-2,7-nonadienenitrile



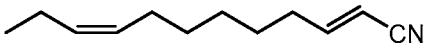
E,Z-2,7-decadienenitrile



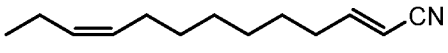
E,Z-2,8-decadienenitrile



E,Z-2,8-undecadienenitrile



E,Z-2,9-dodecadienenitrile



E,Z-2,10-tridecadienenitrile



E,Z-2,11-tetradecadienenitrile

[0037] For the fragrance compositions of this disclosure, the at least one isomeric alkadienal or the at least one isomeric alkadienenitrile is present in an amount of at least about 1 ppm by weight, based on the total weight of the composition, to impart a fragrance to the composition.

[0038] For the flavor compositions of this disclosure, the at least one isomeric alkadienal or the at least one isomeric alkadienenitrile is present in an amount of at least about 0.1 ppm by weight, based on the total weight of the composition, to impart a flavor to the composition.

[0039] For the fragrance compositions of this disclosure, the at least one isomeric alkadienal or the at least one isomeric alkadienenitrile can be combined with geraniol, geranyl acetate, linalool, linalyl acetate, tetrahydrolinalool, citronellol, citronellyl acetate, dihydromyrcenol, dihydromyrcenyl acetate, tetrahydromyrcenol, terpineol, terpinyl acetate, nopol, nopyl acetate, 2-phenylethanol, 2-phenylethyl acetate, benzyl alcohol, benzyl acetate, benzyl salicylate, styrallyl acetate, benzyl benzoate, amyl salicylate, dimethyl-benzyl carbinol, trichloromethylphenyl carbinyl acetate, p-tert-butylcyclohexyl acetate, isononyl acetate, vetiveryl acetate, vetiverol, alpha-hexylcinnam- aldehyde, 2-methyl-3-(p-tert-butylphenyl)-propanal, 2-methyl-3-(p-isopropylphenyl)-propanal, 3-(p-tert-butylphenyl)-propanal, tricyclodecenyl acetate, tricyclodecenyl propionate, 4-(4-hydroxy-4-methylpentyl)-3-cyclohexenecarbaldehyde, 4-(4-methyl-3-pentenyl)-3-cyclohexenecarbaldehyde, 4-acetoxy-3-pentyl-tetrahydropyran, 3-carboxymethyl-2-pentylcyclopentane, 2-n-heptylcyclopentanone, 3-methyl-2-pentyl-2-cyclopentenone, n-decanal, n-dodecanal, 9-decen-1-0l, phenoxyethylisobutyrate, phenylacetaldehydedi-methylacetal, phenylacetaldehyde-diethylacetal, geranylnitrile, citronellylnitrile, cedrylacetate, 3-isocamphylcyclohexanol, cedrylmethyl ether, isolongifolanone, aubepinitrile, aubepine, heliotripine, coumarin, eugenol, vanillin, diphenyl oxide, hydroxycitronellal, ionones, methylionones, isomethylionones, irones, cis-3-hexenol and esters of the latter, indan-musks, tetraline-musks, isochromane-musks, macrocyclic ketones, macrolactone-musks, ethylene brassylate, or aromatic nitromusks, to impart a fragrance to the composition.

[0040] For the flavor compositions of this disclosure, the at least one isomeric alkadienal or the at least one isomeric alkadienenitrile can be combined with geraniol, geranyl acetate, linalool, linalyl acetate, citronellol, citronellyl acetate, terpineol, terpinyl acetate, 2-phenylethanol, 2-phenylethyl acetate, benzyl alcohol, benzyl acetate, benzyl salicylate, heliotropine, benzaldehyde, anisaldehyde, benzyl salicylate, e, n-decanal, n-dodecanal, 9-decen-1-ol, coumarin, eugenol, vanillin, hexanal, eucalyptol, ionones, methylionones, isomethylionones, irones, cis-3-hexenol and esters of the latter, acetaldehyde, ethyl acetate, ethyl butyratecinnamic aldehyde, cuminic aldehyde, furfural, cinnamic aldehyde, maltol, ethyl maltol,

dimethyl sulfide, gamma decalactone, gamma undecalactone, diacetyl, ethyl valerate, damascone, damascenone, methyl caproate, cyclotene, butyric acid, acetoin, delta decalactone, furaneol, acetoin, benzodihydro pyrone, 2,6-nonadienal, melonal or methyl heptane carbonate, to impart a flavor to the composition.

[0041] In an embodiment, this disclosure also relates in part to the preparation of alkadienals and alkadienenitriles for use in fragrance and flavor formulations. These alkadienals and alkadienenitriles have a range of unexpected and unobvious organoleptic properties described as fresh, strong, fruity, floral, and highly diffusive. These notes are highly desirable in creating consumer acceptable fragrances and flavors. Additionally, these alkadienals and alkadienenitriles are extremely cost effective since they possess high odor intensity and can be effective at imparting the desirable organoleptic effect to a fragrance or flavor at a very low concentration.

[0042] In accordance with this disclosure, the isomeric alkadienals and the isomeric alkadienenitriles of this disclosure can be prepared by conventional processes. The compositions of this disclosure and the fragrance and flavor compositions of this disclosure can also be prepared by conventional processes.

[0043] The isomeric alkadienals of this disclosure have a range of fresh, watery, ozone, iris, aldehydic notes of exceptional strength. They also have fresh citrus, fruity, spicy taste suited to enhance a range of flavors for the food products.

[0044] As described herein, this disclosure provides a consumer product containing the fragrance or flavor composition comprising at least one isomeric alkadienal or at least one isomeric alkadienenitrile in an amount effective to impart a fragrance or flavor to the consumer product.

[0045] As further described herein, this disclosure provides a method of imparting a fragrance or flavor to a consumer product comprising adding to the consumer product a fragrance or flavor composition comprising at least one

isomeric alkadienal or at least one isomeric alkadienenitrile in an amount effective to impart a fragrance or flavor to the consumer product.

[0046] Illustrative consumer fragrance products useful in this disclosure include, for example, a candle, an air care product, a perfume, a cologne, a soap, a personal care product, a detergent, a fabric care product, a household cleaning product, and the like.

[0047] More particularly, illustrative consumer fragrance products include a soap, a detergent, an air freshener, a room spray, a pomander, a candle, and a cosmetic comprising a cream, an ointment, a toilet water, a pre-shave lotion, an aftershave lotion, a talcum powder, a hair-care agent, a body deodorant, and an anti-perspirant.

[0048] Preferred illustrative consumer fragrance products include an air care product, a perfume, and a cologne.

[0049] Illustrative consumer flavor products useful in this disclosure include, for example, a beverage, a powder or semi-frozen/frozen concentrate for a drink, a candy, a sugarless candy, a chocolate, a chewing gum, a bubble gum, a condiment, a spice, a seasoning, a dry cereal, an oatmeal, a granola bar, an alcoholic beverage, an energy beverage, a juice, a tea, a coffee, a salsa, a gel bead, a film strip for halitosis, a lozenge, a cough drop, a throat lozenge, a throat spray, a toothpaste, and a mouth rinse.

[0050] More particularly, illustrative consumer flavor products include a beverage, a dairy product, a confectionary, a cereal, a snack, and a soup.

[0051] Preferred illustrative consumer flavor products include a beverage, a chewing gum, and a bubble gum.

[0052] In an embodiment, one or more of the isomeric alkadienals or isomeric alkadienenitriles of the present disclosure, alone or in combination with other co-

ingredients, can be employed in fragrance and flavor compositions, solvents, media and the like. As indicated herein, the use of such isomeric alkadienals or isomeric alkadienenitriles is applicable to a wide variety of products in the fragrance industry such as, but not limited to: candles; air fresheners; perfumes; colognes; personal care products such as soaps, deodorants, shampoos, conditioners, shower gels and shaving lotions; cosmetics such as lotions and ointments; as well as detergents; fabric care products and household cleaner/cleaning agents. Also, as indicated herein, the use of such isomeric alkadienals or isomeric alkadienenitriles is also applicable to a wide variety of products in the flavor industry such as, but not limited to: foodstuffs such as baked goods, dairy products, desserts, etc.; beverages such as juices, sodas, teas, flavored waters, fruit-based "smoothie" drinks, milk-based drinks, etc.; confectionaries such as sweets, hard candy, gums; and gelatinous materials, snacks, desserts, pharmaceuticals, oral care products and the like.

[0053] As the isomeric alkadienals or isomeric alkadienenitriles of the present disclosure are useful ingredients for the perfuming or flavoring of various products, the present disclosure also concerns all different forms of the isomeric alkadienals or isomeric alkadienenitriles that can be advantageously employed in perfumery or in flavors. Such forms include a composition including isomeric alkadienals or isomeric alkadienenitriles and a solvent commonly used in perfumery or in flavor compositions. Examples of such solvents used in perfumery are known in the art and include, but are not limited to: dipropyleneglycol, diethyl phthalate, isopropyl myristate, benzyl benzoate, 2-(2-ethoxy)-1-ethanol, ethyl citrate, ethanol, water/ethanol mixtures, limonene or other terpenes, isoparaffins such as those known under the trademark Isopar™ (ExxonMobil Chemicals, Houston, Tex.), and glycol ethers and glycol ether esters such as those known under the trademark Dowanol™ (Dow Chemical Company, Midland Mich.). Examples of solvents commonly used in flavors are also known in the art and include, but are not limited to: propylene glycol, triacetin, triethyl citrate, benzyl alcohol, benzyl benzoate, ethanol, vegetable oils and terpenes.

[0054] The isomeric alkadienals or isomeric alkadienenitriles of the present disclosure are particularly valuable as being capable of imparting green, fruity, floral, or woody notes to a fragrance composition. For example, E,Z-2,7-decadienenitrile can be used to impart a green, fruity, floral, woody characteristic to fragrance compositions. For fragrance applications, typical concentrations of the isomeric alkadienals or isomeric alkadienenitriles are on the order of 0.01 ppm to 1% by weight, or more, based on the total weight of the composition into which the fragrance compound is incorporated. Those skilled in the art will be able to employ the desired level of the compounds of the disclosure to provide the desired fragrance/flavor and intensity. In general, the isomeric alkadienals or isomeric alkadienenitriles of the present disclosure will be used in relatively small amounts, typically via significant dilutions due to their high-impact, diffusive properties.

[0055] The perfuming compositions according to the disclosure may be in the form of a simple mixture of the various co-ingredients and solvents, or also in the form of a biphasic system such as an emulsion or microemulsion. Such systems are well-known to persons skilled in the art.

[0056] As described herein, suitable perfumed end products that can include a composition of the present disclosure including, but are not limited to: 1) candles, air fresheners, perfumes and colognes, 2) personal care products such as soaps, deodorants, shampoos, conditioners, shower gels and shaving lotions; 3) cosmetics such as lotions and ointments; as well as 4) detergents, fabric care products and household cleansers/cleaning agents. Depending on the solvents that may be present in some end products, it may be necessary to protect the isomeric alkadienals or isomeric alkadienenitriles from premature degradation, for example by encapsulation or with a stabilizer, or other methods well-known to those of ordinary skill in the art.

[0057] The compositions of the present disclosure can also be added to, for example: 1) fragrance products; perfume; eau de perfume; eau de toilet; eau de cologne; and the like; skin-care cosmetics, face washing creams, varnishing creams, cleansing creams, cold creams, massage creams and oils, milky lotions,

skin toning lotion, cosmetic solutions, packs, makeup remover, and the like; 2) makeup cosmetics, foundations, face powders, pressed powders, talcum powders, lip sticks, lip creams, cheek powders, eyeliners, mascara, eye shadows, eyebrow pencils, eye packs, nail enamels, nail enamel removers, and the like; 3) hair care cosmetics, pomades, brilliantines, setting lotions, hair sticks, hair solids, hair oils, hair treatments, hair creams, hair tonics, hair liquids, hair sprays, hair restorers, hair dyes, and the like; 4) sunburn cosmetics, suntan products, sunscreen products, and the like; 5) medical cosmetics, antiperspirants, after-shave lotions and gels, permanent wave lotions, medicated soaps, medicated shampoos, medicated skin care products, and the like; 6) hair care products, shampoos, rinses, shampoo-including-rinses, hair conditioners, hair treatments, hair packs, and the like; 7) as soaps, toilet soaps, bath soaps, perfumed soaps, transparent soaps, synthetic soaps, and the like; 8) body washing soaps, body soaps, body shampoos, hand soaps, and the like; 9) bathing, bathing agents (e.g., bath salts, bath tablets, bath liquids, and the like), foam baths (bubble bath and the like), bath oils (e.g., bath perfumes, bath capsules and the like), milk baths, bath gels, bath cubes, and the like; 10) detergents, heavy duty detergents for clothes, light duty detergents for clothes, liquid detergents, laundering soaps, compact detergents, powder soaps, and the like; 11) softening finishing agents, softeners, furniture care products, and the like; and deodorants, aromatic substances and the like; 12) insect repellent, insecticides, and the like; 13) oral care products such as tooth pastes, mouth cleaners, mouth wash, troches, chewing gums, and the like; and 14) pharmaceutical products, poultices, external skin care pharmaceuticals such as ointments, internal administration medicines, and the like.

[0058] Furthermore, the compositions of the disclosure, in any of their forms, can also be incorporated into flavoring compositions or flavored products, together with co-ingredients or adjuvants, e.g., to impart taste to flavoring compositions, foods or beverages. Consequently, the use of the compositions of the present disclosure, in any of their forms, as flavoring ingredients, is another object of the present disclosure, as is a flavor composition comprising an isomeric alkadienal or isomeric alkadienenitrile of the present disclosure.

[0059] The flavor compositions according to the disclosure may be in the form of a simple mixture of flavoring ingredients or in an encapsulated form, e.g., a flavoring composition entrapped into a solid matrix that may comprise wall-forming and plasticizing materials such as mono-, di- or trisaccharides, natural or modified starches, hydrocolloids, cellulose derivatives, polyvinyl acetates, polyvinylalcohols, proteins or pectins. Examples of particularly useful matrix materials include, for example, sucrose, glucose, lactose, levulose, fructose, maltose, ribose, dextrose, isomalt, sorbitol, mannitol, xylitol, lactitol, maltitol, pentatol, arabinose, pentose, xylose, galactose, maltodextrin, dextrin, chemically modified starch, hydrogenated starch hydrolysate, succinylated or hydrolysed starch, agar, carrageenan, gum arabic, gum accacia, tragacanth, alginates, methyl cellulose, carboxymethyl cellulose, hydroxyethyl cellulose, hydroxypropylinethyl cellulose, derivatives, gelatin, agar, alginate and mixtures thereof. Encapsulation is well-known to persons skilled in the art, and may be performed, for instance, using techniques such as spray-drying, agglomeration or extrusion, or coating encapsulation, including coacervation and complex coacervation techniques.

[0060] The compositions of the present disclosure are particularly valuable as being capable of imparting tropical, berry, bakery, caramel, watermelon, and vegetable notes, to flavor ingredients. Specifically, E,Z-2,7-undecadienals and E,Z-2,8-undecadienals can be used to impart a watermelon characteristic to flavor compositions. For flavor applications, typical concentrations of isomeric alkadienals or isomeric alkadienenitriles are on the order of 0.1 ppb-100 ppm. Preferably, applicable concentrations fall in the range of 0.001 ppm-0.01 ppm. Those skilled in the art will be able to employ the desired level of the isomeric alkadienals or isomeric alkadienenitriles to provide the desired flavor and intensity. Much higher concentrations may be employed when the compounds are used in concentrated flavors and flavor compositions.

[0061] In an embodiment, a composition of the present disclosure is used in chewing and bubble gums and confectionaries (e.g., hard or soft candies or lozenges). Chewing gum compositions typically include one or more gum bases and other standard components such as flavoring agents, softeners, sweeteners and

the like. Flavoring agents for use in chewing gum compositions are well known and include natural flavors such as citrus oils, peppermint oil, spearmint oil, oil of wintergreen, natural menthol, cinnamon, ginger and the like; artificial flavors such as menthol, carvone, limonene, cinnamic aldehyde, linalool, geraniol, ethyl butyrate, and the like. As is known in the art, the ingredients used in chewing gum compositions can include sweeteners, both natural and artificial and both sugar and sugarless. Sweeteners are typically present in the chewing gum compositions in amounts of from about 20% to 80% by weight, preferably from about 30% to 60% by weight, based on the total weight of the chewing gum composition. Sugarless sweeteners include, but are not limited sugar alcohols such as Sorbitol, manifold, xylitol, hydrogenated starch hydrolysates, malitol and the like. High intensity sweeteners such as sucralose, aspartame, neotame, salts of acesulfame, and the like, when employed, are typically present up to about 1.0% by weight.

[0062] In an alternative embodiment, a composition of the present disclosure is included in an oral personal care product (e.g., a mouthwash or toothpaste). For example, a mouthwash can be prepared by dissolving a flavor composition (e.g., a flavor cocktail) (liquid or powder) that includes a composition of the present disclosure in a solvent (e.g., water) that further includes, for example, a flavor such as menthol and a surfactant; and then mixing the resulting solution with, for example, an aqueous erythritol solution.

[0063] In one embodiment of the present disclosure, a composition of the present disclosure is added, directly or indirectly, to a pharmaceutical dosage form (e.g., a tablet, capsule, drop or lozenge) that contains a therapeutically active agent (e.g., a medicament). For example, one embodiment of the present disclosure provides a cough drop or lozenge containing one or more compositions of the present disclosure and, optionally, further containing menthol or other medicaments for the treatment of sore throat, coughing or other upper respiratory ailments.

[0064] One or more of the present compositions can also be added to, for example, compositions for the preparation of: 1) carbonated or non-carbonated

fruit beverages, carbonated cola drinks, wine coolers, fruit liquors, cordials, milk drinks, smoothie drinks, flavored water, tropical alcoholic and "virgin" drink mixes (e.g. margarita, pina colada or "rum-runner" concentrates), and powders for drinks (e.g., powdered sports or "hydrating" drinks); 2) frozen confectioneries such as ice creams, sherbets, and ice-lollies, hard candies, soft candies, taffies, chocolates, and sugarless candies; 3) desserts such as jelly and pudding; 4) confectioneries such as cakes, cookies, chewing gums and bubble gums; 5) condiments, spices and seasonings, dry cereals, oatmeals, and granola bars; 6) alcoholic beverages, energy beverages, juices, teas, coffees, salsa, and gel beads; 7) film strips for halitosis, and oral personal care products; 8) gelatin candies, pectin candies, starch candies, lozenges, cough drops, throat lozenges, throat sprays, and toothpastes.

[0065] The present compositions may also be added to, for example; 1) confectioneries such as buns with jam filling, and bars of sweet jellied paste; 2) jams; candies; 3) breads; 4) beverages such as green tea, oolong tea, black tea, persimmon leaf tea, Chamomile tea, Sasa veitchii tea, mulberry leaf tea, Houttuynia cordata tea, Puer tea, Mate tea, Rooibos tea, Gimunema tea, Guava tea, coffee, espresso, and hot and cold espresso and coffee products obtained by mixing espresso and/or coffee with milk, water or other liquids suitable for oral consumption (e.g., lattes, cafe au lait, cafe mocha) and cocoa; 5) soups such as Japanese flavor soup, western flavor soup, and Chinese flavor soup; 6) seasonings; 7) various instant beverages and foods; 8) various snack foods; and 9) other compositions for oral use.

[0066] As described herein, the compositions of this disclosure can be used in a broad range of fragrance and flavor applications, e.g., fine fragrances, household products, laundry products, personal care products and cosmetics. The flavor use can be in foodstuffs such as soups, beverages, dairy products, confectionaries, cereals, snack, etc. These compositions can be employed in widely varying amounts, depending upon the specific application and on the nature and amounts of other odor or taste carrying ingredients. But because of the exceptional strength of these compositions, the effect can be achieved at a very low level of incorporation.

[0067] Fragrances in consumer products provide several functions. They mask base odors, provide aesthetic pleasure and signal product attributes and function to the user, e.g., hygiene, cleanliness, mildness. Notwithstanding these benefits, it is also true that perfumes can cause a myriad of problems within products they have been added to, e.g., discoloration, phase separation, problems such as irritation and occasional allergic reaction to the user. Additionally, fragrances represent one of the more expensive components of the product and many fragrance ingredients may not be easily biodegradable. Over the years, perfume levels in many consumer products have increased by the popular demand but at the same time consumers have also become more critical of the fragranced products they purchase and use.

[0068] Therefore, in an embodiment, this disclosure provides high intensity consumer acceptable fragrances and desirable hedonics at a much lower concentration than achieved before. This lowering of fragrance concentration in consumer products by an order of magnitude has the benefit of cost saving, less interference with the physical properties of the product base, minimizing toxicological implications on the user, and lowering the environmental impact of chemicals used.

[0069] Fragrance materials and mixtures of fragrance materials which can be used in combination with the compositions of this disclosure for manufacturing perfume compositions include, for example, natural products, such as essential oils, absolutes, resinoids, resins, concretes, etc., but also synthetic fragrance materials such as hydrocarbons, alcohols, aldehydes, ketones, ethers, acids, esters, acetals, ketals, nitriles, etc., including saturated and unsaturated compounds, aliphatic carbocyclic and heterocyclic compounds.

[0070] Examples of fragrance materials which can be used in combination with the compositions of the disclosure include, for example, geraniol, geranyl acetate, linalool, linalyl acetate, tetrahydrolinalool, citronellol, citronellyl acetate, dihydromyrcenol, dihydromyrcenyl acetate, tetrahydromyrcenol, terpineol, terpinyl acetate, nopol, nopyl acetate, 2-phenylethanol, 2-phenylethyl acetate, benzyl

alcohol, benzyl acetate, benzyl salicylate, styrallyl acetate, benzyl benzoate, amyl salicylate, dimethyl-benzyl carbinol, trichloromethylphenyl carbinyl acetate, p-tert-butylcyclohexyl acetate, isononyl acetate, vetiveryl acetate, vetiverol, alpha-hexylcinnam- aldehyde, 2-methyl-3-(p-tert-butylphenyl)-propanal, 2-methyl-3-(p-isopropylphenyl)-propanal, 3-(p-tert-butylphenyl)-propanal, tricyclodecenyl acetate, tricyclodecenyl propionate, 4-(4-hydroxy-4-methylpentyl)-3-cyclohexenecarbaldehyde, 4-(4-methyl-3-pentenyl)-3-cyclohexenecarbaldehyde, 4-acetoxy-3-pentyl- tetrahydropyran, 3-carboxymethyl-2-pentylcyclopentane, 2-n-heptylcyclopentanone, 3-methyl-2-pentyl-2-cyclopentenone, n-decanal, n-dodecanal, 9-decen-1-01, phenoxyethylisobutyrate, phenylacetaldehydedi-methylacetal, phenylacetaldehyde-diethylacetal, geranylnitrile, citronellylnitrile, cedrylacetate, 3-isocamphylcyclohexanol, cedrylmethyl ether, isolongifolanone, aubepinitrile, aubepine, heliotripine, coumarin, eugenol, vanillin, diphenyl oxide, hydroxycitronellal, ionones, methylionones, isomethylionones, irones, cis-3-hexenol and esters of the latter, indan-musks, tetraline-musks, isochromane-musks, macrocyclic ketones, macrolactone-musks, ethylene brassylate, aromatic nitromusks, and the like.

[0071] Auxiliary substances and solvents which can be used in perfume compositions of this disclosure include, for example, ethanol, isopropanol, dipropylene glycol, dipropyleneglycol monomethyl ether, diethylphthalate, and the like.

[0072] The quantities in which the ccompositions of this disclosure can be used in perfume compositions or in products to be perfumed can vary within wide limits and depend inter alia on the nature of the product in which the fragrance material is used, on the nature and quantity of the other components in the perfume composition and on the odor effect which is aimed at. It is therefore only possible to specify very rough limits, which, however, provide sufficient information for the specialist to be able to use the compounds according to the disclosure independently. In most cases a quantity of only 1 ppm in a perfume composition will already be sufficient to obtain a clearly perceptible odor effect. On the other hand, to achieve special odoriferous effects it is possible to use quantities of 100,

1000, 5000 ppm or even more in a composition. In products perfumed with such compositions, these concentrations are proportionately lower, depending on the quantity of composition used in the product.

[0073] There are three basic stages of a fragrance. The first stage (i.e., top notes) is the first impression that a fragrance gives to a customer. This initial stage is the most volatile. In the second stage (i.e., middle notes), a few moments after the application of a fragrance, the heart is revealed. This modifying part of the fragrance has medium volatility. In the third stage (i.e., base notes), after a fragrance dries down, these notes are more pronounced. This part of the fragrance is the longest lasting. The balance between these three groups is very important. In a well-balanced fragrance, it is important to understand what group or groups are the most important for a particular application. The fragrance compositions of this disclosure exemplify a desirable balance between these three groups for desired applications.

[0074] Flavor materials and mixtures of flavor materials which can be used in combination with the compositions of this disclosure for manufacturing flavor compositions are, for example, natural products, such as essential oils, absolutes, resinoids, resins, concretes, etc., but also synthetic flavor materials such as hydrocarbons, alcohols, aldehydes, ketones, ethers, acids, esters, acetals, ketals, etc., including saturated and unsaturated compounds, aliphatic carbocyclic and heterocyclic compounds.

[0075] Examples of flavor materials which can be used in combination with the compositions of the disclosure include, for example, geraniol, geranyl acetate, linalool, linalyl acetate, citronellol, citronellyl acetate, terpineol, terpinyl acetate, 2-phenylethanol, 2-phenylethyl acetate, benzyl alcohol, benzyl acetate, benzyl salicylate, heliotropine, benzaldehyde, anisaldehyde, benzyl salicylate, e, n-decanal, n-dodecanal, 9-decen-1-01, coumarin, eugenol, vanillin, hexanal, eucalyptol, ionones, methylionones, isomethylionones, irones, cis-3-hexenol and esters of the latter, acetaldehyde, ethyl acetate, ethyl butyratecinnamic aldehyde, cuminic aldehyde, furfural, cinnamic aldehyde, maltol, ethyl maltol, dimethyl

sulfide, gamma decalactone, gamma undecalactone, diacetyl, ethyl valerate, damascone, damascenone, methyl caproate, cyclotene, butyric acid, acetoin, delta decalactone, furaneol, acetoin, benzodihydro pyrone, 2,6-nonadienal, melonal, methyl heptane carbonate, and the like.

[0076] Auxiliary substances and solvents which can be used in flavor compositions of this disclosure include, for example, ethanol, propylene glycol, and the like.

[0077] Preferred embodiments of this disclosure are described below.

[0078] A composition comprising at least one isomeric alkadienal or at least one isomeric alkadienenitrile in an amount effective to impart a fragrance or flavor to the composition.

[0079] A fragrance or flavor composition comprising at least one isomeric alkadienal or at least one isomeric alkadienenitrile in an amount effective to impart a fragrance or flavor to the composition.

[0080] A method of imparting a fragrance or flavor to a consumer product comprising adding to the consumer product a fragrance or flavor composition comprising at least one isomeric alkadienal or at least one isomeric alkadienenitrile in an amount effective to impart a fragrance or flavor to the consumer product.

[0081] The composition of paragraph [0079], the fragrance or flavor composition of paragraph [0080], and the method of paragraph [0081], wherein the at least one isomeric alkadienal or the at least one isomeric alkadienenitrile has from about 0.1 percent to about 99.5 percent of E,Z isomers, from about 0.1 percent to about 99.5 percent of Z,E isomers, from about 0.1 percent to about 99.5 percent of E,E isomers, and from about 0.1 percent to about 99.5 of Z,Z isomers, based on the total Z and E isomers in the composition.

[0082] The composition of paragraph [0079], the fragrance or flavor composition of paragraph [0080], and the method of paragraph [0081], wherein the at least one isomeric alkadienal or the at least one isomeric alkadienenitrile has from about 10 percent to about 98 percent of E,Z isomers, from about 0.5 percent to about 40 percent of Z,E isomers, from about 0.1 percent to about 40 percent of E,E isomers, and from about 2 percent to about 40 percent of Z,Z isomers, based on the total Z and E isomers in the composition.

[0083] The composition of paragraph [0079], the fragrance or flavor composition of paragraph [0080], and the method of paragraph [0081], wherein the at least one isomeric alkadienal is selected from the group consisting of isomers of 2,6-alkadienal, 2,7-alkadienal, 2,8-alkadienal, 2,9-alkadienal, 2,10-alkadienal, 2,11-alkadienal, 2,12-alkadienal, 2,13-alkadienal, and 2,14-alkadienal.

[0084] The composition of paragraph [0079], the fragrance or flavor composition of paragraph [0080], and the method of paragraph [0081], wherein the at least one isomeric alkadienenitrile is selected from the group consisting of isomers of 2,6-alkadienenitrile, 2,7-alkadienenitrile, 2,8-alkadienenitrile, 2,9-alkadienenitrile, 2,10-alkadienenitrile, 2,11- alkadienenitrile, 2,12-alkadienenitrile, 2,13-alkadienenitrile, and 2,14-alkadienenitrile.

[0085] The composition of paragraph [0079], the fragrance or flavor composition of paragraph [0080], and the method of paragraph [0081], wherein the isomers of 2,6-alkadienal are selected from the group consisting of isomers of 2,6-heptadienal, 2,6-octadienal, 2,6-nonadienal, 2,6-decadienal, 2,6-undecadienal, 2,6-dodecadienal, 2,6-tridecadienal, 2,6-tetradecadienal, and 2,6-pentadecadienal; the isomers of 2,7-alkadienal are selected from the group consisting of isomers of 2,7-octadienal, 2,7-nonadienal, 2,7-decadienal, 2,7-undecadienal, 2,7-dodecadienal, 2,7-tridecadienal, 2,7-tetradecadienal, and 2,7-pentadecadienal; the isomers of 2,8-alkadienal are selected from the group consisting of isomers of 2,8-nonadienal, 2,8-decadienal, 2,8-undecadienal, 2,8-dodecadienal, 2,8-tridecadienal, 2,8-tetradecadienal, and 2,8-pentadecadienal; the isomers of 2,9-alkadienal are selected from the group consisting of isomers of 2,9-decadienal, 2,9-undecadienal, 2,9-

dodecadienal, 2,9-tridecadienal, 2,9-tetradecadienal, and 2,9-pentadecadienal; the isomers of 2,10-alkadienal are selected from the group consisting of isomers of 2,10-undecadienal, 2,10-dodecadienal, 2,10-tridecadienal, 2,10-tetradecadienal, and 2,10-pentadecadienal; the isomers of 2,11-alkadienal are selected from the group consisting of isomers of 2,11-dodecadienal, 2,11-tridecadienal, 2,11-tetradecadienal, and 2,11-pentadecadienal; the isomers of 2,12-alkadienal are selected from the group consisting of isomers of 2,12-tridecadienal, 2,12-tetradecadienal, and 2,12-pentadecadienal; the isomers of 2,13-alkadienal are selected from the group consisting of the isomers of 2,13-tetradecadienal and 2,13-pentadecadienal; and the isomers of 2,14-alkadienal are selected from isomers of 2,14-pentadecadienal.

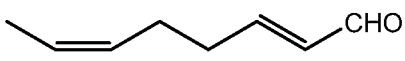
[0086] The composition of paragraph [0079], the fragrance or flavor composition of paragraph [0080], and the method of paragraph [0081], wherein the isomers of 2,6-alkadienenitrile are selected from the group consisting of isomers of 2,6-heptadienenitrile, 2,6-octadienenitrile, 2,6-nonadienenitrile, 2,6-decadienenitrile, 2,6-undecadienenitrile, 2,6-dodecadienenitrile, 2,6-tridecadienenitrile, 2,6-tetradecadienenitrile, and 2,6-pentadecadienenitrile; the isomers of 2,7-alkadienenitrile are selected from the group consisting of isomers of 2,7-octadienenitrile, 2,7-nonadienenitrile, 2,7-decadienenitrile, 2,7-undecadienenitrile, 2,7-dodecadienenitrile, 2,7-tridecadienenitrile, 2,7-tetradecadienenitrile, and 2,7-pentadecadienenitrile; the isomers of 2,8-alkadienenitrile are selected from the group consisting of isomers of 2,8-nonadienenitrile, 2,8-decadienenitrile, 2,8-undecadienenitrile, 2,8-dodecadienenitrile, 2,8-tridecadienenitrile, 2,8-tetradecadienenitrile, and 2,8-pentadecadienenitrile; the isomers of 2,9-alkadienenitrile are selected from the group consisting of isomers of 2,9-decadienenitrile, 2,9-undecadienenitrile, 2,9-dodecadienenitrile, 2,9-tridecadienenitrile, 2,9-tetradecadienenitrile, 2,9-pentadecadienenitrile, and 2,9-pentadecadienenitrile; the isomers of 2,10-alkadienenitrile are selected from the group consisting of isomers of 2,10-undecadienenitrile, 2,10-dodecadienenitrile, 2,10-tridecadienenitrile, 2,10-tetradecadienenitrile, and 2,10-pentadecadienenitrile; the isomers of 2,11-alkadienenitrile are selected from the group consisting of isomers of 2,11-dodecadienenitrile, 2,11-tridecadienenitrile, 2,11-

tetradecadienenitrile, and 2,11-pentadecadienenitrile; the isomers of 2,12-alkadienenitrile are selected from the group consisting of isomers of 2,12-tridecadienenitrile, 2,12-tetradecadienenitrile, and 2,12-pentadecadienenitrile; the isomers of 2,13-alkadienenitrile are selected from the group consisting of the isomers of 2,13-tetradecadienenitrile and 2,13-pentadecadienenitrile; and the isomers of 2,14-alkadienenitrile are selected from the isomers of 2,14-pentadecadienenitrile.

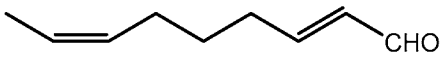
[0087] The composition of paragraph [0079], the fragrance or flavor composition of paragraph [0080], and the method of paragraph [0081], wherein the at least one isomeric alkadienal is selected from the group consisting of E,Z-2,6-octadienal, E,Z-2,7-nonadienal, E,Z-2,6-decadienal, E,Z-2,7-decadienal, E,Z-2,7-undecadienal, E,Z-2,8-undecadienal, E,Z-2,10-tridecadienal, E,Z-2,7-tetradecadienal, E,Z-2,11-tetradecadienal, 5-methyl-E,Z-2,7-nonadienal, and 5-methyl-E,Z-2,7-decadienal.

[0088] The composition of paragraph [0079], the fragrance or flavor composition of paragraph [0080], and the method of paragraph [0081], wherein the at least one isomeric alkadienenitrile is selected from the group consisting of E,Z-2,6-octadienenitrile, E,Z-2,7-nonadienenitrile, E,Z-2,7-decadienenitrile, E,Z-2,8-decadienenitrile, E,Z-2,8-undecadienenitrile, E,Z-2,9-dodecadienenitrile, E,Z-2,10-tridecadienenitrile, and E,Z-2,11-tetradecadienenitrile.

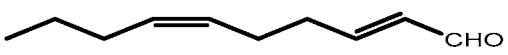
[0089] The composition of paragraph [0079], the fragrance or flavor composition of paragraph [0080], and the method of paragraph [0081], wherein the at least one isomeric alkadienal is represented by the formula



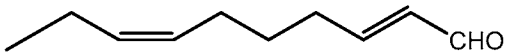
E,Z-2,6-octadienal



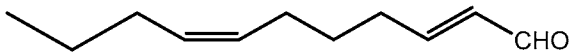
E,Z-2,7-nonadienal



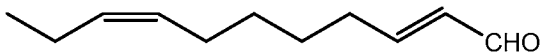
E,Z-2,6-decadienal



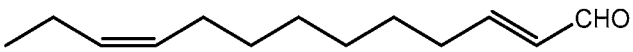
E,Z-2,7-decadienal



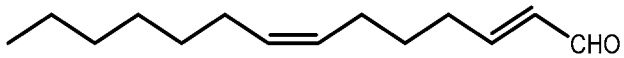
E,Z-2,7-undecadienal



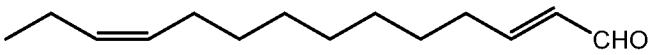
E,Z-2,8-undecadienal



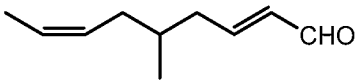
E,Z-2,10-tridecadienal



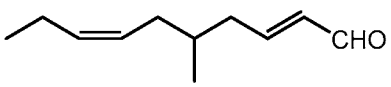
E,Z-2,7-tetradecadienal



E,Z-2,11-tetradecadienal

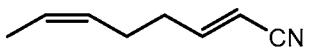


5-methyl-E,Z-2,7-nonadienal

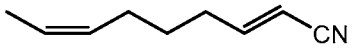


5-methyl-E,Z-2,7-decadienal

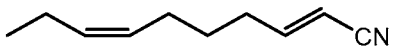
[0090] The composition of paragraph [0079], the fragrance or flavor composition of paragraph [0080], and the method of paragraph [0081], wherein the at least one isomeric alkadienenitrile is represented by the formula



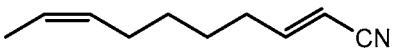
E,Z- 2,6-octadienenitrile



E,Z-2,7-nonadienenitrile



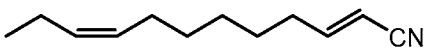
E,Z-2,7-decadienenitrile



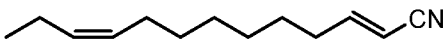
E,Z-2,8-decadienenitrile



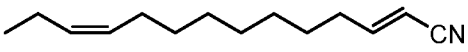
E,Z-2,8-undecadienenitrile



E,Z-2,9-dodecadienenitrile



E,Z-2,10-tridecadienenitrile



E,Z-2,11-tetradecadienenitrile

[0091] The composition of paragraph [0079], the fragrance or flavor composition of paragraph [0080], and the method of paragraph [0081], wherein the at least one isomeric alkadienal or the at least one isomeric alkadienenitrile is present in an

amount of at least about 1 ppm by weight, based on the total weight of the composition, to impart a fragrance to the composition or the consumer product.

[0092] The composition of paragraph [0079], the fragrance or flavor composition of paragraph [0080], and the method of paragraph [0081], wherein the at least one isomeric alkadienal or the at least one isomeric alkadienenitrile is present in an amount of at least about 0.1 ppm by weight, based on the total weight of the composition, to impart a flavor to the composition or the consumer product.

[0093] The composition of paragraph [0079], the fragrance or flavor composition of paragraph [0080], and the method of paragraph [0081], wherein the at least one isomeric alkadienal or the at least one isomeric alkadienenitrile is combined with geraniol, geranyl acetate, linalool, linalyl acetate, tetrahydrolinalool, citronellol, citronellyl acetate, dihydromyrcenol, dihydromyrcenyl acetate, tetrahydromyrcenol, terpineol, terpinyl acetate, nopol, nopyl acetate, 2-phenylethanol, 2-phenylethyl acetate, benzyl alcohol, benzyl acetate, benzyl salicylate, styrallyl acetate, benzyl benzoate, amyl salicylate, dimethyl-benzyl carbinol, trichloromethylphenyl carbinyl acetate, p-tert-butylcyclohexyl acetate, isononyl acetate, vetiveryl acetate, vetiverol, alpha-hexylcinnam- aldehyde, 2-methyl-3-(p-tert-butylphenyl)-propanal, 2-methyl-3-(p-isopropylphenyl)-propanal, 3-(p-tert-butylphenyl)-propanal, tricyclodecenyl acetate, tricyclodecenyl propionate, 4-(4-hydroxy-4-methylpentyl)-3-cyclohexenecarbaldehyde, 4-(4-methyl-3-pentenyl)-3-cyclohexenecarbaldehyde, 4-acetoxy-3-pentyl-tetrahydropyran, 3-carboxymethyl-2-pentylcyclopentane, 2-n-heptylcyclopentanone, 3-methyl-2-pentyl-2-cyclopentenone, n-decanal, n-dodecanal, 9-decen-1-0l, phenoxyethylisobutyrate, phenylacetaldehydedi-methylacetal, phenylacetaldehyde-diethylacetal, geranylnitrile, citronellylnitrile, cedrylacetate, 3-isocamphylcyclohexanol, cedrylmethyl ether, isolongifolanone, aubepinitrile, aubepine, heliotripine, coumarin, eugenol, vanillin, diphenyl oxide, hydroxycitronellal, ionones, methylionones, isomethylionones, irones, cis-3-hexenol and esters of the latter, indan-musks, tetraline-musks, isochromane-musks, macrocyclic ketones, macrolactone-musks, ethylene brassylate, or aromatic nitromusks, to impart a fragrance to the composition or the consumer product.

[0094] The composition of paragraph [0079], the fragrance or flavor composition of paragraph [0080], and the method of paragraph [0081], wherein the at least one isomeric alkadienal or the at least one isomeric alkadienenitrile is combined with geraniol, geranyl acetate, linalool, linalyl acetate, citronellol, citronellyl acetate, terpineol, terpinyl acetate, 2-phenylethanol, 2-phenylethyl acetate, benzyl alcohol, benzyl acetate, benzyl salicylate, heliotropine, benzaldehyde, anisaldehyde, benzyl salicylate, e, n-decanal, n-dodecanal, 9-decen-1-01, coumarin, eugenol, vanillin, hexanal, eucalyptol, ionones, methylionones, isomethylionones, irones, cis-3-hexenol and esters of the latter, acetaldehyde, ethyl acetate, ethyl butyratecinnamic aldehyde, cuminic aldehyde, furfural, cinnamic aldehyde, maltol, ethyl maltol, dimethyl sulfide, gamma decalactone, gamma undecalactone, diacetyl, ethyl valerate, damascone, damascenone, methyl caproate, cyclotene, butyric acid, acetoin, delta decalactone, furaneol, acetoin, benzodihydro pyrone, 2,6-nonadienal, melonal or methyl heptane carbonate, to impart a flavor to the composition or the consumer product.

[0095] A consumer product containing the fragrance or flavor composition of paragraph [0080].

[0096] The consumer product of paragraph [0096] selected from the group consisting of a candle, an air care product, a perfume, a cologne, a soap, a personal care product, a detergent, a fabric care product, and a household cleaning product.

[0097] The consumer product of paragraph [0096] selected from the group consisting of a soap, a detergent, an air freshener, a room spray, a pomander, a candle, and a cosmetic comprising a cream, an ointment, a toilet water, a pre-shave lotion, an aftershave lotion, a talcum powder, a hair-care agent, a body deodorant, and an anti-perspirant.

[0098] The consumer product of paragraph [0096] selected from the group consisting of an air care product, a perfume, and a cologne.

[0099] The consumer product of paragraph [0096] selected from the group consisting of a beverage, a powder or semi-frozen/frozen concentrate for a drink, a candy, a sugarless candy, a chocolate, a chewing gum, a bubble gum, a condiment, a spice, a seasoning, a dry cereal, an oatmeal, a granola bar, an alcoholic beverage, an energy beverage, a juice, a tea, a coffee, a salsa, a gel bead, a film strip for halitosis, a lozenge, a cough drop, a throat lozenge, a throat spray, a toothpaste, and a mouth rinse.

[00100] The consumer product of paragraph [0096] selected from the group consisting of a beverage, a dairy product, a confectionary, a cereal, a snack, and a soup.

[00101] The consumer product of paragraph [0096] selected from the group consisting of a beverage, a chewing gum, and a bubble gum.

[00102] The method of paragraph [0081] wherein the consumer product is selected from the group consisting of a candle, an air care product, a perfume, a cologne, a soap, a personal care product, a detergent, a fabric care product, and a household cleaning product.

[00103] The method of paragraph [0081] wherein the consumer product is selected from the group consisting of a soap, a detergent, an air freshener, a room spray, a pomander, a candle, and a cosmetic comprising a cream, an ointment, a toilet water, a pre-shave lotion, an aftershave lotion, a talcum powder, a hair-care agent, a body deodorant, and an anti-perspirant.

[00104] The method of paragraph [0081] wherein the consumer product is selected from the group consisting of an air care product, a perfume, and a cologne.

[00105] The method of paragraph [0081] wherein the consumer product is selected from the group consisting of a beverage, a powder or semi-frozen/frozen concentrate for a drink, a candy, a sugarless candy, a chocolate, a chewing gum, a bubble gum, a condiment, a spice, a seasoning, a dry cereal, an oatmeal, a granola

bar, an alcoholic beverage, an energy beverage, a juice, a tea, a coffee, a salsa, a gel bead, a film strip for halitosis, a lozenge, a cough drop, a throat lozenge, a throat spray, a toothpaste, and a mouth rinse.

[00106] The method of paragraph [0081] wherein the consumer product is selected from the group consisting of a beverage, a dairy product, a confectionary, a cereal, a snack, and a soup.

[00107] The method of paragraph [0081] wherein the consumer product is selected from the group consisting of a beverage, a chewing gum, and a bubble gum.

[00108] The quantities in which the compositions of this disclosure can be used in flavor compositions or in products to be flavored can vary within wide limits and depend inter alia on the nature of the product in which the flavor material is used, on the nature and quantity of the other components in the composition and on the organoleptic effect which is aimed at. It is therefore only possible to specify very rough limits, which, however, provide sufficient information for the specialist to be able to use the compounds according to the disclosure independently. In most cases a quantity of only 1 ppm in a flavor composition will already be sufficient to obtain a clearly perceptible taste effect. On the other hand, to achieve special organoleptic effects it is possible to use quantities of 10, 100, 500 ppm or even more in a composition.

[00109] While we have shown and described several embodiments in accordance with our disclosure, it is to be clearly understood that the same may be susceptible to numerous changes apparent to one skilled in the art. Therefore, we do not wish to be limited to the details shown and described but intend to show all changes and modifications that come within the scope of the appended claims.

[00110] The following examples are only to illustrate the preparation and use of the compounds according to the disclosure. The disclosure is not limited thereto.

Example 1

Preparation of E,Z-2,7-decadienal

[00111] Cis-5-octenal 15.1g (120mmol) is fed to a catalytic amount of PTSA dissolved in anhydrous ethanol (1.5g) and 17.8g triethylorthoformate (120mmol), maintaining a temperature below 20°C. Once the diethyl acetal formation is complete, the reaction mixture is neutralized with a 25% solution of sodium methoxide in methanol and then the lights are stripped atmospherically to 100°C.

[00112] 10g of Cis-5-octenal diethyl acetal (50mmol) is added to a nitrogen purged flask and a catalytic amount of boron trifluoride diethyl etherate is added followed by a mixed feed of 10g cis-5-octenal DEA (50mmol) and 3g ethyl vinyl ether (42 mmol) keeping the reaction temperature between 30-40°C. The reaction is quenched with 10% sodium hydroxide solution then the organic layer is washed with water. The unreacted diethyl acetal is separated from the 8,10,10-triethoxy-3Z-decene. The purified triethoxy is then reacted with 8 equivalents of formic acid to give a product consisting of E,Z-2,7-decadienal (96.23%). The remainder being the minor quantities of E,E-, Z,Z-, and Z,E isomers(combined 3.77%).

Example 2

Preparation of E,Z-2,11-tetradecadienal

[00113] Cis-9-dodecenal 22.1g (120mmol) is fed to a catalytic amount of PTSA dissolved in anhydrous ethanol (1.5g) and 17.8g triethylorthoformate (120mmol), maintaining a temperature below 20°C. Once the diethyl acetal formation is complete, the reaction mixture is neutralized with a 25% solution of sodium methoxide in methanol and then the lights are stripped atmospherically to 100°C.

[00114] 12.8g of Cis-9-dodecenal diethyl acetal (50mmol) is added to a nitrogen purged flask and a catalytic amount of boron trifluoride diethyl etherate is added followed by a mixed feed of 12.8g cis-9-dodecenal DEA (50mmol) and 3g ethyl

vinyl ether (42 mmol) keeping the reaction temperature between 30-40°C. The reaction is quenched with 10% sodium hydroxide solution then the organic layer is washed with water. The unreacted diethyl acetal is separated from the 12,14,14-triethoxy-3Z-tetradecene. The purified triethoxy is then reacted with 8 equivalents of formic acid to give a product consisting of E,Z-2,11-tetradecadienal (~96%). The remainder being the minor quantities of E,E-, Z,Z-, and Z,E isomers (combined ~4%). BP is 75°C at 0.1mm.

Example 3

Preparation of E,Z-2,6-octadienal

[00115] Cis-4-hexenal 11.8g (120mmol) is fed to a catalytic amount of PTSA dissolved in anhydrous ethanol (1g) and 17.8g triethylorthoformate (120mmol), maintaining a temperature below 20°C. Once the diethyl acetal formation is complete, the reaction mixture is neutralized with a 25% solution of sodium methoxide in methanol and then the lights are stripped atmospherically to 100°C.

[00116] 8.6g of Cis-4-hexenal diethyl acetal (50mmol) is added to a nitrogen purged flask and a catalytic amount of boron trifluoride diethyl etherate is added followed by a mixed feed of 8.6g cis-4-hexenal DEA (50mmol) and 3g ethyl vinyl ether (42 mmol) keeping the reaction temperature between 30-40°C. The reaction is quenched with 10% sodium hydroxide solution then the organic layer is washed with water. The unreacted diethyl acetal is separated from the 6,8,8-triethoxy-2Z-octadecene. The purified triethoxy is then reacted with 8 equivalents of formic acid to give a product consisting of E,Z-2,6-octadienal (92.3%). The remainder being the minor quantities of E,E- Z,Z- and Z,E isomers(combined 7.7%). BP is 55°C at 0.1mm.

Example 4

Fragrance formulation containing E,Z-2,7-decadienal

[00117] Perfume compositions belonging to the olfactive family green floral was formulated using E,Z-2,7-decadienal in an appropriate quantity to provide a fresh, green, ozonic, floral odor emphasizing iris notes.

Green Floral Perfume

Benzyl Acetate	5
Cymene para	0.3
Dihydro Ionone Beta	24.5
DPG	16
Eucalyptol	1
Ionone Beta	112
Coranol	295
Myrcene	0.5
Orange Terpenes	3
Pinene Alpha	0.2
Pinene Beta	1
Rose Oxide	1
Terpineol Alpha	540
E,Z-2,7-Decadienal	0.5
Total	1000

Example 5

Fragrance formulation containing E,Z-2,10-tridecadienal

[00118] Perfume compositions imparting fresh citrus floral effect are created using E,Z-2,10-tridecadienal in an appropriate quantity.

Soft, fresh, floral fragrance

Apritone	10
Methoxy Melonal BRI 280 10%	7
Florol	30
Hedione	100
Dimeth Phen Eth Carbinol	100
Hydroxy Citronellol	400
DPG	253
Lilytol BRI 660	70
Vionil BRI 640 1%	10
3,6-Nonadienol BRI 330 1%	10
E,Z-2,10-Tridecadienal	10

Total	1000

Example 6

Watermelon flavor composition containing E,Z-2,7- and E,Z-2,8-undecadienals

[00119] A watermelon flavor formulation was prepared having the following ingredients:

Watermelon flavor formulation:

Ethyl Maltol	0.60
Cis-3-Hexenol 1%	0.15
2,6-Nonadienal 10%	0.10
Trans-2-Hexenal 10%	0.10
Benzaldehyde	0.10
Ethyl Acetate	1.50
Ethyl Butyrate	2.30
Melonal	1.40
Alpha Ionone	0.45
Methyl Heptine Carbonate 10%	0.60
Propylene Glycol	92.70
Total	100.00

[00120] Flavored water for the test was prepared by adding 200 ppm sucralose 25% solution and 50 ppm of the above formulated watermelon flavor followed by the addition of 0.1 ppm each of E,Z-2,7-undecadienal and E,Z-2,8-undecadienal. The formulation with these two alkadienals of the disclosure was then compared with the same formulation without them by an expert panel. The flavored water containing the watermelon with two alkadienals was unanimously preferred for having a fresh and sweet watermelon aroma and taste missing in the base solution without alkadienals.

Example 7

Caramel flavor composition containing E,Z-2,11-tetradecadienal

[00121] A caramel flavor formulation was prepared having the following ingredients:

Caramel formulation

Vanillin	5.00
Maltol	1.50
Cyclotene	0.75
Ethyl Maltol	2.50
Diacetyl	0.05
Butyric Acid	0.50
Acetoin	1.50
Delta Decalactone	0.10
Gamma Decalactone	0.50
Ethyl Butyrate	0.25
Propylene Glycol	87.35
Total	100.00

[00122] Flavored milk for the test was prepared by adding 300 ppm sucralose 25% solution, 0.05% of the above formulated caramel flavor followed by 4 ppm of E,Z-2,11-tetradecadienal. The formulation containing E,Z-2,11-tetradecadienal was compared with the same formulation without the alkadienal by an expert panel. The flavored milk containing the caramel flavor with E,Z-2,11-tetradecadienal was overwhelmingly preferred for having a rich creamy caramel taste missing in the base solution without the alkadienal of the disclosure.

Example 8

Bakery flavor composition containing E,Z-2,6-octadienal

[00123] A bakery flavor formulation was prepared having the following ingredients:

Graham Cracker formulation

Ethone	0.50
Vanillin	5.00
Maltol	1.00
Furaneol	0.50
Cyclotene	0.20

Acetoin	1.00
Aldehyde C-18 (Gamma Nonalactone)	0.05
Heliotropin	0.05
Benzodihydro Pyrone	0.05
Propylene Glycol	91.65
Total	100.00

[00124] Flavored milk was prepared by adding 300 ppm of sucralose 25% solution followed by 0.05% Graham Cracker flavor and 0.02 ppm of E,Z-2,6-octadienal. The formulation with and without the alkadienal was tested by an expert panel. The flavored milk containing E,Z-2,6-octadienal was unanimously preferred over the sample without.

Example 9

Preparation of E,Z-decadienenitrile and its isomers

[00125] 35.1g of cis-5-octenal (198 mmol) is mixed with 25g of diethyl cyanomethylphosphonate (198 mmol) and 24.5g of a 45% solution of potassium hydroxide in water is fed maintaining a temperature of 20-25°C. Once the reaction is complete, 10g of cyclohexane is added and the solution is washed with water, acidified with a 5% aqueous solution of citric acid, then neutralized with a 5% aqueous solution of sodium carbonate prior to distillation. The crude isomeric ratio is about 69% E,Z to 31% E,E. The isomeric content can be enriched via distillation.

Example 10

Fragrance formulation containing E,Z-2,7-decadienenitrile

[00126] A green, fruity, floral, woody fragrance formulation was prepared having the following ingredients:

Ald C-10 10%	15
Benz Acetate	5

Cymene-para 10%	3
Dihydro Ionone Beta	24
Eucalyptol	1
Ionone Beta	112
Coranol	295
Myrcene 10%	5
Orange Terpenes	3
Limedien 1%	2
Rose Oxide	1
Terpineol alpha	500
E,Z-2,7-Decadienenitrile 1% DPG	20
DPG (diporopylene glycol)	14
Total	1000

[00127] The present disclosure is not to be limited in scope by the specific embodiments described herein. Indeed, various modifications of the disclosure in addition to those described herein will become apparent to those skilled in the art from the foregoing description. Such modifications are intended to fall within the scope of the appended claims.

CLAIMS

What is claimed is:

1. A composition comprising at least one isomeric alkadienal or at least one isomeric alkadienenitrile in an amount effective to impart a fragrance or flavor to the composition.

2. The composition of claim 1 wherein the at least one isomeric alkadienal or the at least one isomeric alkadienenitrile has from about 0.1 percent to about 99.5 percent of E,Z isomers, from about 0.1 percent to about 99.5 percent of Z,E isomers, from about 0.1 percent to about 99.5 percent of E,E isomers, and from about 0.1 percent to about 99.5 of Z,Z isomers, based on the total Z and E isomers in the composition.

3. The composition of claim 1 wherein the at least one isomeric alkadienal or the at least one isomeric alkadienenitrile has from about 10 percent to about 98 percent of E,Z isomers, from about 0.5 percent to about 40 percent of Z,E isomers, from about 0.1 percent to about 40 percent of E,E isomers, and from about 2 percent to about 40 percent of Z,Z isomers, based on the total Z and E isomers in the composition.

4. The composition of claim 1 wherein the at least one isomeric alkadienal is selected from the group consisting of isomers of 2,6-alkadienal, 2,7-alkadienal, 2,8-alkadienal, 2,9-alkadienal, 2,10-alkadienal, 2,11-alkadienal, 2,12-alkadienal, 2,13-alkadienal, and 2,14-alkadienal.

5. The composition of claim 1 wherein the at least one isomeric alkadienenitrile is selected from the group consisting of isomers of 2,6-alkadienenitrile, 2,7-alkadienenitrile, 2,8-alkadienenitrile, 2,9-alkadienenitrile, 2,10-alkadienenitrile, 2,11- alkadienenitrile, 2,12-alkadienenitrile, 2,13-alkadienenitrile, and 2,14-alkadienenitrile.

6. The composition of claim 4 wherein the isomers of 2,6-alkadienal are selected from the group consisting of isomers of 2,6-heptadienal, 2,6-octadienal, 2,6-nonadienal, 2,6-decadienal, 2,6-undecadienal, 2,6-dodecadienal, 2,6-tridecadienal, 2,6-tetradecadienal, and 2,6-pentadecadienal; the isomers of 2,7-alkadienal are selected from the group consisting of isomers of 2,7-octadienal, 2,7-nonadienal, 2,7-decadienal, 2,7-undecadienal, 2,7-dodecadienal, 2,7-tridecadienal, 2,7-tetradecadienal, and 2,7-pentadecadienal; the isomers of 2,8-alkadienal are selected from the group consisting of isomers of 2,8-nonadienal, 2,8-decadienal, 2,8-undecadienal, 2,8-dodecadienal, 2,8-tridecadienal, 2,8-tetradecadienal, and 2,8-pentadecadienal; the isomers of 2,9-alkadienal are selected from the group consisting of isomers of 2,9-decadienal, 2,9-undecadienal, 2,9-dodecadienal, 2,9-tridecadienal, 2,9-tetradecadienal, and 2,9-pentadecadienal; the isomers of 2,10-alkadienal are selected from the group consisting of isomers of 2,10-undecadienal, 2,10-dodecadienal, 2,10-tridecadienal, 2,10-tetradecadienal, and 2,10-pentadecadienal; the isomers of 2,11-alkadienal are selected from the group consisting of isomers of 2,11-dodecadienal, 2,11-tridecadienal, 2,11-tetradecadienal, and 2,11-pentadecadienal; the isomers of 2,12-alkadienal are selected from the group consisting of isomers of 2,12-tridecadienal, 2,12-tetradecadienal, and 2,12-pentadecadienal; the isomers of 2,13-alkadienal are selected from the group consisting of the isomers of 2,13-tetradecadienal and 2,13-pentadecadienal; and the isomers of 2,14-alkadienal are selected from isomers of 2,14-pentadecadienal.

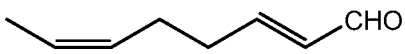
7. The composition of claim 5 wherein the isomers of 2,6-alkadienenitrile are selected from the group consisting of isomers of 2,6-heptadienenitrile, 2,6-octadienenitrile, 2,6-nonadienenitrile, 2,6-decadienenitrile, 2,6-undecadienenitrile, 2,6-dodecadienenitrile, 2,6-tridecadienenitrile, 2,6-tetradecadienenitrile, and 2,6-pentadecadienenitrile; the isomers of 2,7-alkadienenitrile are selected from the group consisting of isomers of 2,7-octadienenitrile, 2,7-nonadienenitrile, 2,7-decadienenitrile, 2,7-undecadienenitrile, 2,7-dodecadienenitrile, 2,7-tridecadienenitrile, 2,7-tetradecadienenitrile, and 2,7-pentadecadienenitrile; the isomers of 2,8-alkadienenitrile are selected from the group consisting of isomers of

2,8-nonadienenitrile, 2,8-decadienenitrile, 2,8-undecadienenitrile, 2,8-dodecadienenitrile, 2,8-tridecadienenitrile, 2,8-tetradecadienenitrile, and 2,8-pentadecadienenitrile; the isomers of 2,9-alkadienenitrile are selected from the group consisting of isomers of 2,9-decadienenitrile, 2,9-undecadienenitrile, 2,9-dodecadienenitrile, 2,9-tridecadienenitrile, 2,9-tetradecadienenitrile, 2,9-pentadecadienenitrile, and 2,9-pentadecadienenitrile; the isomers of 2,10-alkadienenitrile are selected from the group consisting of isomers of 2,10-undecadienenitrile, 2,10-dodecadienenitrile, 2,10-tridecadienenitrile, 2,10-tetradecadienenitrile, and 2,10-pentadecadienenitrile; the isomers of 2,11-alkadienenitrile are selected from the group consisting of isomers of 2,11-dodecadienenitrile, 2,11-tridecadienenitrile, 2,11-tetradecadienenitrile, and 2,11-pentadecadienenitrile; the isomers of 2,12-alkadienenitrile are selected from the group consisting of isomers of 2,12-tridecadienenitrile, 2,12-tetradecadienenitrile, and 2,12-pentadecadienenitrile; the isomers of 2,13-alkadienenitrile are selected from the group consisting of the isomers of 2,13-tetradecadienenitrile and 2,13-pentadecadienenitrile; and the isomers of 2,14-alkadienenitrile are selected from the isomers of 2,14-pentadecadienenitrile.

8. The composition of claim 1 wherein the at least one isomeric alkadienal is selected from the group consisting of E,Z-2,6-octadienal, E,Z-2,7-nonadienal, E,Z-2,6-decadienal, E,Z-2,7-decadienal, E,Z-2,7-undecadienal, E,Z-2,8-undecadienal, E,Z-2,10-tridecadienal, E,Z-2,7-tetradecadienal, E,Z-2,11-tetradecadienal, 5-methyl-E,Z-2,7-nonadienal, and 5-methyl-E,Z-2,7-decadienal.

9. The composition of claim 1 wherein the at least one isomeric alkadienenitrile is selected from the group consisting of E,Z-2,6-octadienenitrile, E,Z-2,7-nonadienenitrile, E,Z-2,7-decadienenitrile, E,Z-2,8-decadienenitrile, E,Z-2,8-undecadienenitrile, E,Z-2,9-dodecadienenitrile, E,Z-2,10-tridecadienenitrile, and E,Z-2,11-tetradecadienenitrile.

10. The composition of claim 1 wherein the at least one isomeric alkadienal is represented by the formula



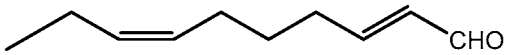
E,Z-2,6-octadienal



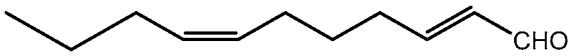
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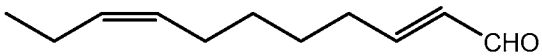
E,Z-2,6-decadienal



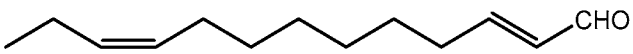
E,Z-2,7-decadienal



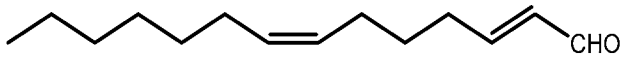
E,Z-2,7-undecadienal



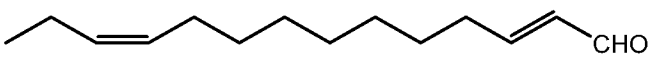
E,Z-2,8-undecadienal



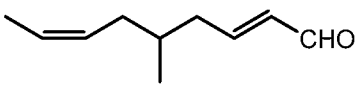
E,Z-2,10-tridecadienal



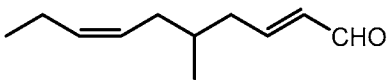
E,Z-2,7-tetradecadienal



E,Z-2,11-tetradecadienal

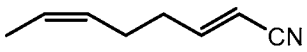


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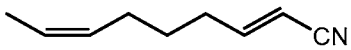


5-methyl-E,Z-2,7-decadienal

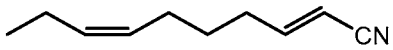
11. The composition of claim 1 wherein the at least one isomeric alkadienenitrile is represented by the formula



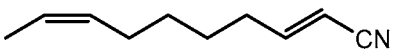
E,Z- 2,6-octadienenitrile



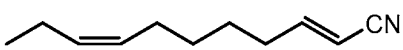
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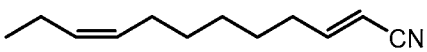
E,Z-2,7-decadienenitrile



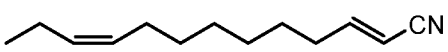
E,Z-2,8-decadienenitrile



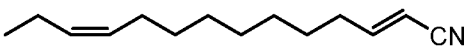
E,Z-2,8-undecadienenitrile



E,Z-2,9-dodecadienenitrile



E,Z-2,10-tridecadienenitrile



E,Z-2,11-tetradecadienenitrile

12. The composition of claim 1 wherein the at least one isomeric alkadienal or the at least one isomeric alkadienenitrile is present in an amount of at least about 1 ppm by weight, based on the total weight of the composition, to impart a fragrance to the composition.

13. The composition of claim 1 wherein the at least one isomeric alkadienal or the at least one isomeric alkadienenitrile is present in an amount of at least about 0.1 ppm by weight, based on the total weight of the composition, to impart a flavor to the composition.

14. The composition of claim 1 wherein the at least one isomeric alkadienal or the at least one isomeric alkadienenitrile is combined with geraniol, geranyl acetate, linalool, linalyl acetate, tetrahydrolinalool, citronellol, citronellyl acetate, dihydromyrcenol, dihydromyrcenyl acetate, tetrahydromyrcenol, terpineol, terpinyl acetate, nopol, nopyl acetate, 2-phenylethanol, 2-phenylethyl acetate, benzyl alcohol, benzyl acetate, benzyl salicylate, styrallyl acetate, benzyl benzoate, amyl salicylate, dimethyl-benzyl carbinol, trichloromethylphenyl carbinyl acetate, p-tert-butylcyclohexyl acetate, isononyl acetate, vetiveryl acetate, vetiverol, alpha-hexylcinnam- aldehyde, 2-methyl-3-(p-tert-butylphenyl)-propanal, 2-methyl-3-(p-isopropylphenyl)-propanal, 3-(p-tert-butylphenyl)-propanal, tricyclodecenyl acetate, tricyclodecenyl propionate, 4-(4-hydroxy-4-methylpentyl)-3-cyclohexenecarbaldehyde, 4-(4-methyl-3-pentenyl)-3-cyclohexenecarbaldehyde, 4-acetoxy-3-pentyl- tetrahydropyran, 3-carboxymethyl-2-pentylcyclopentane, 2-n-heptylcyclopentanone, 3-methyl-2-pentyl-2-cyclopentenone, n-decanal, n-dodecanal, 9-decen-1-0l, phenoxyethylisobutyrate, phenylacetaldehydedi-methylacetal, phenylacetaldehyde-diethylacetal, geranylnitrile, citronellylnitrile, cedrylacetate, 3-isocamphylcyclohexanol, cedrylmethyl ether, isolongifolanone, aubepinitrile, aubepine, heliotripine, coumarin, eugenol, vanillin, diphenyl oxide, hydroxycitronellal, ionones, methylionones, isomethylionones, irones, cis-3-hexenol and esters of the latter, indan-musks, tetraline-musks, isochromane-musks, macrocyclic ketones, macrolactone-musks, ethylene brassylate, or aromatic nitromusks, to impart a fragrance to the composition.

15. The composition of claim 1 wherein the at least one isomeric alkadienal or the at least one isomeric alkadienenitrile is combined with geraniol, geranyl acetate, linalool, linalyl acetate, citronellol, citronellyl acetate, terpineol, terpinyl acetate, 2-phenylethanol, 2-phenylethyl acetate, benzyl alcohol, benzyl acetate, benzyl salicylate, heliotropine, benzaldehyde, anisaldehyde, benzyl salicylate, e, n-decanal, n-dodecanal, 9-decen-1-01, coumarin, eugenol, vanillin, hexanal, eucalyptol, ionones, methylionones, isomethylionones, irones, cis-3-hexenol and esters of the latter, acetaldehyde, ethyl acetate, ethyl butyratecinnamic aldehyde, cuminic aldehyde, furfural, cinnamic aldehyde, maltol, ethyl maltol, dimethyl sulfide, gamma decalactone, gamma undecalactone, diacetyl, ethyl valerate, damascone, damascenone, methyl caproate, cyclotene, butyric acid, acetoin, delta decalactone, furaneol, acetoin, benzodihydro pyrone, 2,6-nonadienal, melonal or methyl heptane carbonate, to impart a flavor to the composition.

16. A fragrance or flavor composition comprising at least one isomeric alkadienal or at least one isomeric alkadienenitrile in an amount effective to impart a fragrance or flavor to the composition.

17. A consumer product containing the fragrance or flavor composition of claim 16.

18. The consumer product of claim 17 selected from the group consisting of a candle, an air care product, a perfume, a cologne, a soap, a personal care product, a detergent, a fabric care product, and a household cleaning product.

19. The consumer product of claim 17 selected from the group consisting of a soap, a detergent, an air freshener, a room spray, a pomander, a candle, and a cosmetic comprising a cream, an ointment, a toilet water, a pre-shave lotion, an aftershave lotion, a talcum powder, a hair-care agent, a body deodorant, and an anti-perspirant.

20. A method of imparting a fragrance or flavor to a consumer product comprising adding to the consumer product a fragrance or flavor composition

comprising at least one isomeric alkadienal or at least one isomeric alkadienenitrile in an amount effective to impart a fragrance or flavor to the consumer product.

INTERNATIONAL SEARCH REPORT

International application No.
PCT/US2016/065573

A. CLASSIFICATION OF SUBJECT MATTER

IPC(8) - A23L 27/00; A23L 27/20; A23L 27/201; C07C 45/44; C07C 45/67; C07C 47/21 (2017.01)
CPC - A23L 27/00; A23L 27/20; A23L 27/201; C07C 45/44; C07C 45/67; C07C 47/21 (2017.01)

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)
See Search History document

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)
See Search History document

C. DOCUMENTS CONSIDERED TO BE RELEVANT

Category*	Citation of document, with indication, where appropriate, of the relevant passages	Relevant to claim No.
Y	US 4,687,599 A (VAN LIER et al) 18 August 1987 (18.08.1987) entire document	1-4, 6, 12-20
Y	US 4,105,697 A (CHABARDES) 08 August 1978 (08.08.1978) entire document	1-4, 6, 12-20
Y	US 4,380,675 A (GEBAUER et al) 19 April 1983 (19.04.1983) entire document	13, 15

☐ Further documents are listed in the continuation of Box C. ☐ See patent family annex.

* Special categories of cited documents:
"A" document defining the general state of the art which is not considered to be of particular relevance
"E" earlier application or patent but published on or after the international filing date
"L" document which may throw doubts on priority claim(s) or which is cited to establish the publication date of another citation or other special reason (as specified)
"O" document referring to an oral disclosure, use, exhibition or other means
"P" document published prior to the international filing date but later than the priority date claimed
"T" later document published after the international filing date or priority date and not in conflict with the application but cited to understand the principle or theory underlying the invention
"X" document of particular relevance; the claimed invention cannot be considered novel or cannot be considered to involve an inventive step when the document is taken alone
"Y" document of particular relevance; the claimed invention cannot be considered to involve an inventive step when the document is combined with one or more other such documents, such combination being obvious to a person skilled in the art
"&" document member of the same patent family

Date of the actual completion of the international search	Date of mailing of the international search report
24 March 2017	20 APR 2017
Name and mailing address of the ISA/US Mail Stop PCT, Attn: ISA/US, Commissioner for Patents P.O. Box 1450, Alexandria, VA 22313-1450 Facsimile No. 571-273-8300	Authorized officer Blaine R. Copenheaver PCT Helpdesk: 571-272-4300 PCT OSP: 571-272-7774

INTERNATIONAL SEARCH REPORT

International application No.
PCT/US2016/065573

Box No. II Observations where certain claims were found unsearchable (Continuation of item 2 of first sheet)

This international search report has not been established in respect of certain claims under Article 17(2)(a) for the following reasons:

1. ☐ Claims Nos.:
because they relate to subject matter not required to be searched by this Authority, namely:

2. ☐ Claims Nos.:
because they relate to parts of the international application that do not comply with the prescribed requirements to such an extent that no meaningful international search can be carried out, specifically:

3. ☐ Claims Nos.:
because they are dependent claims and are not drafted in accordance with the second and third sentences of Rule 6.4(a).

Box No. III Observations where unity of invention is lacking (Continuation of item 3 of first sheet)

This International Searching Authority found multiple inventions in this international application, as follows:

See Extra Sheet

Claims 1-4, 6, and 12-20 have been analyzed subject to the restriction that the claims read on a composition comprising one isomeric alkadienal in an amount effective to impart a fragrance or flavor to the composition, wherein the isomeric alkadienal is 2,6-alkadienal, wherein the 2,6-alkandienal is 2,6-heptadienal.

1. ☐ As all required additional search fees were timely paid by the applicant, this international search report covers all searchable claims.

2. ☐ As all searchable claims could be searched without effort justifying additional fees, this Authority did not invite payment of additional fees.

3. ☐ As only some of the required additional search fees were timely paid by the applicant, this international search report covers only those claims for which fees were paid, specifically claims Nos.:

4. ☒ No required additional search fees were timely paid by the applicant. Consequently, this international search report is restricted to the invention first mentioned in the claims; it is covered by claims Nos.:
1-4, 6, 12-20

Remark on Protest

☐ The additional search fees were accompanied by the applicant's protest and, where applicable, the payment of a protest fee.

☐ The additional search fees were accompanied by the applicant's protest but the applicable protest fee was not paid within the time limit specified in the invitation.

☐ No protest accompanied the payment of additional search fees.

INTERNATIONAL SEARCH REPORT

International application No.
PCT/US2016/065573

Continued from Box No. III Observations where unity of invention is lacking

This application contains the following inventions or groups of inventions which are not so linked as to form a single general inventive concept under PCT Rule 13.1. In order for all inventions to be examined, the appropriate additional examination fees need to be paid.

Group I+: claims 1-20 are drawn to compositions, fragrance or flavor compositions, consumer products thereof, and methods thereof.

The first invention of Group I+ is restricted to a composition comprising one isomeric alkadienal in an amount effective to impart a fragrance or flavor to the composition, wherein the isomeric alkadienal is 2,6-alkadienal, wherein the 2,6-alkandienal is 2,6-heptadienal; fragrance or flavor compositions; consumer products thereof; and methods thereof. It is believed that claims 1-4, 6, and 12-20 read on this first named invention and thus these claims will be searched without fee to the extent that they read on the above embodiment.

Applicant is invited to elect additional formula(e) for each additional compound to be searched in a specific combination by paying an additional fee for each set of election. Each additional elected formula(e) requires the selection of a single definition for each compound variable. An exemplary election would be a composition comprising one isomeric alkadienal in an amount effective to impart a fragrance or flavor to the composition, wherein the isomeric alkadienal is 5-methyl-E,Z-2,7-decadienal. Additional formula(e) will be searched upon the payment of additional fees. Applicants must specify the claims that read on any additional elected inventions. Applicants must further indicate, if applicable, the claims which read on the first named invention if different than what was indicated above for this group. Failure to clearly identify how any paid additional invention fees are to be applied to the "+" group(s) will result in only the first claimed invention to be searched/examined.

The inventions listed in Groups I+ do not relate to a single general inventive concept under PCT Rule 13.1, because under PCT Rule 13.2 they lack the same or corresponding special technical features for the following reasons:

The Groups I+ formulae do not share a significant structural element requiring the selection of alternatives for the alkadienal and alkadienenitrile.

The Groups I+ share the technical features of a composition comprising at least one isomeric alkadienal or at least one isomeric alkadienenitrile in an amount effective to impart a fragrance or flavor to the composition; a fragrance or flavor composition comprising at least one isomeric alkadienal or at least one isomeric alkadienenitrile in an amount effective to impart a fragrance or flavor to the composition; a consumer product containing the fragrance or flavor composition; and a method of imparting a fragrance or flavor to a consumer product comprising adding to the consumer product a fragrance or flavor composition comprising at least one isomeric alkadienal or at least one isomeric alkadienenitrile in an amount effective to impart a fragrance or flavor to the consumer product. However, these shared technical features do not represent a contribution over the prior art.

Specifically, US 4,687,599 A to Van Lier et al. teach of a composition (Abstract; Claims 1 and 3) comprising at least one isomeric alkadienal in an amount effective to impart a fragrance or flavor to the composition (Abstract; Claims 1 and 3; Col. 5, Example 2, Cis,cis-4,7-decadienal); a fragrance or flavor composition (Abstract; Claims 1 and 3) comprising at least one isomeric alkadienal in an amount effective to impart a fragrance or flavor to the composition (Abstract; Claims 1 and 3; Col. 5, Example 2, Cis,cis-4,7-decadienal); a consumer product containing the fragrance or flavor composition (Abstract; Claims 1 and 3; Col. 5, Example 2, Cis,cis-4,7-decadienal); and a method of imparting a fragrance or flavor to a consumer product (Abstract; Claims 1 and 3) comprising adding to the consumer product a fragrance or flavor composition (Abstract; Claims 1 and 3; Col. 5, Example 2, Cis,cis-4,7-decadienal, A perfume composition of the chamomile type for use in soap was prepared according to the recipe below...) comprising at least one isomeric alkadienal or at least one isomeric alkadienenitrile in an amount effective to impart a fragrance or flavor to the consumer product (Abstract; Claims 1 and 3; Col. 5, Example 2).

The inventions listed in Groups I+ therefore lack unity under Rule 13 because they do not share a same or corresponding special technical feature.