

Additive mixtures**Field of the invention**

The presently claimed invention relates to an additive mixture comprising a compound of formula (1) and a compound of formula (2). The presently claimed invention further relates to a composition comprising an organic material which is susceptible to oxidative, thermal or light-induced degradation and the additive mixture. The presently claimed invention also relates to a method for stabilization of organic materials by incorporating therein or applying thereto the additive mixture. Further, the presently claimed invention relates to the use of the additive mixture as light stabilizer for organic materials.

Background of the invention

Organic materials namely synthetic polymers such as polyolefins, polyethylenes, polypropylenes, and the like are used in wide variety of applications due to their ease of use in the manufacturing of a variety of extruded and molded articles. However, these articles frequently suffer from general stability due to repeated exposure to the UV light. Further, current stabilization systems i.e., anti-scratch agent improved organic materials, when used to prepare automotive articles, show a blooming/exudation due to repeated exposure of these articles to the UV light. Blooming/exudation is undesirable because it can destroy the aesthetic surface characteristics of articles made with polymers that bloom. It is particularly undesirable for bloom to occur in articles where clarity is desired. Bloom is also undesirable as it reduces the ability of an article made with the blooming polymer to be securely bound to other article with adhesives. Blooming has been recognized as serious problem in some applications and an effective means for alleviating it has been sought for years.

Hence, retaining the properties such as stability of the polymer when exposed to the UV light and reducing the tendency of a polymer to bloom is highly desirable.

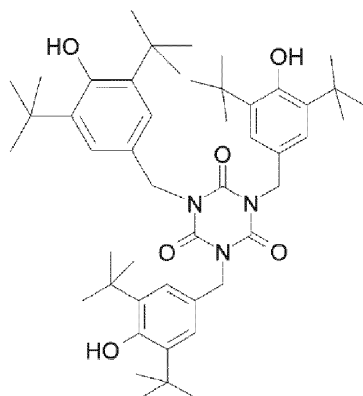
Thus, an object of the present invention is to provide additive mixture that stabilizes an organic material which is susceptible to oxidative, thermal or light-induced degradation.

Another object of the present invention is to provide an additive mixture, which when used in organic material, provides a surface that shows no stickiness to the organic material articles and that shows no blooming/exudation from the organic material articles.

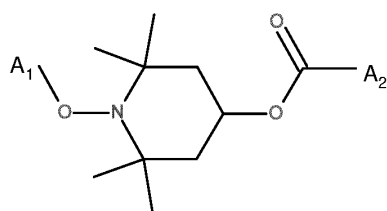
Summary of the invention

Surprisingly, it has been found that additive mixtures containing certain compounds according to the presently claimed invention, stabilize an organic material which is susceptible to oxidative, thermal or light-induced degradation. The additive mixtures of the presently claimed invention when used for organic materials, provide a surface which shows no stickiness to the organic material articles and which shows no blooming/exudation from the organic material articles.

Thus, in one aspect, the presently claimed invention is directed to an additive mixture comprising a compound of formula (1) and a compound of formula (2)



(1),



(2),

wherein

- 5 A_1 is linear or branched, substituted or unsubstituted C_1 to C_{20} alkyl, and
 A_2 is linear or branched, substituted or unsubstituted C_1 to C_{30} alkyl.

In another aspect, the presently claimed invention is directed to a composition comprising
 a) an organic material which is susceptible to oxidative, thermal or light-induced degradation; and

- 10 b) an additive mixture as defined above.

In another aspect, the presently claimed invention is directed to an automotive interior or exterior material made of a composition comprising an organic material and an additive mixture as defined above.

- 15 In another aspect, the presently claimed invention is directed to a method for stabilization of an organic material susceptible to oxidative, thermal or light-induced degradation, which comprises incorporating therein or applying thereto an additive mixture as defined above.

- 20 In still another aspect, the presently claimed invention is directed to the use of the additive mixture as light stabilizer for organic material susceptible to light-induced degradation.

Detailed Description of the Invention

- Before the present compositions and formulations of the invention are described, it is to be under-stood that this invention is not limited to particular compositions and formulations described, since such compositions and formulation may, of course, vary. It is also to be understood that the terminology used herein is not intended to be limiting, since the scope of the presently claimed invention will be limited only by the appended claims.

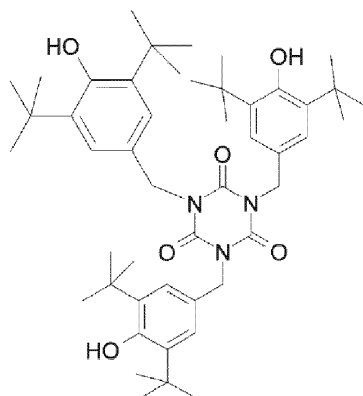
If hereinafter a group is defined to comprise at least a certain number of embodiments, this is meant to also encompass a group which preferably consists of these embodiments only. Further-more, the terms "first", "second", "third" or "(a)", "(b)", "(c)", "(d)" etc. and the like in the description and in the claims, are used for distinguishing between similar elements and not necessarily for describing a sequential or chronological order. It is to be understood that the terms so used are interchangeable under appropriate circumstances and that the embodiments of the invention de-scribed herein are capable of operation in other sequences than described or illustrated herein. In case the terms "first", "second", "third" or "(A)", "(B)" and "(C)" or "(a)", "(b)", "(c)", "(d)", "i", "ii" etc. relate to steps of a method or use or assay there is no time or time interval coherence between the steps, that is, the steps may be carried out simultaneously or there may be time intervals of seconds, minutes, hours, days, weeks, months or even years between such steps, unless other-wise indicated in the application as set forth herein above or below. In the following passages, different aspects of the invention are defined in more detail. Each aspect so defined may be combined with any other aspect or aspects unless clearly indicated to the contrary. In particular, any feature indicated as being preferred or advantageous may be combined with any other feature or features indicated as being preferred or advantageous.

Reference throughout this specification to "one embodiment" or "a preferred embodiment" means that a particular feature, structure or characteristic described in connection with the embodiment is included in at least one embodiment of the presently claimed invention. Thus, appearances of the phrases "in one embodiment" or "in a preferred embodiment" or "in another embodiment" in various places throughout this specification are not necessarily all referring to the same embodiment but may. Furthermore, the particular features, structures or characteristics may be combined in any suitable manner, as would be apparent to a person skilled in the art from this disclosure, in one or more embodiments. Furthermore, while some embodiments described herein include some, but not other features included in other embodiments, combinations of features of different embodiments are meant to be within the scope of the invention, and form different embodiments, as would be understood by those in the art. For example, in the appended claims, any of the claimed embodiments can be used in any combination.

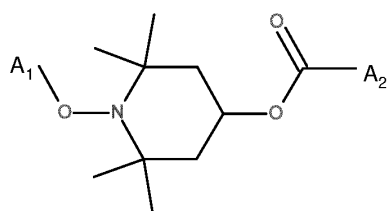
Furthermore, the ranges defined throughout the specification include the end values as well i.e. a range of 1 to 10 implies that both 1 and 10 are included in the range. For the avoidance of doubt, the applicant shall be entitled to any equivalents according to the applicable law.

Certain terms are first defined so that this disclosure can be more readily understood. Unless defined otherwise, all technical and scientific terms used herein have the same meaning as commonly understood by one of ordinary skill in the art to which embodiments of the invention pertain.

In an aspect, the presently claimed invention is directed to additive mixtures comprising a compound of formula (1) and a compound of formula (2)



(1),



(2),

wherein

- 5 A_1 is linear or branched, substituted or unsubstituted C_1 to C_{20} alkyl, and
 A_2 is linear or branched, substituted or unsubstituted C_1 to C_{30} alkyl.

In a preferred embodiment, A_1 is linear or branched, hydroxyl-substituted C_1 - C_{20} alkyl.

- In an embodiment, alkyl substituent of A_1 is selected from the group consisting of methyl, ethyl, propyl, butyl, pentyl, hexyl, heptyl, octyl, nonyl, decyl, undecyl, dodecyl, tridecyl, tetradecyl, pentadecyl, hexadecyl, heptadecyl, octadecyl, nonadecyl, and icosyl.

In a preferred embodiment, A_1 is 2-hydroxy-2-methylpropyl.

In a preferred embodiment, A_2 is linear or branched, unsubstituted C_1 to C_{30} alkyl

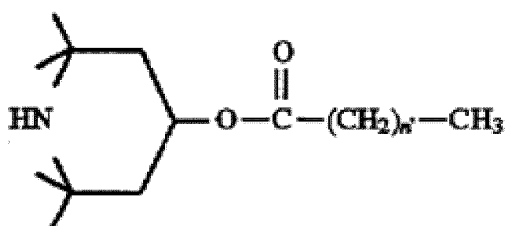
- In an embodiment, alkyl substituent of A_2 is selected from the group consisting of methyl, ethyl, propyl, butyl, pentyl, hexyl, heptyl, octyl, nonyl, decyl, undecyl, dodecyl, tridecyl, tetradecyl, pentadecyl, hexadecyl, heptadecyl, octadecyl, nonadecyl, icosyl, heneicosyl, docosyl, tricosyl, tetracosyl, pentacosyl, hexacosyl, heptacosyl, octacosyl, nonacosyl, and triacontyl.

In a preferred embodiment, A_2 is selected from pentadecyl, and heptadecyl.

- In a most preferred embodiment, the compound of formula (2) is 1-(2-hydroxy-2-methylpropoxy)-4-octadecanoyloxy-2,2,6,6-tetramethylpiperidine.

In an embodiment, the weight ratio of the compound of formula (1) to the compound of formula (2) is in the range of from 5:95 to 95:5, preferably 10:90 to 90:10, more preferably, 20:80 to 80:20, even more preferably 30:70 to 70:30, still more preferably 40:60 to 60:40, and most preferably 50:50.

- 25 In an embodiment, the additive mixture further comprises an additive, other than the additives as defined above, selected from a hindered amine light stabilizer, a hydroxyphenyl triazine UV absorber, a compound of formula (C-I-8)



(C-I-8),

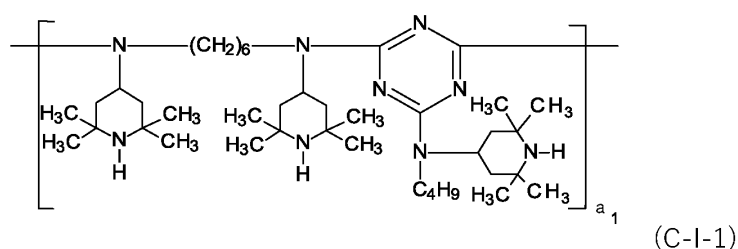
wherein n' is an integer in the range of 14 to 16, and mixtures thereof.

In another embodiment of the presently claimed invention, the additive mixture comprises a compound of formula (1), a compound of formula (2), and at least one compound selected from a group of the hindered amine light stabilizers.

The hindered amine light stabilizer is selected from the group consisting of carbonic acid bis(1-undecyloxy-2,2,6,6-tetramethyl-4-piperidyl)ester, bis(2,2,6,6-tetramethyl-4-piperidyl)sebacate, bis(2,2,6,6-tetramethyl-4-piperidyl)succinate, bis(1,2,2,6,6-pentamethyl-4-piperidyl)sebacate, bis(1-octyloxy-2,2,6,6-tetramethyl-4-piperidyl)sebacate, bis(1,2,2,6,6-pentamethyl-4-piperidyl) n-butyl-3,5-di-tert-butyl-4-hydroxybenzylmalonate, the condensate of 1-(2-hydroxyethyl)-2,2,6,6-tetramethyl-4-hydroxypiperidine and succinic acid, linear or cyclic condensates of N,N'-bis(2,2,6,6-tetramethyl-4-piperidyl)hexamethylenediamine and 4-tert-octylamino-2,6-dichloro-1,3,5-triazine, tris(2,2,6,6-tetramethyl-4-piperidyl)nitritotriacetate, tetrakis(2,2,6,6-tetramethyl-4-piperidyl)-1,2,3,4-butanetetra-carboxylate, 1,1'-(1,2-ethanediyl)-bis(3,3,5,5-tetramethylpiperazinone), 4-benzoyl-2,2,6,6-tetramethylpiperidine, 4-stearyloxy-2,2,6,6-tetramethylpiperidine, bis(1,2,2,6,6-pentamethylpiperidyl)-2-n-butyl-2-(2-hydroxy-3,5-di-tert-butylbenzyl)malonate, 3-n-octyl-7,7,9,9-tetramethyl-1,3,8-triazaspiro[4.5]decane-2,4-dione, bis(1-octyloxy-2,2,6,6-tetramethylpiperidyl)sebacate, bis(1-octyloxy-2,2,6,6-tetramethylpiperidyl)succinate, linear or cyclic condensates of N,N'-bis(2,2,6,6-tetramethyl-4-piperidyl)hexamethylenediamine and 4-morpholino-2,6-dichloro-1,3,5-triazine, the condensate of 2-chloro-4,6-bis(4-n-butylamino-2,2,6,6-tetramethylpiperidyl)-1,3,5-triazine and 1,2-bis(3-aminopropylamino)ethane, the condensate of 2-chloro-4,6-di-(4-n-butylamino-1,2,2,6,6-pentamethylpiperidyl)-1,3,5-triazine and 1,2-bis(3-aminopropylamino)ethane, 8-acetyl-3-dodecyl-7,7,9,9-tetramethyl-1,3,8-triazaspiro[4.5]decane-2,4-dione, 3-dodecyl-1-(2,2,6,6-tetramethyl-4-piperidyl)pyrrolidine-2,5-dione, 3-dodecyl-1-(1,2,2,6,6-pentamethyl-4-piperidyl)pyrrolidine-2,5-dione, a mixture of 4-hexadecyloxy- and 4-stearyloxy-2,2,6,6-tetramethylpiperidine, a condensate of N,N'-bis(2,2,6,6-tetramethyl-4-piperidyl)hexamethylenediamine and 4-cyclohexylamino-2,6-dichloro-1,3,5-triazine, a condensate of 1,2-bis(3-aminopropylamino)ethane and 2,4,6-trichloro-1,3,5-triazine and 4-butylamino-2,2,6,6-tetramethylpiperidine; a condensate of 1,6-hexanediamine and 2,4,6-trichloro-1,3,5-triazine as well as N,N-dibutylamine and 4-butylamino-2,2,6,6-tetramethylpiperidine; N-(2,2,6,6-tetramethyl-4-piperidyl)-n-dodecylsuccinimide, N-(1,2,2,6,6-pentamethyl-4-piperidyl)-n-dodecylsuccinimide, 2-undecyl-7,7,9,9-tetramethyl-1-oxa-3,8-diaza-4-oxo-spiro[4.5]decane, a reaction product of 7,7,9,9-tetramethyl-2-cycloundecyl-1-oxa-3,8-diaza-4-oxospiro[4.5]decane and epichlorohydrin, 1,1-

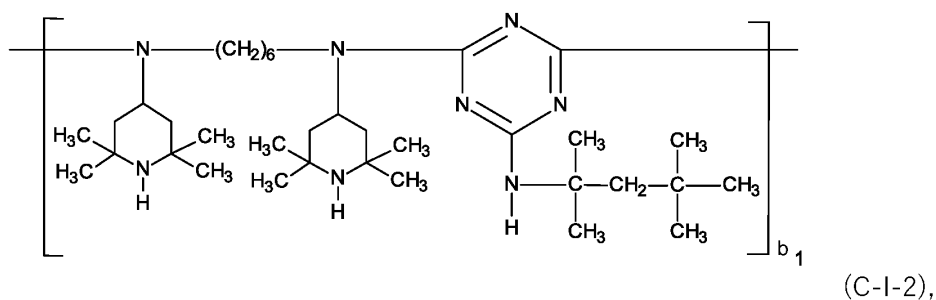
bis(1,2,2,6,6-pentamethyl-4-piperidylloxycarbonyl)-2-(4-methoxyphenyl)ethene, N,N'-bis-formyl-N,N'-bis(2,2,6,6-tetramethyl-4-piperidyl)hexamethylenediamine, a diester of 4-methoxymethylenemalonic acid with 1,2,2,6,6-pentamethyl-4-hydroxypiperidine, poly[methylpropyl-3-oxy-4-(2,2,6,6-tetramethyl-4-piperidyl)]siloxane, a reaction product of maleic acid anhydride- α -olefin copolymer with 2,2,6,6-tetramethyl-4-aminopiperidine or 1,2,2,6,6-pentamethyl-4-aminopiperidine, 2,4-bis[N-(1-cyclohexyloxy-2,2,6,6-tetramethylpiperidine-4-yl)-N-butylamino]-6-(2-hydroxyethyl)amino-1,3,5-triazine, 5-(2-ethylhexanoyl)oxymethyl-3,3,5-trimethyl-2-morpholinone, 5-(2-ethylhexanoyl)oxymethyl-3,3,5-trimethyl-2-morpholinone, the reaction product of 2,4-bis[(1-cyclohexyloxy-2,2,6,6-piperidine-4-yl)butylamino]-6-chloro-s-triazine with N,N'-bis(3-aminopropyl)ethylenediamine), 1,3,5-tris(N-cyclohexyl-N-(2,2,6,6-tetramethylpiperazine-3-one-4-yl)amino)-s-triazine, 1,3,5-tris(N-cyclohexyl-N-(1,2,2,6,6-pentamethylpiperazine-3-one-4-yl)amino)-s-triazine, 4-N-butyl-2-N,4-N-bis(2,2,6,6-tetramethylpiperidin-4-yl)-2-N-[6-[(2,2,6,6-tetramethylpiperidin-4-yl)amino]hexyl]-1,3,5-triazine-2,4-diamine, N,N'-bis(2,2,6,6-tetramethyl-4-piperidyl)-N,N'-diformylhexamethylenediamine, and mixtures thereof.

In a preferred embodiment, the hindered amine light stabilizers are the following:



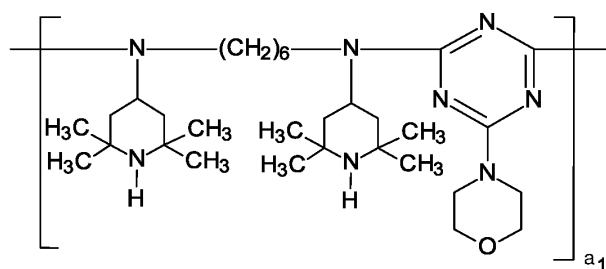
with a_1 being 2 to 10,

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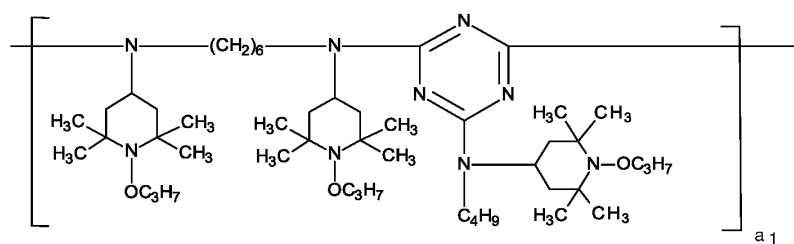


wherein b_1 is a number from 2 to 20, preferably 2 to 10,

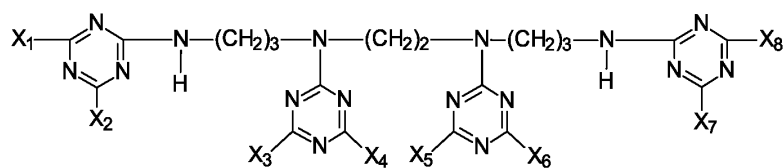
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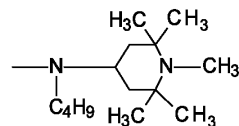
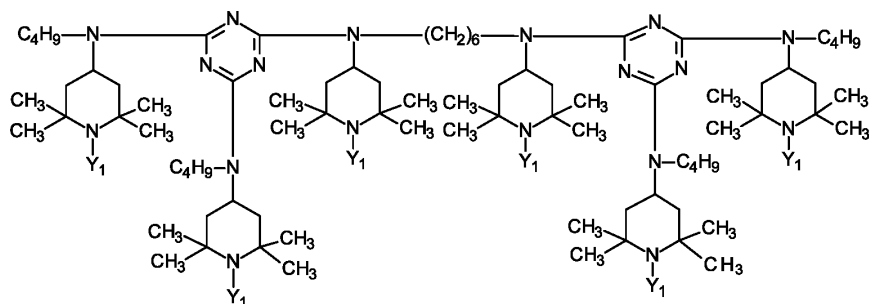
(C-I-3)

with a_1 being 2 to 10,

(C-I-4)

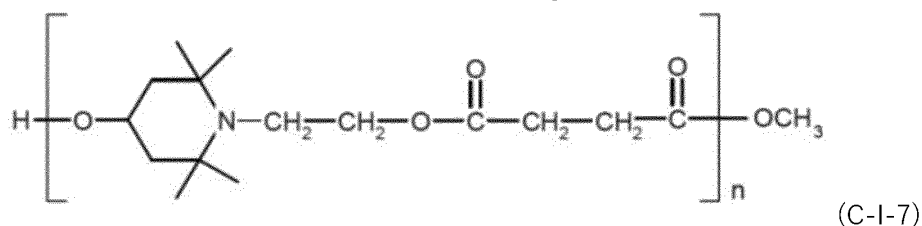
5 with a_1 being 2 to 10,

(C-I-5)

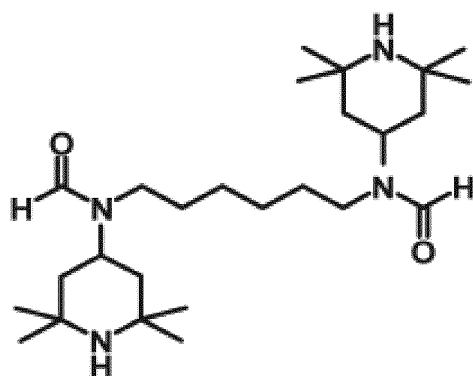
wherein X_1 , X_2 , X_3 , X_4 , X_5 , X_6 , X_7 and X_8 are the group

(C-I-6),

wherein Y_1 independently of each other are hydrogen or propoxy, preferably propoxy.



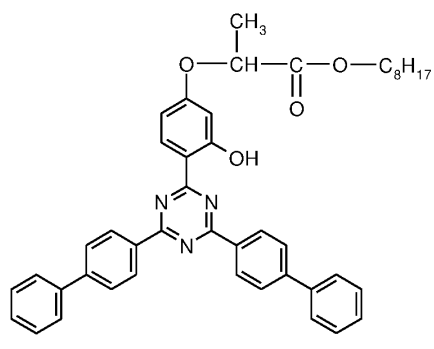
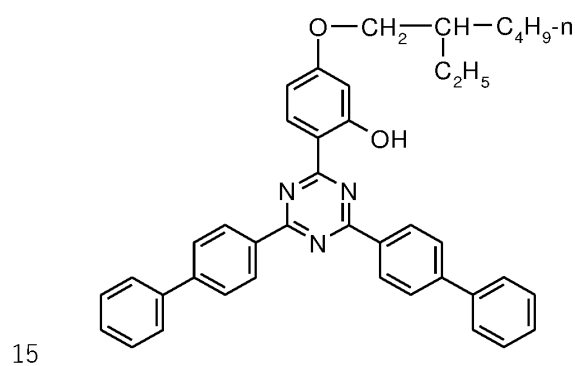
wherein n is 4 to 20,

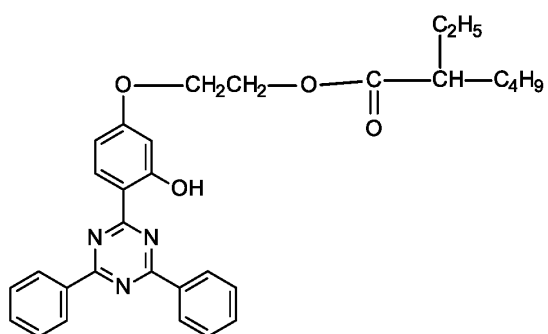


- 5 In an embodiment, the hindered amine light stabilizer is selected from N,N'-bis(2,2,6,6-tetramethyl-4-piperidyl)-N,N'-diformylhexamethylenediamine (C-I-9), a condensate of 1,6-hexanediamine and 2,4,6-trichloro-1,3,5-triazine as well as N,N-dibutylamine and 4-butylamino-2,2,6,6-tetramethylpiperidine (C-I-1), the condensate of 1-(2-hydroxyethyl)-2,2,6,6-tetramethyl-4-hydroxypiperidine and succinic acid, and mixtures thereof.
- 10 In a preferred embodiment, the hindered amine light stabilizer is selected from N,N'-bis(2,2,6,6-tetramethyl-4-piperidyl)-N,N'-diformylhexamethylenediamine (C-I-9), a condensate of 1,6-hexanediamine and 2,4,6-trichloro-1,3,5-triazine as well as N,N-dibutylamine and 4-butylamino-2,2,6,6-tetramethylpiperidine (C-I-1), and mixtures thereof.
- 15 In a more preferred embodiment, the hindered amine light stabilizer is a condensate of 1,6-hexanediamine and 2,4,6-trichloro-1,3,5-triazine as well as N,N-dibutylamine and 4-butylamino-2,2,6,6-tetramethylpiperidine (C-I-1).
- In a most preferred embodiment, the hindered amine light stabilizer is N,N'-bis(2,2,6,6-tetramethyl-4-piperidyl)-N,N'-diformylhexamethylenediamine (C-I-9).
- 20 In another embodiment of the presently claimed invention, the additive mixture comprises a compound of formula (1), a compound of formula (2), and at least one compound selected from a group of the hydroxyphenyl triazine UV absorber.
- The hydroxyphenyl triazine UV absorber is selected from the group consisting of 2,4,6-tris(2-hydroxy-4-octyloxyphenyl)-1,3,5-triazine, 2-(2-hydroxy-4-octyloxyphenyl)-4,6-bis(2,4-dimethylphenyl)-1,3,5-triazine, 2-(2,4-dihydroxyphenyl)-4,6-bis(2,4-dimethylphenyl)-1,3,5-triazine, 2,4-bis(2-hydroxy-4-propyloxyphenyl)-6-(2,4-dimethylphenyl)-1,3,5-triazine, 2-(2-hydroxy-4-octyloxyphenyl)-4,6-bis(4-methylphenyl)-1,3,5-triazine, 2-(2-hydroxy-4-dodecyloxyphenyl)-4,6-bis(2,4-dimethylphenyl)-1,3,5-triazine, 2-(2-hydroxy-4-tridecyloxyphenyl)-4,6-bis(2,4-dimethylphenyl)-1,3,5-triazine, 2-[2-

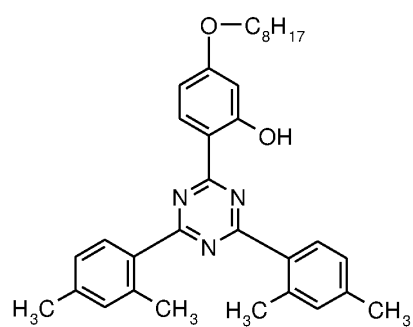
hydroxy-4-(2-hydroxy-3-butyloxypropoxy)phenyl]-4,6-bis(2,4-dimethyl)-1,3,5-triazine, 2-[2-hydroxy-4-(2-hydroxy-3-octyloxypropyloxy)phenyl]-4,6-bis(2,4-dimethyl)-1,3,5-triazine, 2-[4-(dodecyloxy/tridecyloxy-2-hydroxypropoxy)-2-hydroxyphenyl]-4,6-bis(2,4-dimethylphenyl)-1,3,5-triazine, 2-[2-hydroxy-4-(2-hydroxy-3-dodecyloxypropoxy)phenyl]-4,6-bis(2,4-dimethylphenyl)-1,3,5-triazine, 2-(2-hydroxy-4-hexyloxy)phenyl-4,6-diphenyl-1,3,5-triazine, 2-(2-hydroxy-4-methoxyphenyl)-4,6-diphenyl-1,3,5-triazine, 2,4,6-tris[2-hydroxy-4-(3-butoxy-2-hydroxypropoxy)phenyl]-1,3,5-triazine, 2-(2-hydroxyphenyl)-4-(4-methoxyphenyl)-6-phenyl-1,3,5-triazine, 2-[2-hydroxy-4-[3-(2-ethylhexyl-1-oxy)-2-hydroxypropyloxy]phenyl]-4,6-bis(2,4-dimethylphenyl)-1,3,5-triazine, 2,4-bis(4-[2-ethylhexyloxy]-2-hydroxyphenyl)-6-(4-methoxyphenyl)-1,3,5-triazine, 2-(4,6-bis-biphenyl-4-yl-1,3,5-triazin-2-yl)-5-(2-ethyl-(n)-hexyloxy)phenol, and mixtures thereof.

In a preferred embodiment, the hydroxyphenyl triazine UV absorbers are the following:

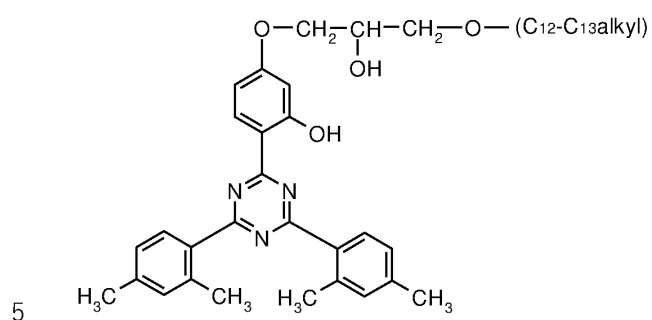




(C-II-4),

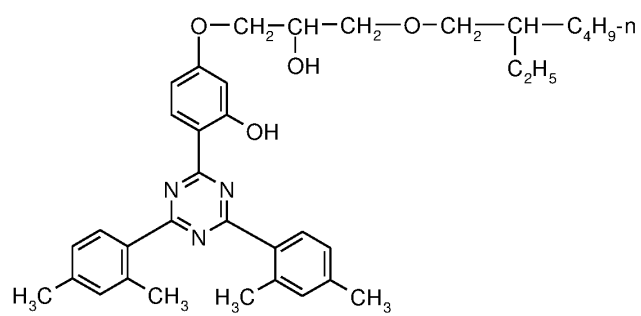


(C-II-5),

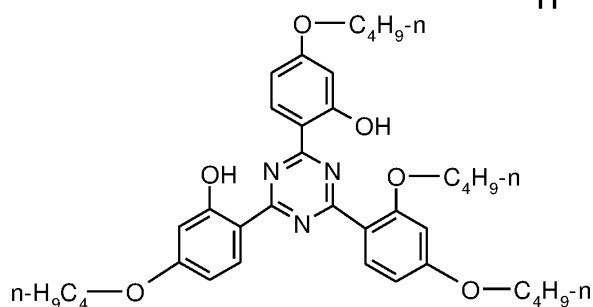


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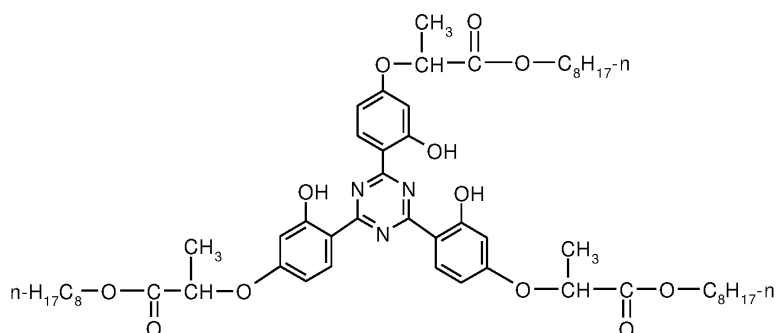
(C-II-6),



(C-II-7),



(C-II-8),



(C-II-9).

In a more preferred embodiment, the hydroxyphenyl triazine UV absorber is compound of formula (C-II-1) and compound of formula (C-II-3), especially compound of formula (C-II-1).

In another embodiment of the presently claimed invention, the additive mixture comprises a compound of formula (1), a compound of formula (2), and a compound of formula (C-I-8).

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In another aspect, the presently claimed invention is directed to a composition comprising a) an organic material which is susceptible to oxidative, thermal or light-induced degradation; and

b) an additive mixture as defined hereinbefore.

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Examples of organic materials which can be stabilized are:

1. Polymers of mono olefins and diolefins, for example polypropylene, polyisobutylene, polybut-1-ene, poly-4-methylpent-1-ene, polyvinylcyclohexane, polyisoprene or polybutadiene, as well as polymers of cycloolefins, for instance of cyclopentene or norbornene, polyethylene (which optionally can be crosslinked), for example high density polyethylene (HDPE), high density and high molecular weight polyethylene (HDPE-HMW), high density and ultrahigh molecular weight polyethylene (HDPE-UHMW), medium density polyethylene (MDPE), low density polyethylene (LDPE), linear low density polyethylene (LLDPE), (VLDPE) and (ULDPE).

Polyolefins, i.e. the polymers of mono olefins exemplified in the preceding paragraph, preferably polyethylene and polypropylene, can be prepared by different, and especially by the following, methods:

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- a) radical polymerisation (normally under high pressure and at elevated temperature).

- b) catalytic polymerisation using a catalyst that normally contains one or more than one metal of groups IVb, Vb, VIb or VIII of the Periodic Table. These metals usually have one or more than one ligand, typically oxides, halides, alcoholates, esters, ethers, amines, alkyls, alkenyls and/or aryls that may be either π - or σ -coordinated. These metal complexes may be in the free form or fixed on substrates, typically on activated magnesium chloride, titanium(III) chloride, alumina or silicon oxide. These catalysts may be soluble or insoluble in the polymerisation medium. The catalysts can be used by themselves in the polymerisation or further activators may be used, typically metal alkyls, metal hydrides, metal alkyl halides, metal alkyl oxides or metal alkyloxanes, said metals being elements of groups Ia, IIa and/or IIIa of the Periodic Table. The activators may be modified conveniently with further ester, ether, amine or silyl ether groups. These catalyst systems are usually termed Phillips, Standard Oil Indiana, Ziegler (-Natta), TNZ (DuPont), metallocene or single site catalysts (SSC).
2. Mixtures of the polymers mentioned under 1), for example mixtures of polypropylene with polyisobutylene, polypropylene with polyethylene (for example PP/HDPE, PP/LDPE) and mixtures of different types of polyethylene (for example LDPE/HDPE).
3. Copolymers of monoolefins and diolefins with each other or with other vinyl monomers, for example ethylene/propylene copolymers, linear low density polyethylene (LLDPE) and mixtures thereof with low density polyethylene (LDPE), propylene/but-1-ene copolymers, propylene/isobutylene copolymers, ethylene/but-1-ene copolymers, ethylene/hexene copolymers, ethylene/methylpentene copolymers, ethylene/heptene copolymers, ethylene/octene copolymers, ethylene/vinylcyclohexane copolymers, ethylene/cycloolefin copolymers (e.g. ethylene/norbornene like COC), ethylene/1-olefins copolymers, where the 1-olefin is generated in-situ; propylene/butadiene copolymers, isobutylene/isoprene copolymers, ethylene/vinylcyclohexene copolymers, ethylene/alkyl acrylate copolymers, ethylene/alkyl methacrylate copolymers, ethylene/vinyl acetate copolymers or ethylene/acrylic acid copolymers and their salts (ionomers) as well as terpolymers of ethylene with propylene and a diene such as hexadiene, dicyclopentadiene or ethylidene-norbornene; and mixtures of such copolymers with one another and with polymers mentioned in 1) above, for example polypropylene/ethylene-propylene copolymers, LDPE/ethylene-vinyl acetate copolymers (EVA), LDPE/ethylene-acrylic acid copolymers (EAA), LLDPE/EVA, LLDPE/EAA and alternating or random polyalkylene/carbon monoxide copolymers and mixtures thereof with other polymers, for example polyamides.
4. Hydrocarbon resins (for example C₅-C₉) including hydrogenated modifications thereof (e.g. tackifiers) and mixtures of polyalkylenes and starch. Homopolymers and copolymers from 1.) - 4.) may have any stereostructure including syndiotactic, isotactic, hemi-isotactic or atactic; where atactic polymers are preferred. Stereoblock polymers are also included.
5. Polystyrene, poly(p-methylstyrene), poly(α -methylstyrene).
6. Aromatic homopolymers and copolymers derived from vinyl aromatic monomers including styrene, α -methylstyrene, all isomers of vinyl toluene, especially p-vinyltoluene, all isomers of ethyl styrene, propyl styrene, vinyl biphenyl, vinyl naphthalene, and vinyl

anthracene, and mixtures thereof. Homopolymers and copolymers may have any stereostructure including syndiotactic, isotactic, hemi-isotactic or atactic; where atactic polymers are preferred. Stereoblock polymers are also included.

5 6a. Copolymers including aforementioned vinyl aromatic monomers and comonomers selected from ethylene, propylene, dienes, nitriles, acids, maleic anhydrides, maleimides, vinyl acetate and vinyl chloride or acrylic derivatives and mixtures thereof, for example styrene/butadiene, styrene/acrylonitrile, styrene/ethylene (interpolymers), styrene/alkyl methacrylate, styrene/butadiene/alkyl acrylate, styrene/butadiene/alkyl methacrylate, styrene/maleic anhydride, styrene/acrylonitrile/methyl acrylate; mixtures of high impact
10 strength of styrene copolymers and another polymer, for example a polyacrylate, a diene polymer or an ethylene/propylene/diene terpolymer; and block copolymers of styrene such as styrene/butadiene/styrene, styrene/isoprene/styrene, styrene/ethylene/butylene/styrene or styrene/ethylene/propylene/styrene.

15 6b. Hydrogenated aromatic polymers derived from hydrogenation of polymers mentioned under 6.), especially including polycyclohexylethylene (PCHE) prepared by hydrogenating atactic polystyrene, often referred to as polyvinylcyclohexane (PVCH).

6c. Hydrogenated aromatic polymers derived from hydrogenation of polymers mentioned under 6a.).

20 Homopolymers and copolymers may have any stereostructure including syndiotactic, isotactic, hemi-isotactic or atactic; where atactic polymers are preferred. Stereoblock polymers are also included.

7. Graft copolymers of vinyl aromatic monomers such as styrene or α -methylstyrene, for example styrene on polybutadiene, styrene on polybutadiene-styrene or polybutadiene-acrylonitrile copolymers; styrene and acrylonitrile (or methacrylonitrile) on polybutadiene;
25 styrene, acrylonitrile and methyl methacrylate on polybutadiene; styrene and maleic anhydride on polybutadiene; styrene, acrylonitrile and maleic anhydride or maleimide on polybutadiene; styrene and maleimide on polybutadiene; styrene and alkyl acrylates or methacrylates on polybutadiene; styrene and acrylonitrile on ethylene/propylene/diene terpolymers; styrene and acrylonitrile on polyalkyl acrylates or polyalkyl methacrylates,
30 styrene and acrylonitrile on acrylate/butadiene copolymers, as well as mixtures thereof with the copolymers listed under 6), for example the copolymer mixtures known as ABS, MBS, ASA or AES polymers.

8. Halogen-containing polymers such as polychloroprene, chlorinated rubbers, chlorinated and brominated copolymer of isobutylene-isoprene (halobutyl rubber), chlorinated
35 or sulfochlorinated polyethylene, copolymers of ethylene and chlorinated ethylene, epichlorohydrin homo- and copolymers, especially polymers of halogen-containing vinyl compounds, for example polyvinyl chloride, polyvinylidene chloride, polyvinyl fluoride, polyvinylidene fluoride, as well as copolymers thereof such as vinyl chloride/vinylidene chloride, vinyl chloride/vinyl acetate or vinylidene chloride/vinyl acetate copolymers.

40 9. Polymers derived from α,β -unsaturated acids and derivatives thereof such as polyacrylates and polymethacrylates; polymethyl methacrylates, polyacrylamides and polyacrylonitriles, impact-modified with butyl acrylate.

10. Copolymers of the monomers mentioned under 9) with each other or with other unsaturated monomers, for example acrylonitrile/ butadiene copolymers, acrylonitrile/alkyl acrylate copolymers, acrylonitrile/alkoxyalkyl acrylate or acrylonitrile/vinyl halide copolymers or acrylonitrile/ alkyl methacrylate/butadiene terpolymers.
- 5 11. Polymers derived from unsaturated alcohols and amines or the acyl derivatives or acetals thereof, for example polyvinyl alcohol, polyvinyl acetate, polyvinyl stearate, polyvinyl benzoate, polyvinyl maleate, polyvinyl butyral, polyallyl phthalate or polyallyl melamine; as well as their copolymers with olefins mentioned in 1) above.
- 10 12. Homopolymers and copolymers of cyclic ethers such as polyalkylene glycols, polyethylene oxide, polypropylene oxide or copolymers thereof with bisglycidyl ethers.
13. Polyacetals such as polyoxymethylene and those polyoxymethylenes which contain ethylene oxide as a comonomer; polyacetals modified with thermoplastic polyurethanes, acrylates or MBS.
- 15 14. Polyphenylene oxides and sulfides, and mixtures of polyphenylene oxides with styrene polymers or polyamides.
- 15 15. Polyurethanes derived from hydroxyl-terminated polyethers, polyesters or polybutadienes on the one hand and aliphatic or aromatic polyisocyanates on the other, as well as precursors thereof.
- 20 16. Polyamides and copolyamides derived from diamines and dicarboxylic acids and/or from aminocarboxylic acids or the corresponding lactams, for example polyamide 4, polyamide 6, polyamide 6/6, 6/10, 6/9, 6/12, 4/6, 12/12, polyamide 11, polyamide 12, aromatic polyamides starting from m-xylene diamine and adipic acid; polyamides prepared from hexamethylenediamine and isophthalic or/and terephthalic acid and with or without an elastomer as modifier, for example poly-2,4,4,-trimethylhexamethylene terephthalamide or poly-m-phenylene isophthalamide; and also block copolymers of the afore-
- 25 mentioned polyamides with polyolefins, olefin copolymers, ionomers or chemically bonded or grafted elastomers; or with polyethers, e.g. with polyethylene glycol, polypropylene glycol or polytetramethylene glycol; as well as polyamides or copolyamides modified with EPDM or ABS; and polyamides condensed during processing (RIM polyamide systems).
- 30 17. Polyureas, polyimides, polyamide-imides, polyetherimides, polyesterimides, polyhydantoins and polybenzimidazoles.
18. Polyesters derived from dicarboxylic acids and diols and/or from hydroxycarboxylic acids or the corresponding lactones or lactides, for example polyethylene terephthalate, polybutylene terephthalate, poly-1,4-dimethylolcyclohexane terephthalate, polyalkylene
- 35 naphthalate and polyhydroxybenzoates as well as copolyether esters derived from hydroxyl-terminated polyethers, and also polyesters modified with polycarbonates or MBS. Copolyesters may comprise, for example - but are not limited to - polybutylenesuccinate/terephthalate, polybutyleneadipate/terephthalate, polytetramethyleneadipate/terephthalate, polybutylensuccinate/adipate, polybutylensuccinate/carbonate, poly-3-hydroxybutyrate/octanoate copolymer, poly-3-hydroxybutyrate/hexanoate/decanoate terpolymer. Furthermore, aliphatic polyesters may comprise, for example - but are not limited to - the class of poly(hydroxyalkanoates), in particular, poly(propiolactone),
- 40

- poly(butylolactone), poly(pivalolactone), poly(valerolactone) and poly(caprolactone), polyethylenesuccinate, polypropylenesuccinate, polybutylenesuccinate, polyhexamethylenesuccinate, polyethyleneadipate, polypropyleneadipate, polybutyleneadipate, polyhexamethyleneadipate, polyethyleneoxalate, polypropyleneoxalate, polybutyleneoxalate, polyhexamethyleneoxalate, polyethylenesebacate, polypropylenesebacate, polybutylenesebacate and polylactic acid (PLA) as well as corresponding polyesters modified with polycarbonates or MBS. The term "polylactic acid (PLA)" designates a homo-polymer of preferably poly-L-lactide and any of its blends or alloys with other polymers; a co-polymer of lactic acid or lactide with other monomers, such as hydroxy-carboxylic acids, like for example glycolic acid, 3-hydroxy-butyric acid, 4-hydroxy-butyric acid, 4-hydroxy-valeric acid, 5-hydroxy-valeric acid, 6-hydroxy-caproic acid and cyclic forms thereof; the terms "lactic acid" or "lactide" include L-lactic acid, D-lactic acid, mixtures and dimers thereof, i.e. L-lactide, D-lactide, meso-lactide and any mixtures thereof.
19. Polycarbonates and polyester carbonates.
20. Polyketones.
21. Polysulfones, polyether sulfones and polyether ketones.
22. Crosslinked polymers derived from aldehydes on the one hand and phenols, ureas and melamines on the other hand, such as phenol/formaldehyde resins, urea/formaldehyde resins and melamine/formaldehyde resins.
23. Drying and non-drying alkyd resins.
24. Unsaturated polyester resins derived from copolyesters of saturated and unsaturated dicarboxylic acids with polyhydric alcohols and vinyl compounds as crosslinking agents, and also halogen-containing modifications thereof of low flammability.
25. Crosslinkable acrylic resins derived from substituted acrylates, for example epoxy acrylates, urethane acrylates or polyester acrylates.
26. Alkyd resins, polyester resins and acrylate resins crosslinked with melamine resins, urea resins, isocyanates, isocyanurates, polyisocyanates or epoxy resins.
27. Crosslinked epoxy resins derived from aliphatic, cycloaliphatic, heterocyclic or aromatic glycidyl compounds, e.g. products of diglycidyl ethers of bisphenol A and bisphenol F, which are crosslinked with customary hardeners such as anhydrides or amines, with or without accelerators.
28. Natural polymers such as cellulose, rubber, gelatin and chemically modified homologous derivatives thereof, for example cellulose acetates, cellulose propionates and cellulose butyrates, or the cellulose ethers such as methyl cellulose; as well as rosins and their derivatives.
29. Blends of the aforementioned polymers (polyblends), for example PP/EPDM, Polyamide/EPDM or ABS, PVC/EVA, PVC/ABS, PVC/MBS, PC/ABS, PBTP/ABS, PC/ASA, PC/PBT, PVC/CPE, PVC/acrylates, POM/thermoplastic PUR, PC/thermoplastic PUR, POM/acrylate, POM/MBS, PPO/HIPS, PPO/PA 6.6 and copolymers, PA/HDPE, PA/PP, PA/PPO, PBT/PC/ABS or PBT/PET/PC.
30. Naturally occurring and synthetic organic materials which are pure monomeric compounds or mixtures of such compounds, for example mineral oils, animal and vegetable fats, oil and waxes, or oils, fats and waxes based on synthetic esters (e.g. phthalates,

adipates, phosphates or trimellitates) and also mixtures of synthetic esters with mineral oils in any weight ratios, typically those used as spinning compositions, as well as aqueous emulsions of such materials.

31. Aqueous emulsions of natural or synthetic rubber, e.g. natural latex or latices of carboxylated styrene/butadiene copolymers.

A polyolefin, an acrylonitrile/butadiene/styrene, a polyvinyl chloride, a polymethylmethacrylate, a polyamide or a polyoxymethylene are of special interest.

In a preferred embodiment the organic material is a thermoplastic elastomer.

Examples of thermoplastic elastomers include polyolefin thermoplastic elastomers and block copolymer-type polystyrene thermoplastic elastomers. The polyolefin thermoplastic elastomers comprise polyolefin resins such as polypropylene and polyethylene serving as hard segments and rubber compositions such as ethylene-propylene-diene-elastomer (EPDM) serving as soft segments. The block copolymer-type polystyrene thermoplastic elastomer comprises polystyrene serving as hard segments and polydienes such as polybutadiene or polyisoprene serving as soft segments.

Alternatively, a blend of the polyolefin elastomers and the polystyrene elastomers may also be used as the thermoplastic elastomer of the present invention. The methods for combining soft segments and hard segments in thermoplastic elastomers may be roughly divided into simple blending, implantation by copolymerization, and dynamic cross-linking. Combinations of segments of polystyrene thermoplastic elastomers include a styrene-butadiene-styrene block copolymer (SBS), a styrene-isoprene-styrene block copolymer (SIS), a styrene-ethylene butylene-styrene block copolymer (SEBS), a styrene-ethylene propylene-styrene block copolymer (SEPS), a hydrogenated polymer of any one of the four copolymers, a hydrogenated polymer of random SBR (HSBR), and a blend of polypropylene and one or more arbitrary members selected from among these polymers. (SBR = styrene butadiene rubber)

Of interest is a thermoplastic polyolefin, in particular polyethylene or polypropylene containing a rubber phase based on ethylene and/or propylene.

The additive mixtures of the present invention can be used in various proportions depending on the nature of the organic material to be stabilized, on the end use and on the presence of other additives.

In general, it is appropriate to use, for example, 0.01 to 5.0 % by weight of the additive mixtures of the present invention, relative to the weight of the organic material, preferably 0.01 to 2.0 %, in particular 0.01 to 1.0 %. Highly preferred are 0.05 to 2.0 %, in particular 0.05 to 1.0 %.

In the most preferred embodiment, 0.6 % by weight of the additive mixtures of the present invention, relative to the weight of the organic material is used.

In an embodiment, the weight ratio of the organic material to the additive mixture is in the range of from 99.99: 0.01 to 1.0: 99, preferably, 99.9: 0.05 to 1.0: 99.

The additive mixtures of the present invention can be added, for example, to polymeric materials before, during or after the polymerization or crosslinking of the said materials. Furthermore, they can be incorporated in the polymeric materials in the pure form or encapsulated in waxes, oils or polymers.

It is to be understood that the compounds of additive mixture, as defined hereinabove, can be added to the organic material directly as a mixture, or the individual compounds are added separately to the organic material.

In general, the additive mixtures of the present invention can be incorporated in the organic materials by various processes, such as dry mixing in the form of powder, or wet
5 mixing in the form of solutions or suspensions or also in the form of a masterbatch which contains the additive mixtures of the present invention in a concentration of 0.01 to 99 % by weight; in such operations, the polymer can be used in the form of powder, granules, solutions, suspensions or in the form of latices. Suitable carrier polymers are for example
10 polyethylene, polypropylene or mixtures thereof.

Examples of processing of the compositions according to the present invention are: Injection blow molding, extrusion, blow molding, rotomolding, in mold decoration (back injection), slush molding, injection molding, co-injection molding, forming, compression
15 molding, pressing, film extrusion (cast film; blown film), fiber spinning (woven, non-woven), drawing (uniaxial, biaxial), annealing, deep drawing, calendering, mechanical transformation, sintering, coextrusion, coating, lamination, crosslinking (radiation, peroxide, silane), vapor deposition, weld together, glue, vulcanization, thermoforming, pipe extru-
sion, profile extrusion, sheet extrusion; sheet casting, spin coating, strapping, foaming, recycling / rework, extrusion coating, visbreaking (peroxide, thermal), fiber melt blown,
20 spun bonded, surface treatment (corona discharge, flame, plasma), sterilization (by gamma rays, electron beams), gel-coating, tape extrusion, SMC-process or plastisol.

The composition of the presently claimed invention further comprises a component (C) an anti-scratch agent, a filler, a pigment, and mixtures thereof.

Examples of anti-scratch additives are saturated or unsaturated fatty acid amides, e.g.
25 erucamide, oleamide and stearamide, as well as a poly(organo)siloxane and mixtures thereof.

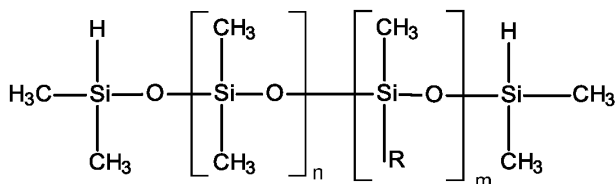
The anti-scratch additives of the present invention are known to those skilled in the art. They can be prepared in analogy to known methods. Most of them are commercially avail-
able.

30 Preferred commercially available poly(organo)siloxane anti-scratch additives are:

TEGOMER® AntiScratch100,
TEGOMER® M-Si 2650,
TEGOPREN® 6846,
35 TEGOMER® H-Si 6440 P,
TEGOMER® AntiScratch 200,
GENIOPLAST® S,
GENIOPLAST® Pellet P and
GENIOPLAST® Pellet P plus.

40 A preferred poly(organo)siloxane anti-scratch additive relates to a mixture of silica and silicone polymer (e.g. 0-50 weight %, preferably 30 weight %, of fumed silica and 50 to 100 weight %, preferably 70 weight %, of silicone polymer).

Further preferred poly(organo)siloxane anti-scratch additives are compounds of the formula



wherein R is alkyl, a polyester residue, an acrylate residue, epoxy, hydroxyalkyl, aminoalkyl, etc.

Another preferred anti-scratch additive is IRGASURF® SR 100.

The composition of the presently claimed invention further comprises conventional additives.

Examples of conventional additives are:

1. Antioxidants

1.1. Alkylated monophenols, for example 2,6-di-tert-butyl-4-methylphenol, 2-tert-butyl-4,6-dimethylphenol, 2,6-di-tert-butyl-4-ethylphenol, 2,6-di-tert-butyl-4-n-butylphenol, 2,6-di-tert-butyl-4-isobutylphenol, 2,6-dicyclopentyl-4-methylphenol, 2-(α-methylcyclohexyl)-4,6-dimethylphenol, 2,6-dioctadecyl-4-methylphenol, 2,4,6-tricyclohexylphenol, 2,6-di-tert-butyl-4-methoxymethylphenol, nonylphenols which are linear or branched in the side chains, for example, 2,6-di-nonyl-4-methylphenol, 2,4-dimethyl-6-(1'-methylundec-1'-yl)phenol, 2,4-dimethyl-6-(1'-methylheptadec-1'-yl)phenol, 2,4-dimethyl-6-(1'-methyltridec-1'-yl)phenol and mixtures thereof.

1.2. Alkylthiomethylphenols, for example 2,4-dioctylthiomethyl-6-tert-butylphenol, 2,4-dioctylthiomethyl-6-methylphenol, 2,4-dioctylthiomethyl-6-ethylphenol, 2,6-di-dodecylthiomethyl-4-nonylphenol.

1.3. Hydroquinones and alkylated hydroquinones, for example 2,6-di-tert-butyl-4-methoxyphenol, 2,5-di-tert-butylhydroquinone, 2,5-di-tert-amylhydroquinone, 2,6-diphenyl-4-octadecyloxyphenol, 2,6-di-tert-butylhydroquinone, 2,5-di-tert-butyl-4-hydroxyanisole, 3,5-di-tert-butyl-4-hydroxyanisole, 3,5-di-tert-butyl-4-hydroxyphenyl stearate, bis(3,5-di-tert-butyl-4-hydroxyphenyl) adipate.

1.4. Tocopherols, for example α-tocopherol, β-tocopherol, γ-tocopherol, δ-tocopherol and mixtures thereof (vitamin E).

1.5. Hydroxylated thiodiphenyl ethers, for example 2,2'-thiobis(6-tert-butyl-4-methylphenol), 2,2'-thiobis(4-octylphenol), 4,4'-thiobis(6-tert-butyl-3-methylphenol), 4,4'-thiobis(6-tert-butyl-2-methylphenol), 4,4'-thiobis(3,6-di-sec-amylphenol), 4,4'-bis(2,6-dimethyl-4-hydroxyphenyl)disulfide.

1.6. Alkylidenebisphenols, for example 2,2'-methylenebis(6-tert-butyl-4-methylphenol), 2,2'-methylenebis(6-tert-butyl-4-ethylphenol), 2,2'-methylenebis[4-methyl-6-(α-methylcyclohexyl)phenol], 2,2'-methylenebis(4-methyl-6-cyclohexylphenol), 2,2'-methylenebis(6-nonyl-4-methylphenol), 2,2'-methylenebis(4,6-di-tert-butylphenol), 2,2'-ethylidenebis(4,6-di-tert-butylphenol), 2,2'-ethylidenebis(6-tert-butyl-4-isobutylphenol), 2,2'-methylenebis[6-(α-methylbenzyl)-4-nonylphenol], 2,2'-methylenebis[6-(α,α-dimethylbenzyl)-4-nonylphenol], 4,4'-methylenebis(2,6-di-tert-butylphenol), 4,4'-

- methylenebis(6-tert-butyl-2-methylphenol), 1,1-bis(5-tert-butyl-4-hydroxy-2-methylphenyl)butane, 2,6-bis(3-tert-butyl-5-methyl-2-hydroxybenzyl)-4-methylphenol, 1,1,3-tris(5-tert-butyl-4-hydroxy-2-methylphenyl)butane, 1,1-bis(5-tert-butyl-4-hydroxy-2-methylphenyl)-3-n-dodecylmercaptobutane, ethylene glycol bis[3,3-bis(3'-tert-butyl-4'-hydroxyphenyl)butyrate], bis(3-tert-butyl-4-hydroxy-5-methylphenyl)dicyclopentadiene, bis[2-(3'-tert-butyl-2'-hydroxy-5'-methylbenzyl)-6-tert-butyl-4-methylphenyl]terephthalate, 1,1-bis-(3,5-dimethyl-2-hydroxyphenyl)butane, 2,2-bis(3,5-di-tert-butyl-4-hydroxyphenyl)propane, 2,2-bis(5-tert-butyl-4-hydroxy-2-methylphenyl)-4-n-dodecylmercaptobutane, 1,1,5,5-tetra-(5-tert-butyl-4-hydroxy-2-methylphenyl)pentane.
- 1.7. O-, N- and S-benzyl compounds, for example 3,5,3',5'-tetra-tert-butyl-4,4'-dihydroxydibenzyl ether, octadecyl-4-hydroxy-3,5-dimethylbenzylmercaptoacetate, tridecyl-4-hydroxy-3,5-di-tert-butylbenzylmercaptoacetate, tris(3,5-di-tert-butyl-4-hydroxybenzyl)amine, bis(4-tert-butyl-3-hydroxy-2,6-dimethylbenzyl)dithioterephthalate, bis(3,5-di-tert-butyl-4-hydroxybenzyl)sulfide, isooctyl-3,5-di-tert-butyl-4-hydroxybenzylmercaptoacetate.
- 1.8. Hydroxybenzylated malonates, for example dioctadecyl-2,2-bis(3,5-di-tert-butyl-2-hydroxybenzyl)malonate, di-octadecyl-2-(3-tert-butyl-4-hydroxy-5-methylbenzyl)malonate, di-dodecylmercaptoethyl-2,2-bis(3,5-di-tert-butyl-4-hydroxybenzyl)malonate, bis[4-(1,1,3,3-tetramethylbutyl)phenyl]-2,2-bis(3,5-di-tert-butyl-4-hydroxybenzyl)malonate.
- 1.9. Aromatic hydroxybenzyl compounds, for example 1,3,5-tris(3,5-di-tert-butyl-4-hydroxybenzyl)-2,4,6-trimethylbenzene, 1,4-bis(3,5-di-tert-butyl-4-hydroxybenzyl)-2,3,5,6-tetramethylbenzene, 2,4,6-tris(3,5-di-tert-butyl-4-hydroxybenzyl)phenol.
- 1.10. Triazine compounds, for example 2,4-bis(octylmercapto)-6-(3,5-di-tert-butyl-4-hydroxyanilino)-1,3,5-triazine, 2-octylmercapto-4,6-bis(3,5-di-tert-butyl-4-hydroxyanilino)-1,3,5-triazine, 2,4,6-tris(3,5-di-tert-butyl-4-hydroxyphenoxy)-1,2,3-triazine, 1,3,5-tris(3,5-di-tert-butyl-4-hydroxybenzyl)isocyanurate, 1,3,5-tris(4-tert-butyl-3-hydroxy-2,6-dimethylbenzyl)isocyanurate, 2,4,6-tris(3,5-di-tert-butyl-4-hydroxyphenylethyl)-1,3,5-triazine, 1,3,5-tris(3,5-di-tert-butyl-4-hydroxyphenylpropionyl)-hexahydro-1,3,5-triazine, 1,3,5-tris(3,5-dicyclohexyl-4-hydroxybenzyl)isocyanurate.
- 1.11. Benzylphosphonates, for example dimethyl-2,5-di-tert-butyl-4-hydroxybenzylphosphonate, diethyl-3,5-di-tert-butyl-4-hydroxybenzylphosphonate, dioctadecyl-3,5-di-tert-butyl-4-hydroxybenzylphosphonate, dioctadecyl-5-tert-butyl-4-hydroxy-3-methylbenzylphosphonate, the calcium salt of the monoethyl ester of 3,5-di-tert-butyl-4-hydroxybenzylphosphonic acid.
- 1.12. Acylaminophenols, for example 4-hydroxylauranilide, 4-hydroxystearanilide, octyl N-(3,5-di-tert-butyl-4-hydroxyphenyl)carbamate.
- 1.13. Esters of β -(3,5-di-tert-butyl-4-hydroxyphenyl)propionic acid with mono- or polyhydric alcohols, e.g. with methanol, ethanol, n-octanol, i-octanol, octadecanol, 1,6-hexanediol, 1,9-nonanediol, ethylene glycol, 1,2-propanediol, neopentyl glycol, thiodiethylene glycol, diethylene glycol, triethylene glycol, pentaerythritol,

tris(hydroxyethyl)isocyanurate, N,N'-bis(hydroxyethyl)oxamide, 3-thiaundecanol, 3-thiapentadecanol, trimethylhexanediol, trimethylolpropane, 4-hydroxymethyl-1-phospha-2,6,7-trioxabicyclo[2.2.2]octane.

5 1.14. Esters of β -(5-tert-butyl-4-hydroxy-3-methylphenyl)propionic acid with mono- or polyhydric alcohols, e.g. with methanol, ethanol, n-octanol, i-octanol, octadecanol, 1,6-hexanediol, 1,9-nonanediol, ethylene glycol, 1,2-propanediol, neopentyl glycol, thiodiethylene glycol, diethylene glycol, triethylene glycol, pentaerythritol, tris(hydroxyethyl)isocyanurate, N,N'-bis(hydroxyethyl)oxamide, 3-thiaundecanol, 3-thiapentadecanol, trimethylhexanediol, trimethylolpropane, 4-hydroxymethyl-1-phospha-2,6,7-trioxabicyclo[2.2.2]octane;
10 3,9-bis[2-{3-(3-tert-butyl-4-hydroxy-5-methylphenyl)propionyloxy}-1,1-dimethylethyl]-2,4,8,10-tetraoxaspiro[5.5]undecane.

1.15. Esters of β -(3,5-dicyclohexyl-4-hydroxyphenyl)propionic acid with mono- or polyhydric alcohols, e.g. with methanol, ethanol, octanol, octadecanol, 1,6-hexanediol, 1,9-nonanediol, ethylene glycol, 1,2-propanediol, neopentyl glycol, thiodiethylene glycol, diethylene glycol, triethylene glycol, pentaerythritol, tris(hydroxyethyl)isocyanurate, N,N'-bis(hydroxyethyl)oxamide, 3-thiaundecanol, 3-thiapentadecanol, trimethylhexanediol, trimethylolpropane, 4-hydroxymethyl-1-phospha-2,6,7-trioxabicyclo[2.2.2]octane.
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1.16. Esters of 3,5-di-tert-butyl-4-hydroxyphenyl acetic acid with mono- or polyhydric alcohols, e.g. with methanol, ethanol, octanol, octadecanol, 1,6-hexanediol, 1,9-nonanediol, ethylene glycol, 1,2-propanediol, neopentyl glycol, thiodiethylene glycol, diethylene glycol, triethylene glycol, pentaerythritol, tris(hydroxyethyl)isocyanurate, N,N'-bis(hydroxyethyl)oxamide, 3-thiaundecanol, 3-thiapentadecanol, trimethylhexanediol, trimethylolpropane, 4-hydroxymethyl-1-phospha-2,6,7-trioxabicyclo[2.2.2]octane.
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1.17. Amides of β -(3,5-di-tert-butyl-4-hydroxyphenyl)propionic acid e.g. N,N'-bis(3,5-di-tert-butyl-4-hydroxyphenylpropionyl)hexamethylenediamide, N,N'-bis(3,5-di-tert-butyl-4-hydroxyphenylpropionyl)trimethylenediamide, N,N'-bis(3,5-di-tert-butyl-4-hydroxyphenylpropionyl)hydrazide, N,N'-bis[2-(3-[3,5-di-tert-butyl-4-hydroxyphenyl]propionyloxy)ethyl]oxamide (Naugard®XL-1, supplied by Uniroyal).
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1.18. Ascorbic acid (vitamin C)

30 1.19. Aminic antioxidants, for example N,N'-di-isopropyl-p-phenylenediamine, N,N'-di-sec-butyl-p-phenylenediamine, N,N'-bis(1,4-dimethylpentyl)-p-phenylenediamine, N,N'-bis(1-ethyl-3-methylpentyl)-p-phenylenediamine, N,N'-bis(1-methylheptyl)-p-phenylenediamine, N,N'-dicyclohexyl-p-phenylenediamine, N,N'-diphenyl-p-phenylenediamine, N,N'-bis(2-naphthyl)-p-phenylenediamine, N-isopropyl-N'-phenyl-p-phenylenediamine, N-(1,3-dimethylbutyl)-N'-phenyl-p-phenylenediamine, N-(1-methylheptyl)-N'-phenyl-p-phenylenediamine, N-cyclohexyl-N'-phenyl-p-phenylenediamine, 4-(p-toluenesulfamoyl)diphenylamine, N,N'-dimethyl-N,N'-di-sec-butyl-p-phenylenediamine, diphenylamine, N-allyldiphenylamine, 4-isopropoxydiphenylamine, N-phenyl-1-naphthylamine, N-(4-tert-octylphenyl)-1-naphthylamine, N-phenyl-2-naphthylamine, octylated diphenylamine, for example p,p'-di-tert-octyldiphenylamine, 4-n-butylaminophenol, 4-butyrylaminophenol, 4-nonanoylaminophenol, 4-dodecanoylaminophenol, 4-octadecanoylaminophenol, bis(4-methoxyphenyl)amine, 2,6-di-tert-butyl-4-dimethylaminomethylphenol, 2,4'-diaminodiphenylmethane, 4,4'-diaminodiphenylmethane, N,N,N',N'-
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tetramethyl-4,4'-diaminodiphenylmethane, 1,2-bis[(2-methylphenyl)amino]ethane, 1,2-bis(phenylamino)propane, (o-tolyl)biguanide, bis[4-(1',3'-dimethylbutyl)phenyl]amine, tert-octylated N-phenyl-1-naphthylamine, a mixture of mono- and dialkylated tert-butyl/tert-octyldiphenylamines, a mixture of mono- and dialkylated nonyldiphenylamines, a mixture of mono- and dialkylated dodecyldiphenylamines, a mixture of mono- and dialkylated isopropyl/isohexyldiphenylamines, a mixture of mono- and dialkylated tert-butyl/tert-octyldiphenylamines, 2,3-dihydro-3,3-dimethyl-4H-1,4-benzothiazine, phenothiazine, a mixture of mono- and dialkylated tert-butyl/tert-octylphenothiazines, a mixture of mono- and dialkylated tert-octyl-phenothiazines, N-allylphenothiazine, N,N,N',N'-tetraphenyl-1,4-diaminobut-2-ene.

2. UV absorbers and light stabilizers

2.1. 2-(2'-Hydroxyphenyl)benzotriazoles, for example 2-(2'-hydroxy-5'-methylphenyl)-benzotriazole, 2-(3',5'-di-tert-butyl-2'-hydroxyphenyl)benzotriazole, 2-(5'-tert-butyl-2'-hydroxyphenyl)benzotriazole, 2-(2'-hydroxy-5'-(1,1,3,3-tetramethylbutyl)phenyl)benzotriazole, 2-(3',5'-di-tert-butyl-2'-hydroxyphenyl)-5-chloro-benzotriazole, 2-(3'-tert-butyl-2'-hydroxy-5'-methylphenyl)-5-chloro-benzotriazole, 2-(3'-sec-butyl-5'-tert-butyl-2'-hydroxyphenyl)benzotriazole, 2-(2'-hydroxy-4'-octyloxyphenyl)benzotriazole, 2-(3',5'-di-tert-amyl-2'-hydroxyphenyl)benzotriazole, 2-(3',5'-bis-(α,α -dimethylbenzyl)-2'-hydroxyphenyl)benzotriazole, 2-(3'-tert-butyl-2'-hydroxy-5'-(2-octyloxycarbonylethyl)phenyl)-5-chloro-benzotriazole, 2-(3'-tert-butyl-5'-[2-(2-ethylhexyloxy)-carbonylethyl]-2'-hydroxyphenyl)-5-chloro-benzotriazole, 2-(3'-tert-butyl-2'-hydroxy-5'-(2-methoxycarbonylethyl)phenyl)-5-chloro-benzotriazole, 2-(3'-tert-butyl-2'-hydroxy-5'-(2-methoxycarbonylethyl)phenyl)benzotriazole, 2-(3'-tert-butyl-5'-[2-(2-ethylhexyloxy)carbonylethyl]-2'-hydroxyphenyl)benzotriazole, 2-(3'-dodecyl-2'-hydroxy-5'-methylphenyl)benzotriazole, 2-(3'-tert-butyl-2'-hydroxy-5'-(2-isooctyloxycarbonylethyl)phenyl)benzotriazole, 2,2'-methylene-bis[4-(1,1,3,3-tetramethylbutyl)-6-benzotriazole-2-ylphenol]; the transesterification product of 2-[3'-tert-butyl-5'-(2-methoxycarbonylethyl)-2'-hydroxyphenyl]-2H-benzotriazole with polyethylene glycol 300; $\left[\text{R}-\text{CH}_2\text{CH}_2-\text{COO}-\text{CH}_2\text{CH}_2 \right]_2$, where R = 3'-tert-butyl-4'-hydroxy-5'-2H-benzotriazol-2-ylphenyl, 2-[2'-hydroxy-3'-(α,α -dimethylbenzyl)-5'-(1,1,3,3-tetramethylbutyl)-phenyl]benzotriazole; 2-[2'-hydroxy-3'-(1,1,3,3-tetramethylbutyl)-5'-(α,α -dimethylbenzyl)-phenyl]benzotriazole.

2.2. 2-Hydroxybenzophenones, for example the 4-hydroxy, 4-methoxy, 4-octyloxy, 4-decyloxy, 4-dodecyloxy, 4-benzyloxy, 4,2',4'-trihydroxy and 2'-hydroxy-4,4'-dimethoxy derivatives.

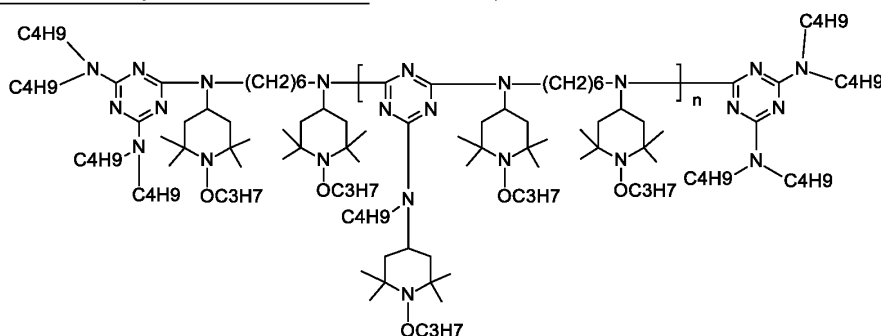
2.3. Esters of substituted and unsubstituted benzoic acids, for example 4-tert-butylphenyl salicylate, phenyl salicylate, octylphenyl salicylate, dibenzoyl resorcinol, bis(4-tert-butylbenzoyl)resorcinol, benzoyl resorcinol, 2,4-di-tert-butylphenyl 3,5-di-tert-butyl-4-hydroxybenzoate, hexadecyl 3,5-di-tert-butyl-4-hydroxybenzoate, octadecyl 3,5-di-tert-butyl-4-hydroxybenzoate, 2-methyl-4,6-di-tert-butylphenyl 3,5-di-tert-butyl-4-hydroxybenzoate. In a preferred embodiment, esters of substituted and unsubstituted

benzoic acids are 2,4-di-tert-butylphenyl 3,5-di-tert-butyl-4-hydroxybenzoate, and/or hexadecyl 3,5-di-tert-butyl-4-hydroxybenzoate.

2.4. Acrylates, for example ethyl α -cyano- β,β -diphenylacrylate, isooctyl α -cyano- β,β -diphenylacrylate, methyl α -carbomethoxycinnamate, methyl α -cyano- β -methyl-p-methoxycinnamate, butyl α -cyano- β -methyl-p-methoxy-cinnamate, methyl α -carbomethoxy-p-methoxycinnamate, N-(β -carbomethoxy- β -cyanovinyl)-2-methylindoline, neopentyl tetra(α -cyano- β,β -diphenylacrylate).

2.5. Nickel compounds, for example nickel complexes of 2,2'-thio-bis[4-(1,1,3,3-tetramethylbutyl)phenol], such as the 1:1 or 1:2 complex, with or without additional ligands such as n-butylamine, triethanolamine or N-cyclohexyldiethanolamine, nickel dibutyl-dithiocarbamate, nickel salts of the monoalkyl esters, e.g. the methyl or ethyl ester, of 4-hydroxy-3,5-di-tert-butylbenzylphosphonic acid, nickel complexes of ketoximes, e.g. of 2-hydroxy-4-methylphenylundecylketoxime, nickel complexes of 1-phenyl-4-lauroyl-5-hydroxypyrazole, with or without additional ligands.

2.6. Sterically hindered amines, for example



2.7. Oxamides, for example 4,4'-dioctyloxyoxanilide, 2,2'-diethoxyoxanilide, 2,2'-dioctyloxy-5,5'-di-tert-butoxanilide, 2,2'-didodecyloxy-5,5'-di-tert-butoxanilide, 2-ethoxy-2'-ethoxyoxanilide, N,N'-bis(3-dimethylaminopropyl)oxamide, 2-ethoxy-5-tert-butyl-2'-ethoxyoxanilide and its mixture with 2-ethoxy-2'-ethyl-5,4'-di-tert-butoxanilide, mixtures of o- and p-methoxy-disubstituted oxanilides and mixtures of o- and p-ethoxy-disubstituted oxanilides.

3. Metal deactivators, for example N,N'-diphenyloxamide, N-salicylal-N'-salicyloyl hydrazine, N,N'-bis(salicyloyl)hydrazine, N,N'-bis(3,5-di-tert-butyl-4-hydroxyphenylpropionyl)hydrazine, 3-salicyloylamino-1,2,4-triazole, bis(benzylidene)oxalyl dihydrazide, oxanilide, isophthaloyl dihydrazide, sebacoyl bisphenylhydrazide, N,N'-diacetyl adipoyl dihydrazide, N,N'-bis(salicyloyl)oxalyl dihydrazide, N,N'-bis(salicyloyl)thiopropionyl dihydrazide.

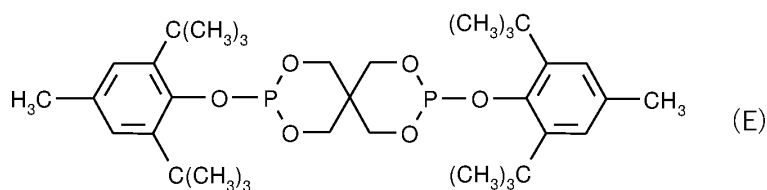
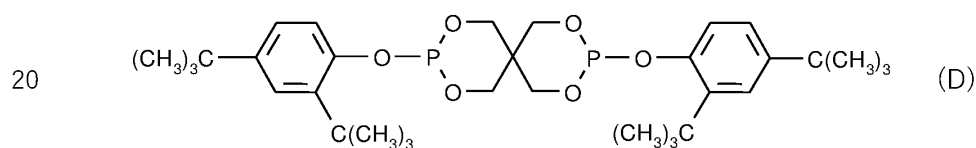
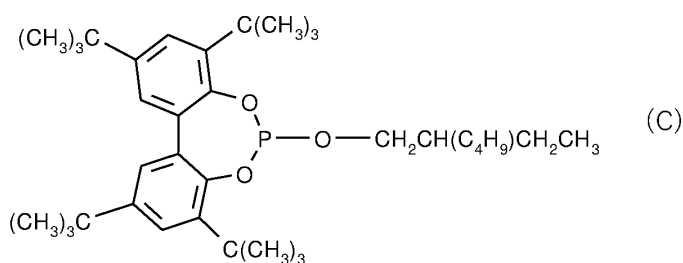
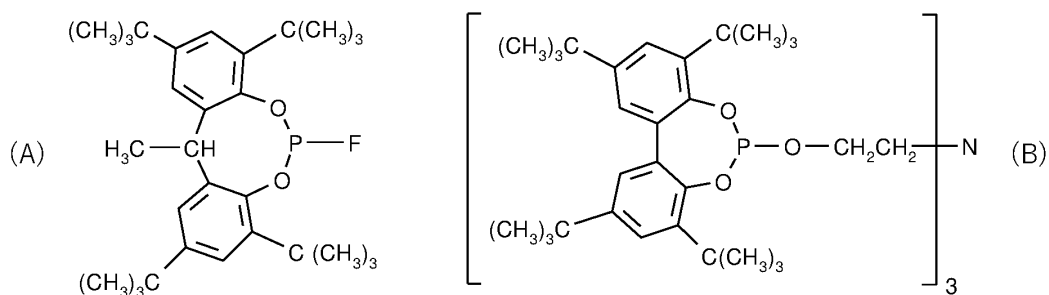
4. Phosphites and phosphonites, for example triphenyl phosphite, diphenylalkyl phosphites, phenyldialkyl phosphites, tris(nonylphenyl) phosphite, trilauryl phosphite, trioctadecyl phosphite, distearyl pentaerythritol diphosphite, tris(2,4-di-tert-butylphenyl) phosphite, diisodecyl pentaerythritol diphosphite, bis(2,4-di-tert-butylphenyl)pentaerythritol diphosphite, bis(2,4-di-cumylphenyl)pentaerythritol diphosphite, bis(2,6-di-tert-butyl-4-methylphenyl)pentaerythritol diphosphite, diisodecyloxypentaerythritol diphosphite, bis(2,4-di-tert-butyl-6-methylphenyl)pentaerythritol diphosphite, bis(2,4,6-tris(tert-

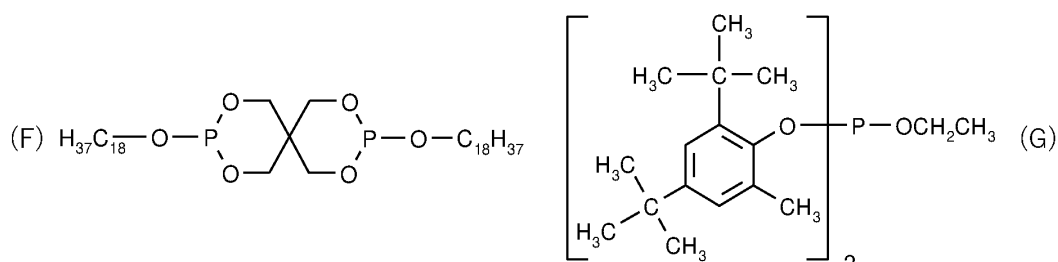
butylphenyl)pentaerythritol diphosphite, tristearyl sorbitol triphosphite, tetrakis(2,4-di-tert-butylphenyl) 4,4'-biphenylene diphosphonite, 6-isooctyloxy-2,4,8,10-tetra-tert-butyl-12H-dibenz[d,g]-1,3,2-dioxaphosphocin, bis(2,4-di-tert-butyl-6-methylphenyl)methyl phosphite, bis(2,4-di-tert-butyl-6-methylphenyl)ethyl phosphite, 6-fluoro-2,4,8,10-tetra-tert-butyl-12-methyl-dibenz[d,g]-1,3,2-dioxaphosphocin, 2,2',2''-nitrilo[triethyltris(3,3',5,5'-tetra-tert-butyl-1,1'-biphenyl-2,2'-diyl)phosphite], 2-ethylhexyl(3,3',5,5'-tetra-tert-butyl-1,1'-biphenyl-2,2'-diyl)phosphite, 5-butyl-5-ethyl-2-(2,4,6-tri-tert-butylphenoxy)-1,3,2-dioxaphosphirane, phosphorous acid, mixed 2,4-bis(1,1-dimethylpropyl)phenyl and 4-(1,1-dimethylpropyl)phenyl triesters (CAS: 939402-02-5), phosphorous acid, triphenyl ester, polymer with α -hydro- ω -hydroxypoly[oxy(methyl-1,2-ethanediyl)], C₁₀-C₁₆-alkyl esters (CAS: 1227937-46-3).

The following phosphites are especially preferred:

Tris(2,4-di-tert-butylphenyl) phosphite,

tris(nonylphenyl) phosphite,





5. Hydroxylamines, for example N,N-dibenzylhydroxylamine, N,N-diethylhydroxylamine, N,N-dioctylhydroxylamine, N,N-dilaurylhydroxylamine, N,N-ditetradecylhydroxylamine, N,N-dihexadecylhydroxylamine, N,N-dioctadecylhydroxylamine, N-hexadecyl-N-octadecylhydroxylamine, N-heptadecyl-N-octadecylhydroxylamine, N,N-dialkylhydroxylamine derived from hydrogenated tallow amine.
6. Nitrones, for example, N-benzyl- α -phenylnitrone, N-ethyl- α -methylnitrone, N-octyl- α -heptylnitrone, N-lauryl- α -undecylnitrone, N-tetradecyl- α -tridecyl-nitrone, N-hexadecyl- α -pentadecylnitrone, N-octadecyl- α -heptadecylnitrone, N-hexadecyl- α -heptadecylnitrone, N-octadecyl- α -pentadecylnitrone, N-heptadecyl- α -heptadecylnitrone, N-octadecyl- α -hexadecylnitrone, nitrone derived from N,N-dialkylhydroxylamine derived from hydrogenated tallow amine.
7. Thiosynergists, for example dilauryl thiodipropionate, dimistyl thiodipropionate, distearyl thiodipropionate, pentaerythritol tetrakis[3-(dodecylthio)propionate] or distearyl disulfide.
8. Peroxide scavengers, for example esters of β -thiodipropionic acid, for example the lauryl, stearyl, myristyl or tridecyl esters, mercaptobenzimidazole or the zinc salt of 2-mercaptobenzimidazole, zinc dibutyldithiocarbamate, dioctadecyl disulfide, pentaerythritol tetrakis(β -dodecylmercapto)propionate.
9. Polyamide stabilizers, for example copper salts in combination with iodides and/or phosphorus compounds and salts of divalent manganese.
10. Basic co-stabilizers, for example melamine, polyvinylpyrrolidone, dicyandiamide, triallyl cyanurate, urea derivatives, hydrazine derivatives, amines, polyamides, polyurethanes, alkali metal salts and alkaline earth metal salts of higher fatty acids, for example calcium stearate, zinc stearate, magnesium behenate, magnesium stearate, sodium ricinoleate and potassium palmitate, antimony pyrocatecholate or zinc pyrocatecholate.
11. Nucleating agents, for example inorganic substances, such as talcum, metal oxides, such as titanium dioxide or magnesium oxide, phosphates, carbonates or sulfates of, preferably, alkaline earth metals; organic compounds, such as mono- or polycarboxylic acids and the salts thereof, e.g. 4-tert-butylbenzoic acid, adipic acid, diphenylacetic acid, sodium succinate or sodium benzoate; polymeric compounds, such as ionic copolymers (ionomers). Especially preferred are 1,3:2,4-bis(3',4'-dimethylbenzylidene)sorbitol, 1,3:2,4-di(paramethyldibenzylidene)sorbitol, and 1,3:2,4-di(benzylidene)sorbitol.
12. Fillers and reinforcing agents, for example calcium carbonate, silicates, glass fibres, glass beads, asbestos, talc, kaolin, mica, barium sulfate, metal oxides and hydroxides,

carbon black, graphite, wood flour and flours or fibers of other natural products, synthetic fibers.

13. Other additives, for example plasticisers, lubricants, emulsifiers, pigments, rheology additives, catalysts, flow-control agents, optical brighteners, flameproofing agents, anti-static agents and blowing agents.

14. Benzofuranones and indolinones, for example those disclosed in U.S. 4,325,863; U.S. 4,338,244; U.S. 5,175,312; U.S. 5,216,052; U.S. 5,252,643; DE-A-4316611;

DE-A-4316622; DE-A-4316876; EP-A-0589839, EP-A-0591102; EP-A-1291384 or 3-[4-(2-acetoxyethoxy)phenyl]-5,7-di-tert-butylbenzofuran-2-one, 5,7-di-tert-butyl-3-[4-(2-stearoyloxyethoxy)phenyl]benzofuran-2-one, 3,3'-bis[5,7-di-tert-butyl-3-(4-[2-hydroxyethoxy]phenyl)benzofuran-2-one], 5,7-di-tert-butyl-3-(4-ethoxyphenyl)benzofuran-2-one, 3-(4-acetoxy-3,5-dimethylphenyl)-5,7-di-tert-butylbenzofuran-2-one, 3-(3,5-dimethyl-4-pivaloyloxyphenyl)-5,7-di-tert-butylbenzofuran-2-one, 3-(3,4-dimethylphenyl)-5,7-di-tert-butylbenzofuran-2-one, 3-(2,3-dimethylphenyl)-5,7-di-tert-butylbenzofuran-2-one, 3-(2-acetyl-5-isooctylphenyl)-5-isooctylbenzofuran-2-one.

Phenolic antioxidants are preferred. Of interest are those listed above under item 1. Of particular interest are phenolic antioxidants and process stabilizers such as pentaerythritol tetrakis[3,5-di-tert-butyl-4-hydroxyphenylpropionate], octadecyl-3-(3,5-di-tert-butyl-4-hydroxyphenyl)propionate, 1,3,5-tris(3,5-di-tert-butyl-4-hydroxybenzyl)-2,4,6-trimethylbenzene, N,N'-bis(3,5-di-tert-butyl-4-hydroxyphenylpropionyl)hexamethylene-diamide, bis(1,2,2,6,6-pentamethylpiperidin-4-yl)-butyl(3,5-di-tert-butyl-4-hydroxybenzyl)malonate) and tris[2,4-di-tert-butylphenyl]phosphite.

Further preferred additives are pentaerythritol tetrakis[3-(dodecylthio)propionate] and Ca stearate.

Pigments such as TiO₂ and carbon black are further preferred. Fillers such as talc are also of interest. Talc is a clay mineral composed of hydrated magnesium silicate, like Mg₃Si₄O₁₀(OH)₂.

Carbon black typically represents finely divided amorphous carbon, usually obtained as soot from partial combustion of hydrocarbons. Any commercially available talc and carbon black pigments may be used.

In general, it is appropriate to use, for example, 0.01 to 30 % by weight of the conventional additives, relative to the weight of the organic material, preferably 0.01 to 20 %, in particular 0.01 to 10 %. Highly preferred are 0.05 to 20 %, in particular 0.05 to 10 %.

The weight ratio of the compound of the additive mixture of the present invention to the conventional additive is for example 1:100 to 100:1, preferably 1:100 to 10:1, in particular 1:10 to 10:1.

The compositions according to the present invention can be advantageously used for the preparation of various shaped articles. Examples are:

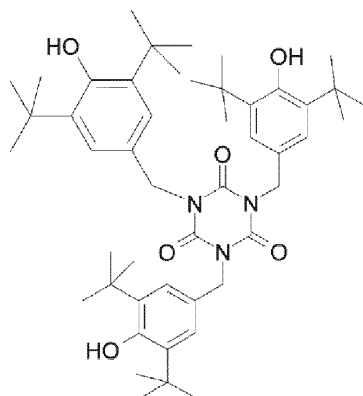
I-1) Floating devices, marine applications, pontoons, buoys, plastic lumber for decks, piers, boats, kayaks, oars, and beach reinforcements.

I-2) Automotive applications, in particular bumpers, dashboards, battery, rear and front linings, moldings parts under the hood, hat shelf, trunk linings, interior linings, air bag covers, electronic moldings for fittings (lights), panes for dashboards, headlamp glass,

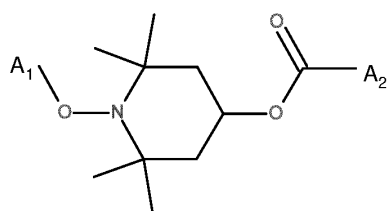
- instrument panel, exterior linings, upholstery, automotive lights, head lights, parking lights, rear lights, stop lights, interior and exterior trims; door panels; gas tank; glazing front side; rear windows; seat backing, exterior panels, wire insulation, profile extrusion for sealing, cladding, pillar covers, chassis parts, exhaust systems, fuel filter / filler, fuel pumps, fuel tank, body side moldings, convertible tops, exterior mirrors, exterior trim, fasteners / fixings, front end module, glass, hinges, lock systems, luggage / roof racks, pressed/stamped parts, seals, side impact protection, sound deadener / insulator and sunroof.
- 5 I-3) Road traffic devices, in particular sign postings, posts for road marking, car accessories, warning triangles, medical cases, helmets, tires.
- 10 I-4) Devices for plane, railway, motor car (car, motorbike) including furnishings.
- I-5) Devices for space applications, in particular rockets and satellites, e.g. reentry shields.
- I-6) Devices for architecture and design, mining applications, acoustic quietized systems, street refuges, and shelters.
- 15 II-1) Appliances, cases and coverings in general and electric/electronic devices (personal computer, telephone, portable phone, printer, television-sets, audio and video devices), flower pots, satellite TV bowl, and panel devices.
- II-2) Jacketing for other materials such as steel or textiles.
- 20 II-3) Devices for the electronic industry, in particular insulation for plugs, especially computer plugs, cases for electric and electronic parts, printed boards, and materials for electronic data storage such as chips, check cards or credit cards.
- II-4) Electric appliances, in particular washing machines, tumblers, ovens (microwave oven), dishwashers, mixers, and irons.
- 25 II-5) Covers for lights (e.g. streetlights, lamp-shades).
- II-6) Applications in wire and cable (semi-conductor, insulation and cable-jacketing).
- II-7) Foils for condensers, refrigerators, heating devices, air conditioners, encapsulating of electronics, semi-conductors, coffee machines, and vacuum cleaners.
- 30 III-1) Technical articles such as cogwheel (gear), slide fittings, spacers, screws, bolts, handles, and knobs.
- III-2) Rotor blades, ventilators and windmill vanes, solar devices, swimming pools, swimming pool covers, pool liners, pond liners, closets, wardrobes, dividing walls, slat walls, folding walls, roofs, shutters (e.g. roller shutters), fittings, connections between pipes, sleeves, and conveyor belts.
- 35 III-3) Sanitary articles, in particular shower cubicles, lavatory seats, covers, and sinks.
- III-4) Hygienic articles, in particular diapers (babies, adult incontinence), feminine hygiene articles, shower curtains, brushes, mats, tubs, mobile toilets, toothbrushes, and bed pans.
- 40 III-5) Pipes (cross-linked or not) for water, wastewater and chemicals, pipes for wire and cable protection, pipes for gas, oil and sewage, guttering, down pipes, and drainage systems.
- III-6) Profiles of any geometry (windowpanes) and siding.

- III-7) Glass substitutes, in particular extruded plates, glazing for buildings (monolithic, twin or multiwall), aircraft, schools, extruded sheets, window film for architectural glazing, train, transportation and sanitary articles.
- III-8) Plates (walls, cutting board), extrusion-coating (photographic paper, tetrapack and pipe coating), silos, wood substitute, plastic lumber, wood composites, walls, surfaces, furniture, decorative foil, floor coverings (interior and exterior applications), flooring, duck boards, and tiles.
- III-9) Intake and outlet manifolds.
- III-10) Cement-, concrete-, composite-applications and covers, siding and cladding, hand rails, banisters, kitchen work tops, roofing, roofing sheets, tiles, and tarpaulins.
- IV-1) Plates (walls and cutting board), trays, artificial grass, astroturf, artificial covering for stadium rings (athletics), artificial floor for stadium rings (athletics), and tapes.
- IV-2) Woven fabrics continuous and staple, fibers (carpets / hygienic articles / geotextiles / monofilaments; filters; wipes / curtains (shades) / medical applications), bulk fibers (applications such as gown / protection clothes), nets, ropes, cables, strings, cords, threads, safety seat-belts, clothes, underwear, gloves; boots; rubber boots, intimate apparel, garments, swimwear, sportswear, umbrellas (parasol, sunshade), parachutes, paraglides, sails, "balloon-silk", camping articles, tents, airbeds, sun beds, bulk bags, and bags.
- IV-3) Membranes, insulation, covers and seals for roofs, tunnels, dumps, ponds, dumps, walls roofing membranes, geomembranes, swimming pools, curtains (shades) / sunshields, awnings, canopies, wallpaper, food packing and wrapping (flexible and solid), medical packaging (flexible & solid), airbags/safety belts, arm- and head rests, carpets, centre console, dashboard, cockpits, door, overhead console module, door trim, headliners, interior lighting, interior mirrors, parcel shelf, rear luggage cover, seats, steering column, steering wheel, textiles, and trunk trim.
- V-1) Films (packaging, dump, laminating, bale wrap, swimming pools, waste bags, wallpaper, stretch film, raffia, desalination film, batteries, and connectors.
- V-2) Agricultural films (greenhouse covers, tunnel, mulch, silage, bale wrap), especially in presence of intensive application of agrochemicals.
- VI-1) Food packing and wrapping (flexible and solid), BOPP, BOPET, bottles.
- VI-2) Storage systems such as boxes (crates), luggage, chest, household boxes, pallets, shelves, tracks, screw boxes, packs, and cans.
- VI-3) Cartridges, syringes, medical applications, containers for any transportation, waste baskets and waste bins, waste bags, bins, dust bins, bin liners, wheely bins, container in general, tanks for water / used water / chemistry / gas / oil / gasoline / diesel; tank liners, boxes, crates, battery cases, troughs, medical devices such as piston, ophthalmic applications, diagnostic devices, and packing for pharmaceuticals blister.
- VII-1) Extrusion coating (photo paper, tetrapack, pipe coating), household articles of any kind (e.g. appliances, thermos bottle / clothes hanger), fastening systems such as plugs, wire and cable clamps, zippers, closures, locks, and snap-closures.

- VII-2) Support devices, articles for the leisure time such as sports and fitness devices, gymnastics mats, ski-boots, inline-skates, skis, big foot, athletic surfaces (e.g. tennis grounds); screw tops, tops and stoppers for bottles, and cans.
- VII-3) Furniture in general, foamed articles (cushions, impact absorbers), foams, sponges, dish clothes, mats, garden chairs, stadium seats, tables, couches, toys, building kits (boards / figures / balls), playhouses, slides, and play vehicles.
- VII-4) Materials for optical and magnetic data storage.
- VII-5) Kitchen ware (eating, drinking, cooking, storing).
- VII-6) Boxes for CD's, cassettes and video tapes; DVD electronic articles, office supplies of any kind (ball-point pens, stamps and ink-pads, mouse, shelves, tracks), bottles of any volume and content (drinks, detergents, cosmetics including perfumes), and adhesive tapes.
- VII-7) Footwear (shoes / shoe-soles), insoles, spats, adhesives, structural adhesives, food boxes (fruit, vegetables, meat, fish), synthetic paper, labels for bottles, couches, artificial joints (human), printing plates (flexographic), printed circuit boards, and display technologies.
- VII-8) Devices of filled polymers (talc, chalk, china clay (kaolin), wollastonite, pigments, carbon black, TiO_2 , mica, nanocomposites, dolomite, silicates, glass, asbestos).
- An automotive interior or exterior material made of a composition according to the present invention is preferred. Particularly preferred shaped articles are those listed above under I-2. Of interest is also a facing material for a roof, seat or dashboard. Compounds of formula (2) and the preparation thereof are known, for example, from WO 2008/077830. The additive mixtures of the present invention are excellent stabilizers against the harmful effect of light and heat and oxidation in different applications like, but not limited to, automotive applications. The additive mixture is especially suited as light stabilizers. Therefore, in another aspect, the presently claimed invention is directed to a method for stabilization of an organic material susceptible to oxidative, thermal or light-induced degradation, which comprises incorporating therein or applying thereto an additive mixture of the present invention.
- In another aspect, the presently claimed invention is directed to the use of the additive mixtures of the present invention as light stabilizer for organic material susceptible to light-induced degradation.
- The presently claimed invention offers one or more of following advantages:
1. The additive mixtures of the present invention stabilize an organic material which is susceptible to oxidative, thermal or light-induced degradation.
 2. The additive mixtures of the present invention, when used in organic materials, provides a surface that shows no stickiness to the organic material articles and that shows no blooming/exudation from the organic material articles.
- In the following, specific embodiments of the presently claimed invention are described:
1. An additive mixture comprising a compound of formula (1) and a compound of formula (2)



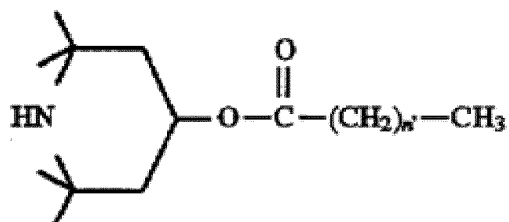
(1),



(2),

wherein

- 5 A_1 is linear or branched, substituted or unsubstituted C_1 to C_{20} alkyl, and
 A_2 is linear or branched, substituted or unsubstituted C_1 to C_{30} alkyl.
2. The additive mixture according to embodiment 1, wherein A_1 is linear or branched, hydroxyl-substituted C_1 - C_{20} alkyl, and A_2 is linear or branched, unsubstituted C_1 to C_{30} alkyl.
- 10 3. The additive mixture according to embodiment 1 or 2, wherein A_1 is 2-hydroxy-2-methylpropyl, and A_2 is C_{15} - C_{17} alkyl.
4. The additive mixture according to one or more of embodiments 1 to 3, wherein the weight ratio of the compound of formula (1) to compound of formula (2) is in the range of from 5:95 to 95:5.
- 15 5. The additive mixture according to one or more of embodiments 1 to 4, further comprising an additive, other than additives as defined in embodiment 1, selected from a hindered amine light stabilizer, a hydroxyphenyl triazine UV absorber, a compound of formula (C-I-8)



(C-I-8),

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wherein n' is an integer in the range of 14 to 16, and mixture thereof.

6. The additive mixture according to embodiment 5, wherein the hindered amine light stabilizer is selected from the group consisting of carbonic acid bis(1-undecyloxy-2,2,6,6-tetramethyl-4-piperidyl)ester, bis(2,2,6,6-tetramethyl-4-piperidyl)sebacate, bis(2,2,6,6-tetramethyl-4-piperidyl)succinate, bis(1,2,2,6,6-pentamethyl-4-piperidyl)sebacate, bis(1-octyloxy-2,2,6,6-tetramethyl-4-piperidyl)sebacate, bis(1,2,2,6,6-pentamethyl-4-piperidyl) n-butyl-3,5-di-tert-butyl-4-hydroxybenzylmalonate, the condensate of 1-(2-hydroxyethyl)-2,2,6,6-tetramethyl-4-hydroxypiperidine and succinic acid, linear or cyclic condensates of N,N'-bis(2,2,6,6-tetramethyl-4-piperidyl)hexamethylenediamine and 4-tert-octylamino-2,6-dichloro-1,3,5-triazine, tris(2,2,6,6-tetramethyl-4-piperidyl)nitrilotriacetate, tetrakis(2,2,6,6-tetramethyl-4-piperidyl)-1,2,3,4-butanetetracarboxylate, 1,1'-(1,2-ethanediyl)-bis(3,3,5,5-tetramethylpiperazinone), 4-benzoyl-2,2,6,6-tetramethylpiperidine, 4-stearyloxy-2,2,6,6-tetramethylpiperidine, bis(1,2,2,6,6-pentamethylpiperidyl)-2-n-butyl-2-(2-hydroxy-3,5-di-tert-butylbenzyl)malonate, 3-n-octyl-7,7,9,9-tetramethyl-1,3,8-triazaspiro[4.5]decane-2,4-dione, bis(1-octyloxy-2,2,6,6-tetramethylpiperidyl)sebacate, bis(1-octyloxy-2,2,6,6-tetramethylpiperidyl)succinate, linear or cyclic condensates of N,N'-bis(2,2,6,6-tetramethyl-4-piperidyl)hexamethylenediamine and 4-morpholino-2,6-dichloro-1,3,5-triazine, the condensate of 2-chloro-4,6-bis(4-n-butylamino-2,2,6,6-tetramethylpiperidyl)-1,3,5-triazine and 1,2-bis(3-aminopropylamino)ethane, the condensate of 2-chloro-4,6-di-(4-n-butylamino-1,2,2,6,6-pentamethylpiperidyl)-1,3,5-triazine and 1,2-bis(3-aminopropylamino)ethane, 8-acetyl-3-dodecyl-7,7,9,9-tetramethyl-1,3,8-triazaspiro[4.5]decane-2,4-dione, 3-dodecyl-1-(2,2,6,6-tetramethyl-4-piperidyl)pyrrolidine-2,5-dione, 3-dodecyl-1-(1,2,2,6,6-pentamethyl-4-piperidyl)pyrrolidine-2,5-dione, a mixture of 4-hexadecyloxy- and 4-stearyloxy-2,2,6,6-tetramethylpiperidine, a condensate of N,N'-bis(2,2,6,6-tetramethyl-4-piperidyl)hexamethylenediamine and 4-cyclohexylamino-2,6-dichloro-1,3,5-triazine, a condensate of 1,2-bis(3-aminopropylamino)ethane and 2,4,6-trichloro-1,3,5-triazine and 4-butylamino-2,2,6,6-tetramethylpiperidine; a condensate of 1,6-hexanediamine and 2,4,6-trichloro-1,3,5-triazine as well as N,N-dibutylamine and 4-butylamino-2,2,6,6-tetramethylpiperidine; N-(2,2,6,6-tetramethyl-4-piperidyl)-n-dodecylsuccinimide, N-(1,2,2,6,6-pentamethyl-4-piperidyl)-n-dodecylsuccinimide, 2-undecyl-7,7,9,9-tetramethyl-1-oxa-3,8-diaza-4-oxo-spiro[4,5]decane, a reaction product of 7,7,9,9-tetramethyl-2-cycloundecyl-1-oxa-3,8-diaza-4-oxospiro-[4,5]decane and epichlorohydrin, 1,1-bis(1,2,2,6,6-pentamethyl-4-piperidyloxycarbonyl)-2-(4-methoxyphenyl)ethene, N,N'-bis-formyl-N,N'-bis(2,2,6,6-tetramethyl-4-piperidyl)hexamethylenediamine, a diester of 4-methoxymethylenemalonic acid with 1,2,2,6,6-pentamethyl-4-hydroxypiperidine, poly[methylpropyl-3-oxy-4-(2,2,6,6-tetramethyl-4-piperidyl)]siloxane, a reaction product of maleic acid anhydride- α -olefin copolymer with 2,2,6,6-tetramethyl-4-aminopiperidine or 1,2,2,6,6-pentamethyl-4-aminopiperidine, 2,4-bis[N-(1-cyclohexyloxy-2,2,6,6-tetramethylpiperidine-4-yl)-N-butylamino]-6-(2-hydroxyethyl)amino-1,3,5-triazine, 5-(2-ethylhexanoyl)oxymethyl-3,3,5-trimethyl-2-morpholinone, 5-(2-ethylhexanoyl)oxymethyl-3,3,5-trimethyl-2-morpholinone, the reaction product of 2,4-bis[(1-cyclohexyloxy-2,2,6,6-piperidine-4-yl)butylamino]-6-chloro-s-triazine with N,N'-bis(3-aminopropyl)ethylenediamine, 1,3,5-tris(N-cyclohexyl-N-(2,2,6,6-tetramethylpiperazine-3-one-4-yl)amino)-s-triazine, 1,3,5-tris(N-cyclohexyl-N-

(1,2,2,6,6-pentamethylpiperazine-3-one-4-yl)amino)-s-triazine, 4-N-butyl-2-N,4-N-bis(2,2,6,6-tetramethylpiperidin-4-yl)-2-N-[6-[(2,2,6,6-tetramethylpiperidin-4-yl)amino]hexyl]-1,3,5-triazine-2,4-diamine, N,N'-bis(2,2,6,6-tetramethyl-4-piperidyl)-N,N'-diformylhexamethylenediamine, and mixtures thereof.

- 5 7. The additive mixture according to embodiment 6, wherein the hydroxyphenyl triazine UV absorber is selected from the group consisting of 2,4,6-tris(2-hydroxy-4-octyloxyphenyl)-1,3,5-triazine, 2-(2-hydroxy-4-octyloxyphenyl)-4,6-bis(2,4-dimethylphenyl)-1,3,5-triazine, 2-(2,4-dihydroxyphenyl)-4,6-bis(2,4-dimethylphenyl)-1,3,5-triazine, 2,4-bis(2-hydroxy-4-propyloxyphenyl)-6-(2,4-dimethylphenyl)-1,3,5-triazine, 2-(2-hydroxy-4-octyloxyphenyl)-4,6-bis(4-methylphenyl)-1,3,5-triazine, 2-(2-hydroxy-4-dodecyloxyphenyl)-4,6-bis(2,4-dimethylphenyl)-1,3,5-triazine, 2-(2-hydroxy-4-tridecyloxyphenyl)-4,6-bis(2,4-dimethylphenyl)-1,3,5-triazine, 2-[2-hydroxy-4-(2-hydroxy-3-butyloxypropoxy)phenyl]-4,6-bis(2,4-dimethyl)-1,3,5-triazine, 2-[2-hydroxy-4-(2-hydroxy-3-octyloxypropyloxy)phenyl]-4,6-bis(2,4-dimethyl)-1,3,5-triazine, 2-[4-(dodecyloxy/tridecyloxy-2-hydroxypropoxy)-2-hydroxyphenyl]-4,6-bis(2,4-dimethylphenyl)-1,3,5-triazine, 2-[2-hydroxy-4-(2-hydroxy-3-dodecyloxypropoxy)phenyl]-4,6-bis(2,4-dimethylphenyl)-1,3,5-triazine, 2-(2-hydroxy-4-hexyloxy)phenyl-4,6-diphenyl-1,3,5-triazine, 2-(2-hydroxy-4-methoxyphenyl)-4,6-diphenyl-1,3,5-triazine, 2,4,6-tris[2-hydroxy-4-(3-butoxy-2-hydroxypropoxy)phenyl]-1,3,5-triazine, 2-(2-hydroxyphenyl)-4-(4-methoxyphenyl)-6-phenyl-1,3,5-triazine, 2-{2-hydroxy-4-[3-(2-ethylhexyl-1-oxy)-2-hydroxypropyloxy]phenyl}-4,6-bis(2,4-dimethylphenyl)-1,3,5-triazine, 2,4-bis(4-[2-ethylhexyloxy]-2-hydroxyphenyl)-6-(4-methoxyphenyl)-1,3,5-triazine, 2-(4,6-bis-biphenyl-4-yl-1,3,5-triazin-2-yl)-5-(2-ethyl-(n)-hexyloxy)phenol, and mixtures thereof.
- 15 8. The additive mixture according to one or more of embodiments 1 to 7, further comprising esters of substituted and unsubstituted benzoic acids.
- 25 9. A composition comprising
- a) an organic material which is susceptible to oxidative, thermal or light-induced degradation; and
 - b) an additive mixture as defined in one or more of embodiments 1 to 8.
- 30 10. The composition according to embodiment 9, wherein the weight ratio of the organic material to the additive mixture is in the range of from 99.99: 0.01 to 1.0: 99.0.
11. The composition according to embodiments 9 or 10, wherein the organic material is selected from the group consisting of a thermoplastic elastomer, a polyolefin, an acrylonitrile/butadiene/styrene, a polyvinyl chloride, a polymethylmethacrylate, a polyamide or a polyoxymethylene.
- 35 12. The composition according to one or more of embodiments 9 to 11, wherein the organic material is a thermoplastic polyolefin.
13. The composition according to one or more of embodiments 9 to 12, wherein the thermoplastic polyolefin is a thermoplastic polyethylene or polypropylene.
- 40 14. The composition according to one or more of embodiments 9 to 13, further comprising a component (c) an anti-scratch agent, a filler, a pigment, and mixtures thereof.
15. The composition according to one or more of embodiments 9 to 14, wherein the anti-scratch agent is selected from the group consisting of an unsaturated or saturated fatty

acid amide, a poly(organo)siloxane, and mixtures thereof.16. An automotive interior or exterior material made of a composition according to any of embodiments 9 to 14.

17. A method for stabilization of an organic material susceptible to oxidative, thermal or light-induced degradation, which comprises incorporating therein or applying thereto an additive mixture as defined in embodiments 1 to 8.

18. Use of the additive mixture defined in embodiments 1 to 8 as light stabilizer for organic material susceptible to light-induced degradation.

The examples below illustrate the invention in greater detail. All percentages and parts mentioned in the present application are by weight, unless stated otherwise.

Example 1: Stabilization of a thermoplastic polypropylene.

Base formulation:

1. 89.36% by weight of thermoplastic polypropylene (Daplen® EE013 AE of Borealis; Melt Flow Rate: 11 g/10 min (ISO 1133); Density: 905 kg/m³ (ISO 1183),
2. 0.1% by weight of blend of 80% tris(2,4-di-tert.-butylphenyl)phosphite) + 20% octadecyl-3-[3,5-di-tert-butyl-4-hydroxyphenyl]propionate,
3. 0.05% by weight of Calcium stearate,
4. 10.0% by weight of talc,
5. 0.03% by weight of carbon black, and
6. 0.4% by weight of erucamide.

Further additive mixtures, as outlined below, are incorporated with the same method as for the base formulation. In every case, the percentage by weight of the thermoplastic polypropylene is adjusted to have the sum of all ingredients giving 100%.

Additive mixtures:

- Compound A: 1,3,5-tri(3,5-di-tert-butyl-4-hydroxybenzyl) isocyanurate,
 Compound B: 1-(2-hydroxy-2-methylpropoxy)-4-octadecanoyloxy-2,2,6,6-tetramethylpiperidine,
 Compound C: N,N'-bis(2,2,6,6-tetramethyl-4-piperidyl)-N,N'-diformylhexamethylenediamine, and
 Compound D: a condensate of 1,6-hexanediamine and 2,4,6-trichloro-1,3,5-triazine as well as N,N-dibutylamine and 4-butylamino-2,2,6,6-tetramethylpiperidine

Additive mixtures	Compound A	Compound B	Compound C	Compound D
Mixture 1	0.03%	0.03%	-	-
Mixture 2	0.025%	0.025%	0.01%	-
Mixture 3	0.025%	0.025%	-	0.01%

Preparation of the tested specimen:

The base formulation was pre-mixed in a Pappermaier® ESK-150 mixer. This mixture was combined with 0.6% by weight of Additive mixtures listed above in a Mixaco Lab CM12 high speed mixer and then compounded in a twin-screw extruder Berstorff® ZE 25x32D

at 220° C. The full formulation was then injection molded on an Engel HL65 injection molding machine at 240° C.

The injection molded plaques 40 mm x 60 mm x 2 mm or 25 mm x 60 mm x 2 mm were exposed to artificial weathering according to the international norm from Volkswagen (VW), PV 1303 – Grey Scale and from Volkswagen, PV 1303 – Delta E. The settings for PV 1303 are as follows:

VW PV 1303, DIN 75 202:

10	Lamp:	Xenon arc
	Irradiation of lamp:	1.2 W/m ² @ 420 nm or 60 W/m ² in 300 - 400 nm
	Filterset around lamp:	Inner borosilicate / outer sodalime
	Black Panel Temperature BPT:	100 ± 3 ° C
	Dry Bulb Temperature:	65 ± 3 ° C
	R.H. in chamber:	20 ± 10 %
15	Weather cycle:	Permanent light / no dark phase, only dry / no rain

The parameters measured were color deviation on Grey scale according to DIN EN ISO 105-A05 and on Delta E scale according to DIN 6174.

The results are listed in Tables 1 and 2.

20

Table 1: Grey scale (High values are desired.)

Hours exposure	0	259	493	748	993	1249	1505
Base formulation	5	0.27	-	-	-	-	-
Base formulation + Additive mixture 1	5	4.76	4.78	4.87	4.83	-	-
Base formulation + Additive mixture 2	5	4.82	4.72	4.81	4.85	4.8	0.39
Base formulation + Additive mixture 3	5	4.74	4.81	4.81	4.8	4.72	4.54

Table 2: Delta E (Low values are desired.)

Hours exposure	0	259	493	748	993	1249	1505	1744
Base formulation	0	32.7	-	-	-	-	-	-
Base formulation + Additive mixture 1	0	0.4	0.37	0.22	0.28	32.9	-	-
Base formulation + Additive mixture 2	0	0.3	0.47	0.31	0.26	0.33	35.6	-
Base formulation + Additive mixture 3	0	0.43	0.32	0.32	0.34	0.47	0.79	35.2

From tables 1 and 2, it is evident that the addition of additive mixtures of the present invention provides a better retention of the properties (i.e., no change in color due to degradation when exposed to artificial weathering) of the tested thermoplastic polypropylene samples.

25

Example 2: Stabilization of a thermoplastic polypropylene.

5 The test specimens were prepared in analogy to the method described in Example 1 and were exposed to artificial weathering according to the international norm from Volkswagen, PV 3930 – Grey Scale and from Volkswagen, PV 3930 – Delta E (PV 3930 is also known as ‘Florida test’).

The settings for PV 3930 are as follows:

VW PV 3930:

10	Lamp:	Xenon arc
	Irradiation of lamp:	0.5 W/m ² @ 340 nm
	Filterset around lamp:	Inner borosilicate / outer borosilicate
	Black Standard Temperature BST:	65 ± 3 ° C
	Dry Bulb Temperature:	40 ± 3 ° C
15	R.H. in chamber:	70 ± 10 %
	Weather cycle:	108 min light and dry / 18 min light and wet

The parameters measured were color deviation on Grey scale according to DIN EN ISO 105-A05 and on Delta E scale according to DIN 6174.

20 The results are listed in Tables 3 and 4.

Table 3: Grey scale (High values are desired.)

Hours exposure	0	283	490	770	999	1257	1491	1980	2554	3512	4277	5015
Base formulation	5	4.83	1.04	-	-	-	-	-	-	-	-	-
Base formulation + Additive mixture 1	5	4.92	4.92	4.85	4.96	4.91	4.85	4.99	4.87	4.17	3.74	2.79
Base formulation + Additive mixture 2	5	4.94	4.88	4.93	4.92	4.87	4.54	4.8	4.69	4.55	4.09	2.71
Base formulation + Additive mixture 3	5	4.93	4.89	4.93	4.96	4.9	4.89	4.93	4.78	4.15	3.49	2.66

Table 4: Delta E (Low values are desired.)

Hours exposure	0	283	490	770	999	1257	1491	1754	1980	2243	2554	2745	3249
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Base for- mulation	0	0.29	13.2	-	-	-	-	-	-	-	-	-	-
Base for- mulation + Addi- tive mix- ture 1	0	0.14	0.13	0.26	0.06	0.16	0.26	0.07	0.02	0.11	0.22	0.35	1.05
Base for- mulation + Addi- tive mix- ture 2	0	0.1	0.2	0.11	0.14	0.22	0.78	1.03	0.35	0.49	0.52	0.84	0.56
Base for- mulation + Addi- tive mix- ture 3	0	0.11	0.19	0.11	0.07	0.17	0.19	0.06	0.12	0.3	0.38	0.47	1.15

- From tables 3 and 4, it is evident that the addition of additive mixtures of the present invention provides a better retention of the properties (i.e., no change in color due to degradation when exposed to artificial weathering) of the tested thermoplastic polypropylene samples.

Example 3: Stabilization of a thermoplastic polypropylene.

- In some combinations of polymer, filler, color, stabilizers and anti-scratch agents, some of the additives can migrate and in unfortunate combination ratios, these additives can even bloom onto the surface. Exposed and degraded by the sunlight, these additives can then form a layer with a tacky or sticky behavior. With a stickiness-test it can be recorded, how this stickiness on the surface develops.
- The test specimens were prepared in analogy to the method described in Example 1 and were evaluated for their stickiness according to the international norm PV 1306 – GS and PV 1306 – DE (PV 1306 is an exposure Test for Determining the Stickiness of Polypropylene Parts). The stickiness experienced by the finger was rated according to a given system and recorded over the aging time. For our tests, we used the ranking-system as given below:

Ok	1
Dull (blooming, but not sticky)	2
Slight sticky	3
Sticky	4
Very sticky	5

Resinified (no longer sticky)	6
Waxy	7
Test canceled, samples cracked	8

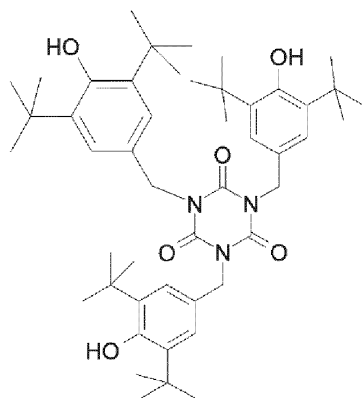
The results are listed in Table 5.

Hours exposure	0	225	503	786	997	1257	1517	1756	2014	2254	2517	2780	2996	3284
Base formu- lation	-	2	2	2	2	-	-	-	-	-	-	-	-	-
Base formu- lation + Addi- tive mixture 1	-	2	2	1	1	1	1	1	1	1	1	1	1	1
Base formu- lation + Addi- tive mixture 2	-	2	2	1	1	1	1	1	1	1	1	1	1	1
Base formu- lation + Addi- tive mixture 3	-	2	2	1	1	1	1	1	1	1	1	1	1	1

- 5 From table 5, it is evident that the addition of additive mixtures provides a surface which shows no stickiness to the thermoplastic polypropylene samples and which shows no blooming/exudation from the thermoplastic polypropylene samples.

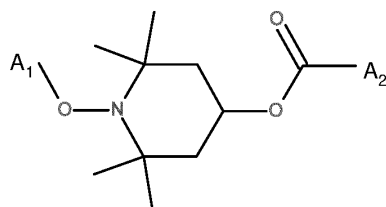
Claims

1. An additive mixture comprising a compound of formula (1) and a compound of formula (2)



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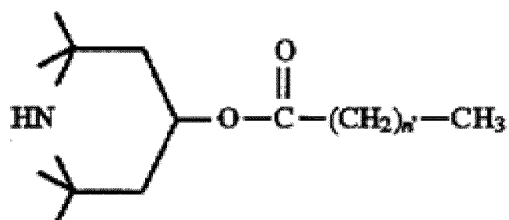
(1),



(2),

wherein

- A_1 is linear or branched, substituted or unsubstituted C_1 to C_{20} alkyl, and
 A_2 is linear or branched, substituted or unsubstituted C_1 to C_{30} alkyl.
2. The additive mixture according to claim 1, wherein A_1 is linear or branched, hydroxyl-substituted C_1 - C_{20} alkyl, and A_2 is linear or branched, unsubstituted C_1 to C_{30} alkyl.
3. The additive mixture according to claim 1 or 2, wherein A_1 is 2-hydroxy-2-methylpropyl, and A_2 is C_{15} - C_{17} alkyl.
4. The additive mixture according to one or more of claims 1 to 3, wherein the weight ratio of the compound of formula (1) to compound of formula (2) is in the range of from 5:95 to 95:5.
5. The additive mixture according to one or more of claims 1 to 4, further comprising an additive, other than additives as defined in claim 1, selected from a hindered amine light stabilizer, a hydroxyphenyl triazine UV absorber, a compound of formula (C-I-8)



(C-I-8),

wherein n' is an integer in the range of 14 to 16, and mixture thereof.

6. The additive mixture according to claim 5, wherein the hindered amine light stabilizer is selected from the group consisting of carbonic acid bis(1-undecyloxy-2,2,6,6-tetramethyl-4-piperidyl)ester, bis(2,2,6,6-tetramethyl-4-piperidyl)sebacate, bis(2,2,6,6-tetramethyl-4-piperidyl)succinate, bis(1,2,2,6,6-pentamethyl-4-piperidyl)sebacate, bis(1-octyloxy-2,2,6,6-tetramethyl-4-piperidyl)sebacate, bis(1,2,2,6,6-pentamethyl-4-piperidyl)n-butyl-3,5-di-tert-butyl-4-hydroxybenzylmalonate, the condensate of 1-(2-hydroxyethyl)-2,2,6,6-tetramethyl-4-hydroxypiperidine and succinic acid, linear or cyclic condensates of N,N'-bis(2,2,6,6-tetramethyl-4-piperidyl)hexamethylenediamine and 4-tert-octylamino-2,6-dichloro-1,3,5-triazine, tris(2,2,6,6-tetramethyl-4-piperidyl)nitrilotriacetate, tetrakis(2,2,6,6-tetramethyl-4-piperidyl)-1,2,3,4-butanetetracarboxylate, 1,1'-(1,2-ethanediyl)-bis(3,3,5,5-tetramethylpiperazinone), 4-benzoyl-2,2,6,6-tetramethylpiperidine, 4-stearyloxy-2,2,6,6-tetramethylpiperidine, bis(1,2,2,6,6-pentamethylpiperidyl)-2-n-butyl-2-(2-hydroxy-3,5-di-tert-butylbenzyl)malonate, 3-n-octyl-7,7,9,9-tetramethyl-1,3,8-triazaspiro[4.5]decane-2,4-dione, bis(1-octyloxy-2,2,6,6-tetramethylpiperidyl)sebacate, bis(1-octyloxy-2,2,6,6-tetramethylpiperidyl)succinate, linear or cyclic condensates of N,N'-bis(2,2,6,6-tetramethyl-4-piperidyl)hexamethylenediamine and 4-morpholino-2,6-dichloro-1,3,5-triazine, the condensate of 2-chloro-4,6-bis(4-n-butylamino-2,2,6,6-tetramethylpiperidyl)-1,3,5-triazine and 1,2-bis(3-aminopropylamino)ethane, the condensate of 2-chloro-4,6-di-(4-n-butylamino-1,2,2,6,6-pentamethylpiperidyl)-1,3,5-triazine and 1,2-bis(3-aminopropylamino)ethane, 8-acetyl-3-dodecyl-7,7,9,9-tetramethyl-1,3,8-triazaspiro[4.5]decane-2,4-dione, 3-dodecyl-1-(2,2,6,6-tetramethyl-4-piperidyl)pyrrolidine-2,5-dione, 3-dodecyl-1-(1,2,2,6,6-pentamethyl-4-piperidyl)pyrrolidine-2,5-dione, a mixture of 4-hexadecyloxy- and 4-stearyloxy-2,2,6,6-tetramethylpiperidine, a condensate of N,N'-bis(2,2,6,6-tetramethyl-4-piperidyl)hexamethylenediamine and 4-cyclohexylamino-2,6-dichloro-1,3,5-triazine, a condensate of 1,2-bis(3-aminopropylamino)ethane and 2,4,6-trichloro-1,3,5-triazine and 4-butylamino-2,2,6,6-tetramethylpiperidine; a condensate of 1,6-hexanediamine and 2,4,6-trichloro-1,3,5-triazine as well as N,N-dibutylamine and 4-butylamino-2,2,6,6-tetramethylpiperidine; N-(2,2,6,6-tetramethyl-4-piperidyl)-n-dodecylsuccinimide, N-(1,2,2,6,6-pentamethyl-4-piperidyl)-n-dodecylsuccinimide, 2-undecyl-7,7,9,9-tetramethyl-1-oxa-3,8-diaza-4-oxo-spiro[4,5]decane, a reaction product of 7,7,9,9-tetramethyl-2-cycloundecyl-1-oxa-3,8-diazpa-4-oxospiro-[4,5]decane and epichlorohydrin, 1,1-bis(1,2,2,6,6-pentamethyl-4-piperidyloxycarbonyl)-2-(4-methoxyphenyl)ethene, N,N'-bis-formyl-N,N'-bis(2,2,6,6-tetramethyl-4-piperidyl)hexamethylenediamine, a diester of 4-methoxymethylenemalonic acid with 1,2,2,6,6-pentamethyl-4-hydroxypiperidine, poly[methylpropyl-3-oxy-4-(2,2,6,6-tetramethyl-4-piperidyl)]siloxane, a reaction product of maleic acid anhydride- α -olefin copolymer with 2,2,6,6-tetramethyl-4-aminopiperidine or 1,2,2,6,6-pentamethyl-4-aminopiperidine, 2,4-bis[N-(1-cyclohexyloxy-2,2,6,6-tetramethylpiperidine-4-yl)-N-butylamino]-6-(2-hydroxyethyl)amino-1,3,5-triazine, 5-(2-ethylhexanoyl)oxymethyl-3,3,5-trimethyl-2-morpholinone, 5-(2-ethylhexanoyl)oxymethyl-3,3,5-trimethyl-2-morpholinone, the reaction product of 2,4-bis[(1-cyclohexyloxy-2,2,6,6-piperidine-4-yl)butylamino]-6-chloro-s-triazine with N,N'-bis(3-aminopropyl)ethylenediamine, 1,3,5-tris(N-cyclohexyl-N-

(2,2,6,6-tetramethylpiperazine-3-one-4-yl)amino)-s-triazine, 1,3,5-tris(N-cyclohexyl-N-(1,2,2,6,6-pentamethylpiperazine-3-one-4-yl)amino)-s-triazine, 4-N-butyl-2-N,4-N-bis(2,2,6,6-tetramethylpiperidin-4-yl)-2-N-[6-[(2,2,6,6-tetramethylpiperidin-4-yl)amino]hexyl]-1,3,5-triazine-2,4-diamine, N,N'-bis(2,2,6,6-tetramethyl-4-piperidyl)-N,N'-diformylhexamethylenediamine, and mixtures thereof.

7. The additive mixture according to claim 6, wherein the hydroxyphenyl triazine UV absorber is selected from the group consisting of 2,4,6-tris(2-hydroxy-4-octyloxyphenyl)-1,3,5-triazine, 2-(2-hydroxy-4-octyloxyphenyl)-4,6-bis(2,4-dimethylphenyl)-1,3,5-triazine, 2-(2,4-dihydroxyphenyl)-4,6-bis(2,4-dimethylphenyl)-1,3,5-triazine, 2,4-bis(2-hydroxy-4-propyloxyphenyl)-6-(2,4-dimethylphenyl)-1,3,5-triazine, 2-(2-hydroxy-4-octyloxyphenyl)-4,6-bis(4-methylphenyl)-1,3,5-triazine, 2-(2-hydroxy-4-dodecyloxyphenyl)-4,6-bis(2,4-dimethylphenyl)-1,3,5-triazine, 2-(2-hydroxy-4-tridecyloxyphenyl)-4,6-bis(2,4-dimethylphenyl)-1,3,5-triazine, 2-[2-hydroxy-4-(2-hydroxy-3-butyloxypropoxy)phenyl]-4,6-bis(2,4-dimethyl)-1,3,5-triazine, 2-[2-hydroxy-4-(2-hydroxy-3-octyloxypropoxy)phenyl]-4,6-bis(2,4-dimethyl)-1,3,5-triazine, 2-[4-(dodecyloxy/tridecyloxy-2-hydroxypropoxy)-2-hydroxyphenyl]-4,6-bis(2,4-dimethylphenyl)-1,3,5-triazine, 2-[2-hydroxy-4-(2-hydroxy-3-dodecyloxypropoxy)phenyl]-4,6-bis(2,4-dimethylphenyl)-1,3,5-triazine, 2-(2-hydroxy-4-hexyloxy)phenyl-4,6-diphenyl-1,3,5-triazine, 2-(2-hydroxy-4-methoxyphenyl)-4,6-diphenyl-1,3,5-triazine, 2,4,6-tris[2-hydroxy-4-(3-butoxy-2-hydroxypropoxy)phenyl]-1,3,5-triazine, 2-(2-hydroxyphenyl)-4-(4-methoxyphenyl)-6-phenyl-1,3,5-triazine, 2-{2-hydroxy-4-[3-(2-ethylhexyl-1-oxy)-2-hydroxypropyloxy]phenyl}-4,6-bis(2,4-dimethylphenyl)-1,3,5-triazine, 2,4-bis(4-[2-ethylhexyloxy]-2-hydroxyphenyl)-6-(4-methoxyphenyl)-1,3,5-triazine, 2-(4,6-bis-biphenyl-4-yl-1,3,5-triazin-2-yl)-5-(2-ethyl-(n)-hexyloxy)phenol, and mixtures thereof.

8. The additive mixture according to one or more of claims 1 to 7, further comprising esters of substituted and unsubstituted benzoic acids.

9. A composition comprising

- a) an organic material which is susceptible to oxidative, thermal or light-induced degradation; and
- b) an additive mixture as defined in one or more of claims 1 to 8.

10. The composition according to claim 9, wherein the weight ratio of the organic material to the additive mixture is in the range of from 99.99: 0.01 to 1.0: 99.0.

11. The composition according to claims 9 or 10, wherein the organic material is selected from the group consisting of a thermoplastic elastomer, a polyolefin, an acrylonitrile/butadiene/styrene, a polyvinyl chloride, a polymethylmethacrylate, a polyamide or a polyoxymethylene.

12. The composition according to one or more of claims 9 to 11, wherein the organic material is a thermoplastic polyolefin.

13. The composition according to one or more of claims 9 to 12, wherein the thermoplastic polyolefin is a thermoplastic polyethylene or polypropylene.

14. The composition according to one or more of claims 9 to 13, further comprising a component (c) an anti-scratch agent, a filler, a pigment, and mixtures thereof.

15. The composition according to one or more of claims 9 to 14, wherein the anti-scratch agent is selected from the group consisting of an unsaturated or saturated fatty acid amide, a poly(organo)siloxane, and mixtures thereof.
16. An automotive interior or exterior material made of a composition according to any of
5 claims 9 to 15.
17. A method for stabilization of an organic material susceptible to oxidative, thermal or light-induced degradation, which comprises incorporating therein or applying thereto an additive mixture as defined in claims 1 to 8.
18. Use of the additive mixture defined in claims 1 to 8 as light stabilizer for organic ma-
10 terial susceptible to light-induced degradation.