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(54) **STABILIZING COMPOSITIONS FOR STABILIZING MATERIALS AGAINST ULTRAVIOLET LIGHT AND THERMAL DEGRADATION**

STABILISIERUNGSZUSAMMENSETZUNGEN FÜR MATERIALSTABILISIERUNG GEGEN UV-LICHT UND THERMISCHE ABBAU

COMPOSITION STABILISANTE POUR LA STABILISATION DE MATÉRIAUX CONTRE LA LUMIÈRE UV ET CONTRE LA DÉGRADATION THERMIQUE

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Description

Field of Invention

[0001] The instant invention relates to stabilizing compositions. In particular, the instant invention relates to compositions that stabilize materials against ultraviolet light degradation and thermal degradation.

Background

[0002] Exposure to sunlight and other sources of ultraviolet (UV) radiation (also referred to as UV light) is known to cause degradation of a wide variety of materials. For example, polymeric materials such as plastics often discolor, lose gloss and/or become brittle as a result of prolonged exposure to UV light due primarily to a reduction in the molecular weight of the polymer. Accordingly, a large body of art has been developed directed towards compositions such as UV light absorbers and stabilizers, which are capable of inhibiting such degradation in polymeric articles.

[0003] Exposure to heat is also known to cause degradation of materials, especially polymeric materials. While compositions that reduce or prevent degradation caused by heat have been developed, combining these compositions with UV light stabilizer systems has not always yielded the desired result since the UV light stabilization properties are often hindered or completely relinquished (*i.e.*, antagonistic) when combined with the heat stabilizer composition(s).

US 5214084 relates to stabilizing compositions suitable for protecting materials from degradation against UV light and thermal exposure. However, the compositions disclosed therein do not include ortho-hydroxy tris-aryl-triazines.

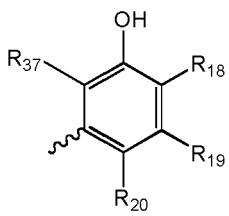
US 2009/149581 refers to blends of phosphites and phenols and their use as stabilizer compositions for polymer compositions.

US 6843939 discloses stabilizing compositions for protecting materials from degradation only against UV light.

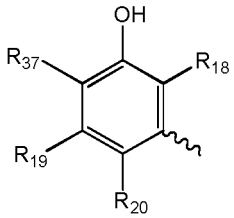
There remains an unmet need in the market for a stabilizer composition that can protect materials from degradation due to both UV light and thermal exposure. This invention is believed to be an answer to the foregoing need.

Summary

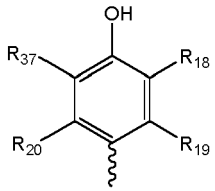
[0004] In one aspect, the invention is directed to thermal and ultraviolet (UV) light stabilizing compositions that include an ortho-hydroxyl tris-aryl-s-triazine compound; a hindered amine light stabilizer compound; a hindered hydroxybenzoate compound; an acid scavenger; a phosphite compound; a hindered phenol antioxidant compound comprising a molecular fragment according to one or more of Formula (IVa), (IVb), or (IVc):



Formula (IVa)



Formula (IVb)



Formula (IVc)

wherein

R_{18} in Formulae (IVa), (IVb) and (IVc) is chosen from hydrogen and a $C_{1\text{-}4}$ hydrocarbyl;

R_{19} and R_{20} in Formulae (IVa), (IVb) and (IVc) are each individually chosen from hydrogen and a C_1-C_{20} hydrocarbyl; and

R_{37} in Formulae (IVa), (IVb) and (IVc) is chosen from C_1-C_{12} hydrocarbyl; and

a thioester compound.

[0005] In another aspect, the invention is directed to stabilized compositions that include any of the thermal and UV light stabilizing compositions described herein and a material to be stabilized.

[0006] In yet a further aspect, the invention is directed to a process for achieving stability against thermal and UV light

degradation of a material selected from the group consisting of polyolefins, polyesters, polyethers, polyketones, polyamides, natural and synthetic rubbers, polyurethanes, polystyrenes, high-impact polystyrenes, polyacrylates, polymethacrylates, polyacetals, polyacrylonitriles, polybutadienes, polystyrenes, acrylonitrile-butadiene-styrene, styrene acrylonitrile, acrylate styrene acrylonitrile, cellulosic acetate butyrate, cellulosic polymers, polyimides, polyamideimides, polyetherimides, polyphenylsulfides, polyphenyloxidepolysulfones, polyethersulfones, polyvinylchlorides, polycarbonates, polyketones, aliphatic polyketones, thermoplastic olefins, aminoresin cross-linked polyacrylates and polyesters, polyisocyanate cross-linked polyesters and polyacrylates, phenol/formaldehyde, urea/formaldehyde and melamine/formaldehyde resins, drying and non-drying alkyd resins, alkyd resins, polyester resins, acrylate resins cross-linked with melamine resins, urea resins, isocyanates, isocyanurates, carbamates, and epoxy resins, cross-linked epoxy resins derived from aliphatic, cycloaliphatic, heterocyclic and aromatic glycidyl compounds, which are cross-linked with anhydrides or amines, polysiloxanes, Michael addition polymers, amines, blocked amines with activated unsaturated and methylene compounds, ketimines with activated unsaturated and methylene compounds, polyketimines in combination with unsaturated acrylic polyacetoacetate resins, polyketimines in combination with unsaturated acrylic resins, radiation curable compositions, epoxymelamine resins, organic dyes, cosmetic products, cellulose-based paper formulations, photographic film paper, fibers, waxes, inks, and blends thereof, the process comprising adding a stabilizing amount of a stabilizing composition as described herein to the material.

[0007] These and other aspects of the invention are described in more detail herein.

Brief Description of the Drawings

[0008]

FIGS. 1A-1E are photographs (corresponding to Table 3, Examples 1C, 2C, 10, 13, and 14, respectively) showing percentage of gloss retention of plaques containing a thermoplastic olefin blended with or without light stabilizing compositions following exposure to extreme thermal conditions.

FIG. 2 is a graph illustrating the results of Examples 15-19.

Detailed Description

[0009] As summarized above, the compositions and processes using the same that have now been discovered and disclosed herein for the first time are surprisingly useful for achieving optimal stability against thermal and UV light degradation compared to current commercially available stabilizer packages. Furthermore, the processes and compositions disclosed herein additionally (and surprisingly) provide a stabilizer package that has a low release of volatile organic compounds (VOCs), low odor and low blooming as compared to current commercially available polymer stabilizer packages.

[0010] As employed above and throughout the disclosure, the following terms and definitions are provided to assist the reader. Unless otherwise defined, all terms of art, notations and other scientific terminology used herein are intended to have the meanings commonly understood by those of skill in the chemical arts. As used herein and in the appended claims, the singular forms include plural referents unless the context clearly dictates otherwise. Additionally, as used herein and in the appended claims, the disclosure of any ranges of amounts or concentrations includes the disclosure of any amount or value in the given range.

[0011] Throughout this specification the terms and substituents retain their definitions. A comprehensive list of abbreviations utilized by organic chemists (*i.e.* persons of ordinary skill in the art) appears in the first issue of each volume of the Journal of Organic Chemistry. The list, which is typically presented in a table entitled "Standard List of Abbreviations", is incorporated herein by reference.

[0012] The term "hydrocarbyl" is a generic term encompassing aliphatic, alicyclic and aromatic groups having an all-carbon backbone and consisting of carbon and hydrogen atoms. In certain cases, as defined herein, one or more of the carbon atoms making up the carbon backbone may be replaced or interrupted by a specified atom or group of atoms, such as by one or more heteroatom of N, O, and/or S. Examples of hydrocarbyl groups include alkyl, cycloalkyl, cycloalkenyl, carbocyclic aryl, alkenyl, alkynyl, alkylcycloalkyl, cycloalkylalkyl, cycloalkenylalkyl, and carbocyclic aralkyl, alkaryl, aralkenyl and aralkynyl groups. Such hydrocarbyl groups can also be optionally substituted by one or more substituents as defined herein. Accordingly, the chemical groups or moieties discussed in the specification and claims should be understood to include the substituted or unsubstituted forms. The examples and preferences expressed below also apply to each of the hydrocarbyl substituent groups or hydrocarbyl-containing substituent groups referred to in the various definitions of substituents for compounds of the formulas described herein unless the context indicates otherwise.

[0013] Preferred non-aromatic hydrocarbyl groups are saturated groups such as alkyl and cycloalkyl groups. Generally, and by way of example, the hydrocarbyl groups can have up to fifty carbon atoms, unless the context requires otherwise.

Hydrocarbyl groups with from 1 to 30 carbon atoms are preferred. Within the sub-set of hydrocarbyl groups having 1 to 30 carbon atoms, particular examples are C_{1-20} hydrocarbyl groups, such as C_{1-12} hydrocarbyl groups (e.g. C_{1-6} hydrocarbyl groups or C_{1-4} hydrocarbyl groups), specific examples being any individual value or combination of values selected from C_1 through C_{30} hydrocarbyl groups.

[0014] Alkyl is intended to include linear, branched, or cyclic hydrocarbon structures and combinations thereof. Lower alkyl refers to alkyl groups of from 1 to 6 carbon atoms. Examples of lower alkyl groups include methyl, ethyl, propyl, isopropyl, butyl, s-and t-butyl and the like. Preferred alkyl groups are those of C_{30} or below.

[0015] Alkoxy or alkoxyalkyl refers to groups of from 1 to 20 carbon atoms of a straight, branched, cyclic configuration and combinations thereof attached to the parent structure through an oxygen. Examples include methoxy, ethoxy, propoxy, isopropoxy, cyclopropyloxy, cyclohexyloxy and the like.

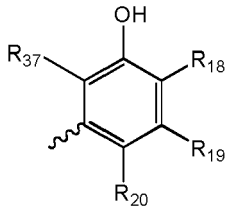
[0016] Acyl refers to formyl and to groups of 1, 2, 3, 4, 5, 6, 7, 8, 9, 10, 11 and 12 carbon atoms of a straight, branched, cyclic configuration, saturated, unsaturated and aromatic and combinations thereof, attached to the parent structure through a carbonyl functionality. Examples include acetyl, benzoyl, propionyl, isobutyryl, t-butoxycarbonyl, benzyloxycarbonyl and the like. Lower-acyl refers to groups containing one to six carbons.

[0017] References to "carbocyclic" or "cycloalkyl" groups as used herein shall, unless the context indicates otherwise, include both aromatic and non-aromatic ring systems. Thus, for example, the term includes within its scope aromatic, non-aromatic, unsaturated, partially saturated and fully saturated carbocyclic ring systems. In general, such groups may be monocyclic or bicyclic and may contain, for example, 3 to 12 ring members, more usually 5 to 10 ring members. Examples of monocyclic groups are groups containing 3, 4, 5, 6, 7, and 8 ring members, more usually 3 to 7, and preferably 5 or 6 ring members. Examples of bicyclic groups are those containing 8, 9, 10, 11 and 12 ring members, and more usually 9 or 10 ring members. Examples of non-aromatic carbocycle/cycloalkyl groups include c-propyl, c-butyl, c-pentyl, c-hexyl, and the like. Examples of C_7 to C_{10} polycyclic hydrocarbons include ring systems such as norbornyl and adamantyl.

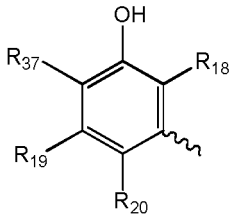
[0018] Aryl (carbocyclic aryl) refers to a 5- or 6-membered aromatic carbocycle ring containing; a bicyclic 9- or 10-membered aromatic ring system; or a tricyclic 13- or 14-membered aromatic ring system. The aromatic 6- to 14-membered carbocyclic rings include, e.g., substituted or unsubstituted phenyl groups, benzene, naphthalene, indane, tetralin, and fluorene.

[0019] Substituted hydrocarbyl, alkyl, aryl, cycloalkyl, alkoxy, etc. refer to the specific substituent wherein up to three H atoms in each residue are replaced with alkyl, halogen, haloalkyl, hydroxy, alkoxy, carboxy, carboalkoxy (also referred to as alkoxycarbonyl), carboxamido (also referred to as alkylaminocarbonyl), cyano, carbonyl, nitro, amino, alkylamino, dialkylamino, mercapto, alkylthio, sulfoxide, sulfone, acylamino, amidino, phenyl, benzyl, halobenzyl, heteroaryl, phenoxy, benzyloxy, heteroaryloxy, benzoyl, halobenzoyl, or lower alkylhydroxy.

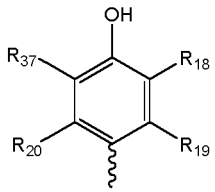
[0020] As summarized above, this invention relates to a thermal and ultraviolet (UV) light stabilizing composition that includes an ortho-hydroxyl tris-aryl-s-triazine compound, a hindered amine light stabilizer (HALS) compound, a hindered hydroxybenzoate compound, a phosphite compound, an acid scavenger, a hindered phenol antioxidant compound comprising a molecular fragment according to one or more of Formula (IVa), (IVb), or (IVc):



Formula (IVa)



Formula (IVb)



Formula (IVc)

wherein

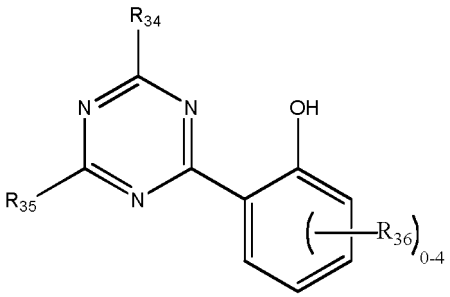
R_{18} in Formulae (IVa), (IVb) and (IVc) is chosen from hydrogen and a C_{1-4} hydrocarbyl;

R_{19} and R_{20} in Formulae (IVa), (IVb) and (IVc) are each individually chosen from hydrogen and a C_1-C_{20} hydrocarbyl; and

R_{37} in Formulae (IVa), (IVb) and (IVc) is chosen from C_1-C_{12} hydrocarbyl, and

a thioester compound.

[0021] Preferably, the ortho-hydroxy tris-aryl-s-triazine compound is 2-(2'-hydroxyphenyl)-1,3,5-triazine compound according to Formula (I):

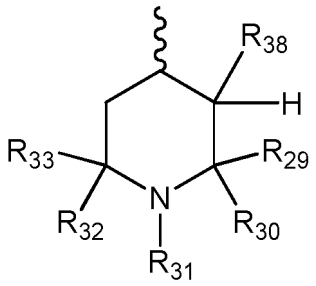


Formula (I)

wherein each of R_{34} and R_{35} in Formula (I) is independently chosen from C_6-C_{10} aryl optionally substituted, C_1-C_{10} hydrocarbyl-substituted amino, C_1-C_{10} acyl and C_1-C_{10} alkoxyl; and wherein R_{36} in Formula (I) is a substituent that is the same or different at from 0 to 4 positions of the phenoxy portion of Formula I and is independently chosen from hydroxyl, C_1-C_{12} hydrocarbyl, C_1-C_{12} alkoxyl, C_1-C_{12} alkoxyester, and C_1-C_{12} acyl.

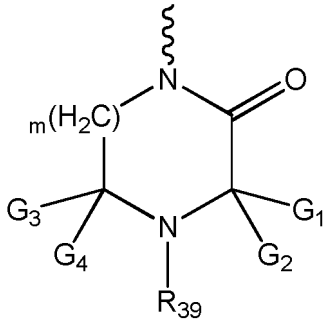
[0022] Examples of the 2-(2'-hydroxyphenyl)-1,3,5-triazine include 4,6-bis-(2,4-dimethylphenyl)-2-(2-hydroxy-4-octyloxyphenyl)-s-triazine; 4,6-bis-(2,4-dimethylphenyl)-2-(2,4-- dihydroxyphenyl)-s-triazine; 2,4-bis(2,4-dihydroxyphenyl)-6-(4-chlorophenyl)-s-triazine; 2,4-bis[2-hydroxy-4-(2-hydroxy-ethoxy)phenyl]-6-(4-chlorophenyl)-s-triazine; 2,4-bis[2-hydroxy-4-(2-hydroxy-4-(2-hydroxy-ethoxy)phenyl]-6-(2,4-dimethylphenyl)-s-triazine; 2,4-bis[2-hydroxy-4-(2-hydroxyethoxy)phenyl]-6-(4-bromophenyl)-s-triazine; 2,4-bis[2-hydroxy-4-(2-acetoxyethoxy)phenyl]-6-(4-chlorophenyl)-s-triazine; 2,4-bis(2,4-dihydroxyphenyl)-6-(2,4-dimethylphenyl)-s-triazine; 2,4-bis(4-biphenylyl)-6-[2-hydroxy-4-[(octyloxycarbonyl)ethylideneoxy]phenyl]-s-triazine; 2,4-bis(4-biphenylyl)-6-[2-hydroxy-4-(2-ethylhexyloxy)phenyl]-s-triazine; 2-phenyl-4-[2-hydroxy-4-(3-sec-butyloxy-2-hydroxypropyloxy)phenyl]-6-[2-hydroxy-4-(3-sec-amyloxy-2-hydroxypropyloxy)phenyl]-s-triazine; 2,4-bis(2,4-dimethylphenyl)-6-[2-hydroxy-4(- 3-benzyloxy-2-hydroxypropyloxy)phenyl]-s-triazine; 2,4-bis(2-hydroxy-4-n-butyloxyphenyl)-6-(2,4-di-n-butyloxyphenyl)-s-triazine; 2,4-bis(2,4-dimethylphenyl)-6-[2-hydroxy-4-(3-nonyloxy-2-hydroxypropylox- y)-5-α-cumylphenyl]-s-triazine; methylenebis-{2,4-bis(2,4-dimethylphenyl)-6-[2-hydroxy-4-(3-butyloxy-2-hydroxypropoxy)phenyl]-s-triazine}; methylene bridged dimer mixture bridged in the 3:5', 5:5' and 3:3' positions in a 5:4:1 ratio; 2,4,6-tris(2-hydroxy-4-isooctyloxycarbonyliso-propylideneoxy-phenyl)-s-triazine; 2,4-bis(2,4-dimethylphenyl)-6-(2-bydroxy-4-hexyloxy-5-α-cumylphenyl)-s-triazine; 2-(2,4,6-trimethylphenyl)-4,6-bis[2-hydroxy-4-(3-butyloxy-2-hydroxypropyloxy)phenyl]-s-triazine; 2,4,6-tris[2-hydroxy-4-(3-sec-butyloxy-2-hydroxypropyloxy)-phenyl]-s-triazine; mixture of 4,6-bis-(2,4-dimethylphenyl)-2-(2-hydroxy-4-(3-dodecyloxy-2-hydroxypropoxy)phenyl)-s-triazine and 4,6-bis-(2,4-dimethylphenyl)-2-(2-hydroxy-4-(3-tridecyloxy-2-hydroxypropoxy)phenyl)-s-triazine; 4,6-bis-(2,4-dimethylphenyl)-2-(2-hydroxy-4(3-(2-ethylhexyloxy)-2-hydroxypropoxy)-phenyl)-s-triazine; 4,6-diphenyl-2-(4-hexyloxy-2-hydroxyphenyl)-s-triazine; 2-(4,6-Diphenyl-1,3,5-triazin-2-yl)-5-[2-(2-ethylhexanoyloxy)ethoxy]phenol; 2,4,6-tris(2-hydroxy-4-octyloxyphenyl)-1,3,5-triazine; propanoic acid, 2,2',2"-[1,3,5-triazine-2,4,6-triyltris[(3-hydroxy-4,1-phenylene)oxy]]tris-1,1',1" -trioctyl ester; propanoic acid, 2-[4-[4,6-bis([1,1'-biphenyl]-4-yl)-1,3,5-triazin-2y1]-3-hydroxyphenoxyl]-isooctyl ester; and combinations thereof.

[0023] The HALS compound includes a molecular fragment according to Formula (II):



Formula (II)

wherein R_{31} in Formula (II) is chosen from: hydrogen; OH; C_1-C_{20} hydrocarbyl; -CH_2CN; C_1-C_{12} acyl; and C_1-C_{18} alkoxy; R_{38} in Formula (II) is chosen from: hydrogen; and C_1-C_8 hydrocarbyl; and each of R_{29}, R_{30}, R_{32}, and R_{33} in Formula (II) is independently chosen from C_1-C_{20} hydrocarbyl, or R_{29} and R_{30} and/or R_{32} and R_{33} in Formula (II) taken together with the carbon to which they are attached form a C_5-C_{10} cycloalkyl; or Formula (IIa)



Formula (IIa)

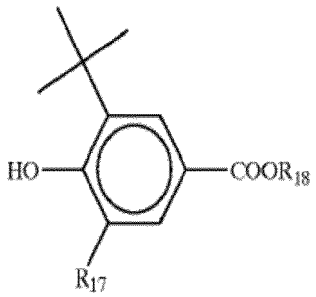
wherein m in Formula (IIa) is an integer from 1 to 2; R_{39} is chosen from: hydrogen; OH; C_1-C_{20} hydrocarbyl; -CH_2CN; C_1-C_{12} acyl; and C_1-C_{18} alkoxy; and each of G_1-G_4 in Formula (IIa) is independently chosen from C_1-C_{20} hydrocarbyl.

[0024] Examples of the HALS compound include bis(2,2,6,6-tetramethylpiperidin-4-yl) sebacate; bis(2,2,6,6-tetramethylpiperidin-4-yl)succinate; bis(1,2,2,6,6-pentamethylpiperidin-4-yl)sebacate; bis(1-octyloxy-2,2,6,6-tetramethylpiperidin-4-yl)sebacate; bis(1,2,2,6,6-pentamethylpiperidin-4-yl) n-butyl 3,5-di-tert-butyl-4-hydroxybenzylmalonate; a condensate of 1-(2-hydroxyethyl)-2,2,6,6-tetramethyl-4-hydroxypiperidine and succinic acid; 2,2,6,6-tetramethylpiperidin-4-yl stearate; 2,2,6,6-tetramethylpiperidin-4-yl dodecanate; 1,2,2,6,6-pentamethylpiperidin-4-yl stearate; 1,2,2,6,6-pentamethylpiperidin-4-yl dodecanate; a condensate of N,N'-bis(2,2,6,6-tetramethylpiperidin-4-yl)hexamethylenediamine and 4-tert-octylamino-2,6-dichloro-1,3,5-triazine; tris(2,2,6,6-tetramethylpiperidin-4-yl) nitrilotriacetate; tetrakis(2,2,6,6-tetramethylpiperidin-4-yl)- 1,2,3,4-butanetetracarboxylate; 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]decan-2,4-dione; bis(1-octyloxy-2,2,6,6-tetramethylpiperidyl)sebacate; bis(1-octyloxy-2,2,6,6-tetramethylpiperidyl)succinate; a condensate of N,N'-bis(2,2,6,6-tetramethylpiperidin-4-yl)hexamethylenediamine and 4-morpholino-2,6-dichloro-1,3,5-triazine; a condensate of N,N'-bis(2,2,6,6-tetramethylpiperidin-4-yl)hexamethylenediamine and 4-morpholino-2,6-dichloro-1,3,5-triazine, methylated; a 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; a condensate of 2-chloro-4,6-bis(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-tetramethylpiperidin-4-yl)pyrrolidin-2,5-dione; 3-dodecyl-1-(1-ethanoyl-2,2,6,6-tetramethylpiperidin-4-yl)pyrrolidin-2,5-dione; 3-dodecyl-1-(1,2,2,6,6-pentamethylpiperidin-4-yl)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-tetramethylpiperidin-4-yl)hexamethylenediamine and 4-cyclohexylamino-2,6-dichloro-1,3,5-triazine; a condensate of 1,2-bis(3-aminopropylamino)ethane, 2,4,6-trichloro-1,3,5-triazine and 4-butylamino-2,2,6,6-tetramethylpiperidine; 2-undecyl-7,7,9,9-tetramethyl-1-oxa-3,8-diaza-4-oxospiro[4.5]decane; oxo-piperanzinyl-triazines; a reaction product of 7,7,9,9-tetramethyl-2-cycloundecyl-1-oxa-3,8-diaza-4-oxospiro[4.5]decane and epichlorohydrin; tetrakis(2,2,6,6-tetramethyl-4-piperidyl) butane-

1,2,3,4-tetracarboxylate; 1,2,3,4-butanetetracarboxylic acid, tetrakis(1,2,2,6,6-pentamethyl-4-piperidinyl)ester; 1,2,3,4-butanetetracarboxylic acid, 1,2,2,6,6-pentamethyl-4-piperdinyl tridecyl ester; 1,2,3,4-butanetetracarboxylic acid, 2,2,6,6-tetramethyl-4-piperidinyl tridecyl ester; 1,2,3,4-butanetetracarboxylic acid, polymer with 2,2,6,6-tetramethyl-2,4,8,10-tetraoxaspiro[5.5]-undecane-3,9-diethanol,1,2,2,6,6-pentamethyl-4-piperdinyl ester; 1,2,3,4-butanetetracarboxylic acid, polymer with 2,2,6,6-tetramethyl-2,4,8,10-tetraoxaspiro[5.5]-undecane-3,9-diethanol, 2,2,6,6-tetramethyl-4-piperdinyl ester; bis(1-undecanoxy-2,2,6,6-tetramethylpiperidin-4-yl)carbonate; 1-(2-hydroxy-2-methylpropoxy)-2,2,6,6-tetramethyl-4-piperdinol; 1-(2-hydroxy-2-methylpropoxy)-4-octadecanoyloxy-2,2,6,6-tetramethylpiperidine; 1-(4-octadecanoyloxy-2,2,6,6-tetramethylpiperidin-1-yloxy)-2-octadecanoyloxy-2-methylpropane; 1-(2-hydroxyethyl)-2,2,6,6-tetramethyl-4-piperdinol; a reaction product of 1-(2-hydroxyethyl)-2,2,6,6-tetramethyl-4-piperdinol and dimethylsuccinate; 2,2,4,4-tetramethyl-7-oxa-3,20-diazadispiro[5.1.11.2]heneicosan-21-one; the ester of 2,2,6,6-tetramethyl-4-piperidinol with higher fatty acids; 3-dodecyl-1-(2,2,6,6-tetramethyl-4-piperidyl)pyrrolidine-2,5-dione; 1H-Pyrrole-2,5-dione, 1-octadecyl-, polymer with (1-methylethenyl)benzene and 1-(2,2,6,6-tetramethyl-4-piperidinyl)-1H-pyrrole-2,5-dione; piperazinone, 1,1',1"-[1,3,5-triazine-2,4,6-triyltris[(cyclohexylimino)-2,1-ethanediyl]]tris[3,3,5,5-tetramethyl-; piperazinone, 1,1',1"-[1,3,5-triazine-2,4,6-triyltris[(cyclohexylimino)-2,1-ethanediyl]]tris[3,3,4,5,5-pentamethyl-; the reaction product of 7,7,9,9-tetramethyl-2-cycloundecyl-1-oxa-3,8-diaza-4-oxospiro[4.5]decane and epichlorohydrin; the condensate of N,N'-bis(2,2,6,6-tetramethylpiperidin-4-yl)hexamethylenediamine and 4-cyclohexylamino-2,6-dichloro-1,3,5-triazine; the condensate of 1,2-bis(3-aminopropylamino)ethane, 2,4,6-trichloro-1,3,5-triazine and 4-butylamino-2,2,6,6-tetramethylpiperidine; the condensate of N,N'-bis(2,2,6,6-tetramethylpiperidin-4-yl)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-bis(4-n-butylamino-1,2,2,6,6-pentamethylpiperidyl)-1,3,5-triazine and 1,2-bis-(3-aminopropylamino)ethane; 2-[(2-hydroxyethyl)amino]-4,6-bis[N-(1-cyclohexyloxy-2,2,6,6-tetramethylpiperidin-4-yl)butylamino-1,3,5-triazine; propanedioic acid, [(4-methoxyphenyl)-methylene]-bis-(1,2,2,6,6-pentamethyl-4-piperidinyl) ester; tetrakis(2,2,6,6-tetramethylpiperidin-4-yl)-1,2,3,4-butanetetracarboxylate; benzenepropanoic acid, 3,5-bis(1,1-dimethylethyl)-4-hydroxy-, 1-[2-[3-[3,5-bis(1,1-dimethylethyl)-4-hydroxyphenyl]-1-oxopropoxy]ethyl]-2,2,6,6-tetramethyl-4-piperidinyl ester; N-(1-octyloxy-2,2,6,6-tetramethylpiperidin-4-yl)-N'-dodecyloxalamide; tris(2,2,6,6-tetramethylpiperidin-4-yl) nitrilotriacetate; 1,5-dioxaspiro{5,5}undecane-3,3-dicarboxylic acid, bis(1,2,2,6,6-pentamethyl-4-piperidinyl): 1,5-dioxaspiro{5,5}undecane-3,3-dicarboxylic acid, bis(2,2,6,6-tetramethyl-4-piperidinyl); the condensate of 1-(2-hydroxyethyl)-2,2,6,6-tetramethyl-4-hydroxypiperidine and succinic acid; the condensate of N,N'-bis(2,2,6,6-tetramethylpiperidin-4-yl)hexamethylenediamine and 4-tert-octylamino-2,6-dichloro-1,3,5-triazine; 1,2,3,4-butanetetracarboxylic acid, 1,2,2,6,6-pentamethyl-4-piperidinyl tridecyl ester; tetrakis(2,2,6,6-tetramethylpiperidin-4-yl)-1,2,3,4-butanetetracarboxylate; 1,2,3,4-butanetetracarboxylic acid, 2,2,6,6-tetramethyl-4-piperidinyl tridecyl ester; tetrakis(1,2,2,6,6-pentamethylpiperidin-4-yl)-1,2,3,4-butanetetracarboxylate; mixture of 2,2,4,4-tetramethyl-21-oxo-7-oxa-3.20-diazaspiro(5.1.11.2)-heneicosane-20-propanoic acid-dodecylester and 2,2,4,4-tetramethyl-21-oxo-7-oxa-3.20-diazaspiro(5.1.11.2)-heneicosane-20-propanoic acid-tetradecylester; 1H,4H,5H,8H-2,3a,4a,6,7a,8a-hexaazacyclopenta[def]fluorene-4,8-dione, hexahydro-2,6-bis(2,2,6,6-tetramethyl-4-piperidinyl)-; polymethyl[propyl-3-oxy(2',2',6',6'-tetramethyl-4,4'-piperidinyl)]siloxane; polymethyl[propyl-3-oxy(1',2',2',6',6'-pentamethyl-4,4'-piperidinyl)]siloxane; copolymer of methylmethacrylate with ethyl acrylate and 2,2,6,6-tetramethylpiperidin-4-yl acrylate; copolymer of mixed C_{20} to C_{24} alpha-olefins and (2,2,6,6-tetramethylpiperidin-4-yl)succinimide; 1,2,3,4-butanetetracarboxylic acid, polymer with β,β,β',β'-tetramethyl-2,4,8,10-tetraoxaspiro[5.5]undecane-3,9-diethanol, 1,2,2,6,6-pentamethyl-4-piperidinyl ester; 1,2,3,4-butanetetracarboxylic acid, polymer with β,β,β',β'-tetramethyl-2,4,8,10-tetraoxaspiro[5.5]undecane-3,9-diethanol, 2,2,6,6-tetramethyl-4-piperidinyl ester copolymer; 1,3-benzenedicarboxamide, N,N'-bis(2,2,6,6-tetramethyl-4-piperidinyl; 1,1'-(1,10-dioxo-1,10-decanediyl)-bis(hexahydro-2,2,4,4,6-pentamethylpyrimidine; ethane diamide, N-(1-acetyl-2,2,6,6-tetramethylpiperidinyl)-N'-dodecyl; formamide, N,N'-1,6-hexanediylbis[N-(2,2,6,6-tetramethyl-4-piperidinyl); D-glucitol, 1,3:2,4-bis-O-(2,2,6,6-tetramethyl-4-piperidinylidene)-; 2,2,4,4-tetramethyl-7-oxa-3,20-diaza-21-oxo-dispiro[5.1.11.2]heneicosane; propanamide, 2-methyl-N-(2,2,6,6-tetramethyl-4-piperidinyl)-2-[(2,2,6,6-tetramethyl-4-piperidinyl)amino]-; 7-oxa-3,20-diazadispiro[5.1.11.2]heneicosane-20-propanoic acid, 2,2,4,4-tetramethyl-21-oxo-, dodecyl ester; N-(2,2,6,6-tetramethylpiperidin-4-yl)-β-aminopropionic acid dodecyl ester; N-(2,2,6,6-tetramethylpiperidin-4-yl)-N'-aminooxalamide; propanamide, N-(2,2,6,6-tetramethyl-4-piperidinyl)-3-[(2,2,6,6-tetramethyl-4-piperidinyl)amino]-; mixture of 4-hexadecyloxy- and 4-stearyloxy-2,2,6,6-tetramethylpiperidine; 3-dodecyl-1-(1,2,2,6,6-pentamethylpiperidin-4-yl)pyrrolidine-2,5-dione; 3-dodecyl-1-(1-ethanoyl-2,2,6,6-pentamethylpiperidin-4-yl)pyrrolidine-2,5-dione; bis(2,2,6,6-tetramethylpiperidin-4-yl)succinate; bis(1,2,2,6,6-pentamethylpiperidin-4-yl) n-butyl 3,5-di-tert-butyl-4-hydroxybenzylmalonate; tris(2,2,6,6-tetramethylpiperidin-4-yl) nitrilotriacetate; 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]decan-2,4-dione; bis(1-octyloxy-2,2,6,6-tetramethylpiperidyl)sebacate; bis(1-octyloxy-2,2,6,6-tetramethylpiperidyl)succinate; 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-tetramethylpiperidin-4-yl)pyrrolidin-2,5-dione; 3-dodecyl-1-(1-ethanoyl-2,2,6,6-tetramethylpiperidin-4-yl)pyrrolidin-2,5-dione; 3-dodecyl-1-(1,2,2,6,6-pentamethylpiperidin-4-yl)pyrrolidine-2,5-dione; a mixture of 4-hexadecyloxy-

and 4-stearyloxy-2,2,6,6-tetramethylpiperidine; 2-undecyl-7,7,9,9-tetramethyl-1-oxa-3,8-diaza-4-oxospiro[4.5]decane; 1,5-dioxaspiro{5,5}undecane-3,3-dicarboxylic acid, bis(2,2,6,6-tetramethyl-4-piperidinyl) and 1,5-dioxaspiro{5,5}undecane-3,3-dicarboxylic acid, bis(1,2,2,6,6-pentamethyl-4-piperidinyl); N^1-(β-hydroxyethyl)3,3-pentamethylene-5,5-dimethylpiperazin-2-one; N^1-tert-octyl-3,3,5,5-tetramethyl-diazepin-2-one; N^1-tert-octyl-3,3-pentamethylene-5,5-hexamethylene-diazepin-2-one; N^1-tert-octyl-3,3-pentamethylene-5,5-dimethylpiperazin-2-one; trans-1,2-cyclohexane-bis-(N^1-5,5-dimethyl-3,3-pentamethylene-2-piperazinone; trans-1,2-cyclohexane-bis-(N^1-3,3,5,5-dispiropentamethylene-2-piperazinone); N^1-isopropyl-1,4-diazadispiro-(3,3,5,5)pentamethylene-2-piperazinone; N^1-isopropyl-1,4-diazadispiro-3,3-pentamethylene-5,5-tetramethylene-2-piperazinone; N^1-isopropyl-5,5-dimethyl-3,3-pentamethylene-2-piperazinone; trans-1,2-cyclohexane-bis-N^1-(dimethyl-3,3-pentamethylene-2-piperazinone); N^1-octyl-5,5-dimethyl-3,3-pentamethylene-1,4-diazepin-2-one; N^1-octyl-1,4-diazadispiro-(3,3,5,5)pentamethylene-1,5-diazepin-2-one; and mixtures thereof.

[0025] The hindered hydroxybenzoate compound is a compound according to Formula (III):

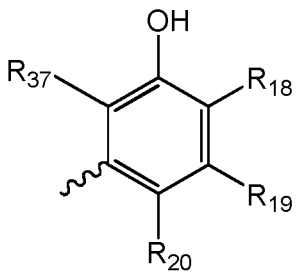


Formula (III)

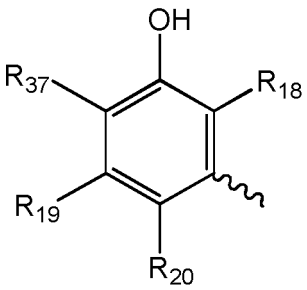
wherein R_{17} in Formula (III) is a C_1-C_8 alkyl and R_{18} in Formula (III) is a C_1-C_{24} alkyl or substituted or unsubstituted C_6-C_{24} aryl. In particular, the hindered hydroxybenzoate compound is 2,4-di-tert-butylphenyl 3,5-di-tert-butyl-4-hydroxybenzoate; hexadecyl 3,5-di-tert-butyl-4-hydroxybenzoate; octadecyl 3,5-di-tert-butyl-4-hydroxybenzoate; octyl 3,5-di-tert-butyl-4-hydroxybenzoate; tetradecyl 3,5-di-tert-butyl-4-hydroxybenzoate; behenylyl 3,5-di-tert-butyl-4-hydroxybenzoate; 2-methyl-4,6-di-tert-butylphenyl 3,5-di-tert-butyl-4-hydroxybenzoate or butyl 3-[3-t-butyl-4-(3,5-di-t-butyl-4-hydroxybenzoyloxy)phenyl]propionate

[0026] The acid scavenger used in the thermal and UV light stabilizing composition may include one or more of the following compounds: zinc oxide, calcium lactate, natural and synthetic hydrotalcites, natural and synthetic hydrocalumites, alkali metal salts and alkaline earth metal salts of higher fatty acids, calcium stearate, zinc stearate, magnesium behenate, magnesium stearate, sodium stearate, sodium ricinoleate and potassium palmitate, antimony pyrocatecholate, zinc pyrocatecholate. In one example, the acid scavenger includes magnesium oxide, aluminum oxide, magnesium hydroxide, aluminum hydroxide, carbonates thereof or mixtures thereof. A specific example of an acid scavenger includes DHT-4A (CAS No. 11097-59-9), a magnesium aluminum hydroxide carbonate hydrate that is a synthetic hydrotalcite compound.

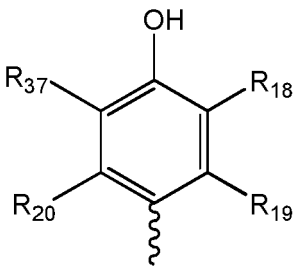
[0027] The hindered phenol antioxidant compound includes a molecular fragment according to one or more of Formula (IVa), (IVb), or (IVc):



Formula (IVa)



Formula (IVb)

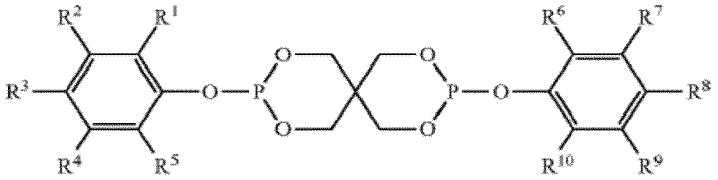


Formula (IVc)

wherein R_{18} in Formulae (IVa), (IVb) and (IVc) is chosen from hydrogen and a C_{1-4} hydrocarbyl; R_{19} and R_{20} in Formulae

(IVa), (IVb) and (IVc) are each individually chosen from hydrogen and a C_1-C_{20} hydrocarbyl; and R_{37} in Formulae (IVa), (IVb) and (IVc) is chosen from C_1-C_{12} hydrocarbyl. In one embodiment, R_{18} in Formulae (IVa), (IVb) and (IVc) and R_{37} are chosen from methyl and t-butyl. Examples of the hindered phenol antioxidant compound include (1,3,5-Tris(4-t-butyl-3-hydroxy-2,6-dimethylbenzyl)-1,3,5-triazine-2,4,6-(1H,3H,5H)-trione; 1,3,5-tris(3,5-di-tert-butyl-4-hydroxybenzyl)-1,3,5-triazine-2,4,6(1H,3H,SH)-trione; 1,1,3-Tris(2'-methyl-4'-hydroxy-5'-t-butylphenyl)butane; Triethylene glycol bis[3-(3-*t*-butyl-4-hydroxy-5-methylphenyl)propionate]; 4,4'-Thiobis(2-*t*-butyl-5-methylphenol); 2,2'-Thiodiethylene bis[3-(3-*t*-butyl-4-hydroxyl-5-methylphenyl)propionate]; Octadecyl 3-(3'-t-butyl-4'-hydroxy-5'-methylphenyl)propionate; Tetrakismethylene(3-t-butyl-4-hydroxy-5-methylhydrocinnamate)methane; *N*,*N*'-Hexamethylene bis[3-(3-*t*-butyl-4-hydroxy-5-methylphenyl)propionamide]; Di(4-tertiarybutyl-3-hydroxy-2,6-dimethyl benzyl) thiodipropionate; and octadecyl 3,5-di-(tert)-butyl-4-hydroxyhydrocinnamate.

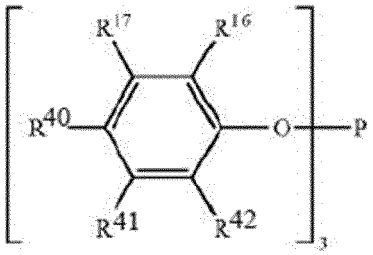
[0028] The phosphite used in the thermal and UV light stabilizing composition may be a hindered arylalkyl phosphite or a trisarylphosphite, or mixtures thereof. The hindered arylalkyl phosphite is a compound according to Formula (V):



Formula (V)

wherein R^1, R^2, R^3, R^4, R^5, R^6, R^7, R^8, R^9, and R^{10} in Formula (V) are each individually selected from hydrogen, C_1-C_{12} alkyl, C_3-C_{12} cycloalkyl, C_4-C_{12} alkyl cycloalkyl, C_6-C_{10} aryl, and C_7-C_{12} alkylaryl, wherein R^1 and R^5 together comprise at least 5 carbons and at least one of R^1 and R^5 comprises a tertiary carbon, wherein R^6 and R^{10} together comprise at least 5 carbons and at least one of R^6 and R^{10} comprises a tertiary carbon. Examples of the hindered arylalkyl phosphite include: bis-(2,6-di-t-butyl-4-methlphenyl)pentaerythritol diphosphite, (bis-(2,4-dicumylphenyl)pentaerythritol diphosphite, bis-(2,4-di-t-butyl-phenyl)pentaerythritol diphosphite, and bis-(2,4,6-tri-t-butyl-phenyl)pentaerythritol diphosphate.

[0029] The trisarylphosphite is a compound according to Formula (VI):



Formula (VI)

wherein R^{16}, R^{17}, R^{40}, R^{41}, and R^{42} in Formula (VI) are each individually selected from hydrogen, C_1-C_{20} alkyl, C_3-C_{20} cycloalkyl, C_4-C_{20} alkyl cycloalkyl, C_6-C_{10} aryl, and C_7-C_{20} alkylaryl. Examples of the trisarylphosphite include: tris-(2,4-di-t-butylphenyl)phosphite, tris(4-nonylphenyl) phosphite and triphenyl phosphite.

[0030] The thioester compound is dilauryl thiodipropionate, distearyl thiodipropionate, pentaerythrithol tetrakis-(3-dodecylthipropionate), tetra-alkyl thioethyl thiodisuccinate, 2,12-dihydroxy-4,10-dithia-7-oxatridecamethylene bis[3-(dodecylthio)propionate], polyalkanol esters of alkylthio-alkanoic acids, or dialkyl 3,3'-thiodipropionate.

[0031] In anembodiment, a formulation of the thermal and UV light stabilizing composition includes between about 1.00 wt.% to about 10.00 wt.% (preferably about 2.00 wt.% to about 6.00 wt.%) of the ortho-hydroxyl tris-aryl-s-triazine compound, between about 20.00 wt.% to about 50.00 wt.% (preferably about 30.00 wt.% to about 40.00 wt.%) of the hindered amine light stabilizer compound, between about 20.00 wt.% to about 50.00 wt.% (preferably about 30.00 wt.% to about 40.00 wt.%) of the hindered hydroxybenzoate compound, between 1 wt.% to about 10 wt.% (preferably about 2.00 wt.% to about 8.00 wt. %) of the acid scavenger, between about 1 wt.% to about 10 wt.% (preferably about 2.00 wt.% to about 6.00 wt. %) of the hindered phenol antioxidant compound, between about 5.00 wt.% to about 25.00 wt.%

(preferably about 6.00 wt.% to about 12.00 wt.%) of the phosphite compound, and between about 1.00 wt.% to about 15.00 wt.% (preferably about 5.00 wt.% to 10.00 wt. %) of the thioester compound, where the wt.% of each component is based on the total weight of the thermal and UV light stabilizing composition.

[0032] In a particular embodiment, a formulation of the thermal and UV light stabilizing composition includes about 4 wt.% of the ortho-hydroxyl tris-aryl-s-triazine compound, about 34 wt.% of the hindered amine light stabilizer compound, about 34 wt.% of the hindered hydroxybenzoate compound, about 7 wt.% of the acid scavenger, about 4 wt.% of the hindered phenol antioxidant compound, about 10 wt.% of the phosphite compound and about 7 wt.% of the thioester compound, where the wt.% of each component is based on the total weight of the thermal and UV light stabilizing composition.

[0033] The thermal and UV light stabilizing composition can be combined with a material to be stabilized, *e.g.,* a polymer, in any manner known in the art, thus forming a composition that is a stabilized material (also referred to herein as a stabilized composition or a composition). Materials to be stabilized, to which the thermal and UV light stabilizing composition may be combined with, include, but are not limited to, polymers such as polyolefins, polyesters, polyethers, polyketones, polyamides, natural and synthetic rubbers, polyurethanes, polystyrenes, high-impact polystyrenes, polyacrylates, polymethacrylates, polyacetals, polyacrylonitriles, polybutadienes, polystyrenes, acrylonitrile-butadiene-styrene, styrene acrylonitrile, acrylate styrene acrylonitrile, cellulosic acetate butyrate, cellulosic polymers, polyimides, polyamideimides, polyetherimides, polyphenylsulfides, polyphenyloxidepolysulfones, polyethersulfones, polyvinylchlorides, polycarbonates, polyketones, aliphatic polyketones, thermoplastic olefins, aminoresin cross-linked polyacrylates and polyesters, polyisocyanate cross-linked polyesters and polyacrylates, phenol/formaldehyde, urea/formaldehyde and melamine/formaldehyde resins, drying and non-drying alkyd resins, alkyd resins, polyester resins, acrylate resins cross-linked with melamine resins, urea resins, isocyanates, isocyanurates, carbamates, and epoxy resins, cross-linked epoxy resins derived from aliphatic, cycloaliphatic, heterocyclic and aromatic glycidyl compounds, which are cross-linked with anhydrides or amines, polysiloxanes, Michael addition polymers, amines, blocked amines with activated unsaturated and methylene compounds, ketimines with activated unsaturated and methylene compounds, polyketimines in combination with unsaturated acrylic polyacetoacetate resins, polyketimines in combination with unsaturated acrylic resins, radiation curable compositions, epoxymelamine resins, as well as organic dyes, cosmetic products, cellulose-based paper formulations, photographic film paper, fibers, waxes, inks, and blends thereof.

[0034] Preferably, the material to be stabilized is a polymer, such as thermoplastic olefins, acrylonitrile-butadiene-styrene, polyesters, polyvinylchloride, polyamides, polyurethanes, or homo- and copolymers of propylene, isobutylene, butene, methylpentene, hexene, heptene, octene, isoprene, butadiene, hexadiene, dicyclopentadiene, ethylidene, cyclopentene and norbornene. More preferably, the material to be stabilized is polypropylene and thermoplastic olefins.

[0035] In one embodiment, it is contemplated that the material to be stabilized may be a material or item used in the construction or renovation of buildings, e.g., homes, offices, warehouses, and the like. For example, the material to be stabilized may include vinyl siding, vinyl siding trim, shutters, gable vents, eaves, fascia, soffits, moldings, roofing shingles, roofing underlayment or base sheets, roofing membranes, batten systems, batten extenders, flashing, tile pans, ridge vents, weather blocks, hip and ridge systems (also known as hip and ridge shingles), eave risers, taper strips, gable end wedges, rake trim, geomembranes, composite deck materials, railings, window frames, and other materials and items used in the construction or renovation of buildings.

[0036] In one embodiment, the material to be stabilized, and thermal and UV light stabilizing composition are combined to form a "master batch" composition. In one embodiment, the master batch composition includes between 10 wt.% to about 80 wt.% of the thermal and UV light stabilizing compound, based on the total weight of the master batch composition, with the remainder being the material to be stabilized. In a more preferred embodiment, the master batch composition includes between 30 wt. % to about 60 wt.% of the thermal and UV light stabilizing composition, based on the total weight of the master batch composition, with the remainder being the material to be stabilized. In another embodiment, the master batch composition includes between 40 wt. % to about 50 wt.% of the thermal and UV light stabilizing composition, based on the total weight of the master batch composition, with the remainder being the material to be stabilized.

[0037] One embodiment includes a masterbatch concentrate comprising a stabilizing composition according to any of the embodiments described herein and at least one organic material identical or compatible with a material to be stabilized, wherein the stabilizing composition is present in an amount from 10 wt. % to 90 wt.% based on the total weight of the master batch concentrate.

[0038] In certain embodiments, the amount of thermal and UV stabilizing composition as described herein in the stabilized composition for end-use is present at any point in the range from 0.01 wt. % to 5 wt. %, based on the total weight of the material to be stabilized. In a particular embodiment, the amount of thermal and UV stabilizing composition in the stabilized composition for end-use is present at any point in the range from 0.05 wt. % to 2 wt. %, based on the total weight of the material to be stabilized.

[0039] The specific components of the thermal and UV stabilizing composition as described herein can be present in the stabilized composition in various amounts depending on the material to be stabilized and/or the level of desired

protection. For example, the amount of the ortho-hydroxyl tris-aryl-s-triazine compound in the stabilized composition for end-use can range from about 0.002 wt.% to about 0.50 wt.%, preferably 0.004 wt.% to about 0.20 wt.%, more preferably 0.005 wt.% to about 0.1 wt.% based on the total weight of stabilized composition.

[0040] The amount of the hindered amine light stabilizer compound in the stabilized composition is from about 0.01 wt.% to about 1.20 wt.%, preferably from about 0.02 wt.% to about 0.80 wt.%, more preferably from 0.03 wt.% to about 0.62 wt.%, based on the total weight of the stabilized composition.

[0041] The amount of the hindered hydroxybenzoate compound in the stabilized composition is from about 0.01 wt.% to about 1.20 wt.%, preferably from about 0.02 wt.% to about 0.80 wt.%, more preferably from about 0.03 wt.% to about 0.62 wt.%, based on the total weight of the stabilized composition.

[0042] The amount of the acid scavenger in the stabilized composition is from about 0.001 wt.% to about 0.50 wt.%, preferably from about 0.003 wt.% to about 0.25 wt.%, more preferably from 0.006 wt.% to about 0.14 wt.%, based on the total weight of the stabilized composition.

[0043] The amount of the hindered phenol antioxidant compound in the stabilized composition is from about 0.001 wt.% to about 0.50 wt.%, preferably from about 0.002 wt.% to about 0.25 wt.%, more preferably from about 0.004 wt.% to about 0.085 wt.%, based on the total weight of the stabilized composition.

[0044] The amount of the phosphite compound in the stabilized composition is from about 0.005 wt.% to about 1.00 wt.%, preferably from about 0.01 wt.% to about 0.80 wt.%, more preferably from about 0.02 wt.% to about 0.5 wt.%, based on the total weight of the stabilized composition.

[0045] The amount of the thioester compound in the stabilized composition is from about 0.001 wt.% to about 0.80 wt.%, preferably from about 0.003 wt.% to about 0.4 wt.%, more preferably from about 0.006 wt.% to about 0.2 wt.%, based on the total weight of the stabilized composition.

[0046] This application also contemplates a method of preparing the composition above by combining the thermal and UV light stabilizing composition with the material to be stabilized. The term "combining" or "combined" is intended to include all manners in which the thermal and UV light stabilizing compositions can be combined, and includes, for example, intermixing, admixing, integrating, mixing, blending, and the like. Additionally, it is noted that the thermal and UV light stabilizing composition and the material to be stabilized may be combined in any order, *i.e.*, the thermal and UV light stabilizing composition can be added to the material to be stabilized, or *vice versa*, or the thermal and UV light stabilizing composition and the material to be stabilized can be simultaneously added to a vessel.

[0047] The material to be stabilized and the thermal and UV light stabilizing composition can be combined by blending or compounding the components in a kneading apparatus such as a single or twin screw extruder, Banbury mixer, or hot rollers. The processing parameters and the use of such kneading apparatus are well known to those skilled in the art.

[0048] As would be apparent to those skilled in the art of making plastic materials, in addition to the material to be stabilized and the thermal and UV light stabilizing composition, the composition of the present invention may also include conventional additives including, but not limited to, metal deactivators, nitrones, lactones, co-stabilizers, nucleating agents, clarifying agents, neutralizers, metallic stearates, metal oxides, hydrotalcites, fillers and reinforcing agents, plasticizers, lubricants, emulsifiers, pigments, rheological additives, catalysts, level agents, optical brighteners, flame retardant agents, anti-static agents and blowing agents.

[0049] The invention includes at least the following embodiments:

Embodiment 1. A thermal and ultraviolet (UV) light stabilizing composition comprising:

an ortho-hydroxyl tris-aryl-s-triazine compound;

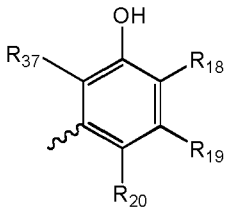
a hindered amine light stabilizer compound;

a hindered hydroxybenzoate compound;

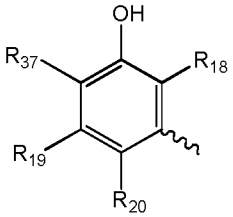
an acid scavenger;

a phosphite compound; and

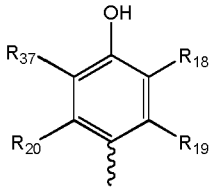
a hindered phenol antioxidant compound comprising a molecular fragment according to one or more of Formula (IVa), (IVb), or (IVc):



Formula (IVa)



Formula (IVb)



Formula (IVc)

wherein

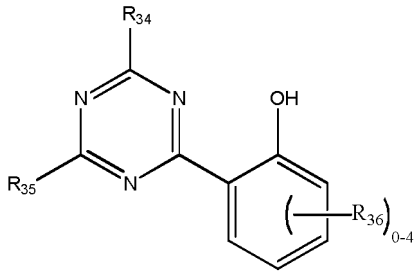
R_{18} in Formulae (IVa), (IVb) and (IVc) is chosen from hydrogen and a C_{1-4} hydrocarbyl;

R_{19} and R_{20} in Formulae (IVa), (IVb) and (IVc) are each individually chosen from hydrogen and a C_1-C_{20} hydrocarbyl; and

R_{37} in Formulae (IVa), (IVb) and (IVc) is chosen from C_1-C_{12} hydrocarbyl, and

a thioester compound.

Embodiment 2. The thermal and UV light stabilizing composition according to embodiment 1, wherein the ortho-hydroxyl tris-aryl-s-triazine compound is a 2-(2'-hydroxyphenyl)-1,3,5-triazine compound according to Formula (I):



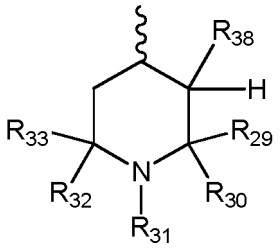
Formula (I)

wherein each of R_{34} and R_{35} in Fomrula (I) is independently chosen from C_6-C_{10} aryl optionally substituted, C_1-C_{10} hydrocarbyl-substituted amino, C_1-C_{10} acyl and C_1-C_{10} alkoxyl; and wherein R_{36} in Formula (I) is a substituent that is the same or different at from 0 to 4 positions of the phenoxy portion of Formula I and is independently chosen from hydroxyl, C_1-C_{12} hydrocarbyl, C_1-C_{12} alkoxyl, C_1-C_{12} alkoxyester, and C_1-C_{12} acyl.

Embodiment 3. The thermal and UV light stabilizing composition according to embodiment 2, wherein the 2-(2'-hydroxyphenyl)-1,3,5-triazine compound is chosen from: 4,6-bis-(2,4-dimethylphenyl)-2-(2-hydroxy-4-octyloxyphenyl)-s-triazine; 4,6-bis-(2,4-dimethylphenyl)-2-(2,4-- dihydroxyphenyl)-s-triazine; 2,4-bis(2,4-dihydroxyphenyl)-6-(4-chlorophenyl)-s-triazine; 2,4-bis[2-hydroxy-4-(2-hydroxy-ethoxy)phenyl]-6-(4-chlorophenyl)-s-triazine; 2,4-bis[2-hydroxy-4-(2-hydroxy-4-(2-hydroxy-ethoxy)phenyl]-6-(2,4-dimethylphenyl)-s-triazine; 2,4-bis[2-hydroxy-4-(2-hydroxyethoxy)phenyl]-6-(4-bromophenyl)-s-triazine; 2,4-bis[2-hydroxy-4-(2-acetoxyethoxy)phenyl]-6-(4-chlorophenyl)-s-triazine; 2,4-bis(2,4-dihydroxyphenyl)-6-(2,4-dimethylphenyl)-s-triazine; 2,4-bis(4-biphenylyl)-6-[2-hydroxy-4-[(octyloxycarbonyl)ethylideneoxy]phenyl]-s-triazine; 2,4-bis(4-biphenylyl)-6-[2-hydroxy-4-(2-ethylhexyloxy)phenyl]-s-triazine; 2-phenyl-4-[2-hydroxy-4-(3-sec-butyloxy-2-hydroxypropyloxy)phenyl]-6-[2-hydroxy-4-(3-sec-amyloxy-2-hydroxypropyloxy)phenyl]-s-triazine; 2,4-bis(2,4-dimethylphenyl)-6-[2-hydroxy-4(- 3-benzyloxy-2-hydroxypropyloxy)phenyl]-s-triazine; 2,4-bis(2-hydroxy-4-n-butyloxyphenyl)-6-(2,4-di-n-butyloxyphenyl)-s-triazine; 2,4-bis(2,4-

dimethylphenyl)-6-[2-hydroxy-4-(3-nonyloxy-2-hydroxypropylox- y)-5-α-cumylphenyl]-s-triazine; methylenebis-{2,4-bis(2,4-dimethylphenyl)-6-[2-hydroxy-4-(3-butyloxy-2-hydroxypropoxy)phenyl]-s-triazine}; methylene bridged dimer mixture bridged in the 3:5', 5:5' and 3:3' positions in a 5:4:1 ratio; 2,4,6-tris(2-hydroxy-4-isooctyloxy-carbonyliso-propylideneoxy-phenyl)-s-triazine; 2,4-bis(2,4-dimethylphenyl)-6-(2-hydroxy-4-hexyloxy-5-α-cumylphenyl)-s-triazine; 2-(2,4,6-trimethylphenyl)-4,6-bis[2-hydroxy-4-(3-butyloxy-2-hydroxypropyloxy)phenyl]-s-triazine; 2,4,6-tris[2-hydroxy-4-(3-sec-butyloxy-2-hydroxypropyloxy)-phenyl]-s-triazine; mixture of 4,6-bis-(2,4-dimethylphenyl)-2-(2-hydroxy-4-(3-dodecyloxy-2-hydroxypropoxy)phenyl)-s-triazine and 4,6-bis-(2,4-dimethylphenyl)-2-(2-hydroxy-4-(3-tridecyloxy-2-hydroxypropoxy)phenyl)-s-triazine; 4,6-bis-(2,4-dimethylphenyl)-2-(2-hydroxy-4(3-(2-ethylhexyloxy)-2-hydroxypropoxy)-phenyl)-s-triazine; 4,6-diphenyl-2-(4-hexyloxy-2-hydroxyphenyl)-s-triazine; 2-(4,6-Diphenyl-1,3,5-triazin-2-yl)-5-[2-(2-ethylhexanoyloxy)ethoxy]phenol; 2,4,6-tris(2-hydroxy-4-octyloxyphenyl)-1,3,5-triazine; propanoic acid, 2,2',2"-[1,3,5-triazine-2,4,6-triyltris[(3-hydroxy-4, 1-phenylene)oxy]]tris-1,1',1" -trioctyl ester; propanoic acid, 2-[4-[4,6-bis([1,1'-biphenyl]-4-yl)-1,3,5-triazin-2yl]-3-hydroxyphenoxyl]-isooctyl ester; and combinations thereof.

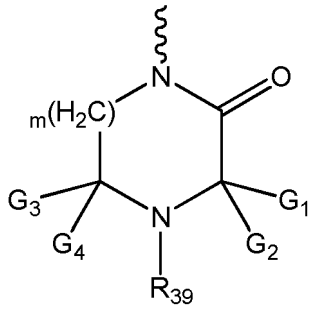
Embodiment 4. The thermal and UV light stabilizing composition according to any one of the preceding embodiments, wherein the hindered amine light stabilizer compound comprises a molecular fragment according to Formula (II):



Formula (II)

wherein

R_{31} in Formula (II) is chosen from: hydrogen; OH; C_1-C_{20} hydrocarbyl; -CH_2CN; C_1-C_{12} acyl; and Ci-Cis alkoxy;
R_{38} in Formula (II) is chosen from: hydrogen; and C_1-C_8 hydrocarbyl; and
each of R_{29}, R_{30}, R_{32}, and R_{33} in Formula (II) is independently chosen from C_1-C_{20} hydrocarbyl, or R_{29} and R_{30} and/or R_{32} and R_{33} in Formula (II) taken together with the carbon to which they are attached form a C_5-C_{10} cycloalkyl;
or Formula (IIa)



Formula (IIa)

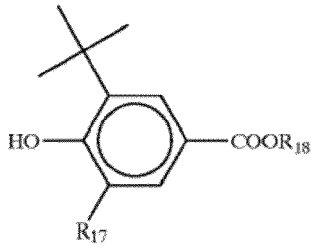
wherein
m in Formula (IIa) is an integer from 1 to 2; R_{39} in Formula (IIa) is chosen from: hydrogen; OH; C_1-C_{20} hydrocarbyl; -CH_2CN; C_1-C_{12} acyl; and C_1-C_{18} alkoxy; and each of G_1-G_4 in Formula (IIa) is independently chosen from C_1-C_{20} hydrocarbyl.

Embodiment 5. The thermal and UV light stabilizing composition according to any one of the preceding embodiments, wherein the hindered amine light stabilizer is chosen from: bis(2,2,6,6-tetramethylpiperidin-4-yl) sebacate;

bis(2,2,6,6-tetramethylpiperidin-4-yl)succinate; bis(1,2,2,6,6-pentamethylpiperidin-4-yl)sebacate; bis(1-octyloxy-2,2,6,6-tetramethylpiperidin-4-yl)sebacate; bis(1,2,2,6,6-pentamethylpiperidin-4-yl) n-butyl 3,5-di-tert-butyl-4-hydroxybenzylmalonate; a condensate of 1-(2-hydroxyethyl)-2,2,6,6-tetramethyl-4-hydroxypiperidine and succinic acid; 2,2,6,6-tetramethylpiperidin-4-yl stearate; 2,2,6,6-tetramethylpiperidin-4-yl dodecanate; 1,2,2,6,6-pentamethylpiperidin-4-yl stearate; 1,2,2,6,6-pentamethylpiperidin-4-yl dodecanate; a condensate of N,N'-bis(2,2,6,6-tetramethylpiperidin-4-yl)hexamethylenediamine and 4-tert-octylamino-2,6-dichloro-1,3,5-triazine; tris(2,2,6,6-tetramethylpiperidin-4-yl) nitrilotriacetate; tetrakis(2,2,6,6-tetramethylpiperidin-4-yl)- 1,2,3,4-butanetetracarboxylate; 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]decan-2,4-dione; bis(1-octyloxy-2,2,6,6-tetramethylpiperidyl)sebacate; bis(1-octyloxy-2,2,6,6-tetramethylpiperidyl)succinate; a condensate of N,N'-bis(2,2,6,6-tetramethylpiperidin-4-yl)hexamethylenediamine and 4-morpholino-2,6-dichloro-1,3,5-triazine; a condensate of N,N'-bis(2,2,6,6-tetramethylpiperidin-4-yl)hexamethylenediamine and 4-morpholino-2,6-dichloro-1,3,5-triazine, methylated; a 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; a condensate of 2-chloro-4,6-bis(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-tetramethylpiperidin-4-yl)pyrrolidin-2,5-dione; 3-dodecyl-1-(1-ethanoyl-2,2,6,6-tetramethylpiperidin-4-yl)pyrrolidin-2,5-dione; 3-dodecyl-1-(1,2,2,6,6-pentamethylpiperidin-4-yl)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-tetramethylpiperidin-4-yl)hexamethylenediamine and 4-cyclohexylamino-2,6-dichloro-1,3,5-triazine; a condensate of 1,2-bis(3-aminopropylamino)ethane, 2,4,6-trichloro-1,3,5-triazine and 4-butylamino-2,2,6,6-tetramethylpiperidine; 2-undecyl-7,7,9,9-tetramethyl-1-oxa-3,8-diaza-4-oxospiro[4.5]decane; oxo-piperanzinyl-triazines; a reaction product of 7,7,9,9-tetramethyl-2-cycloundecyl-1-oxa-3,8-diaza-4-oxospiro[4.5]decane and epichlorohydrin; tetrakis(2,2,6,6-tetramethyl-4-piperidyl) butane-1,2,3,4-tetracarboxylate; 1,2,3,4-butanetetracarboxylic acid, tetrakis(1,2,2,6,6-pentamethyl-4-piperidinyl)ester; 1,2,3,4-butanetetracarboxylic acid, 1,2,2,6,6-pentamethyl-4-piperdinyl tridecyl ester; 1,2,3,4-butanetetracarboxylic acid, 2,2,6,6-tetramethyl-4-piperidinyl tridecyl ester; 1,2,3,4-butanetetracarboxylic acid, polymer with 2,2,6,6-tetramethyl-2,4,8,10-tetraoxaspiro[5.5]-undecane-3,9-diethanol,1,2,2,6,6-pentamethyl-4-piperdinyl ester; 1,2,3,4-butanetetracarboxylic acid, polymer with 2,2,6,6-tetramethyl-2,4,8,10-tetraoxaspiro[5.5]-undecane-3,9-diethanol, 2,2,6,6-tetramethyl-4-piperdinyl ester; bis(1-undecanoxy-2,2,6,6-tetramethylpiperidin-4-yl)carbonate; 1-(2-hydroxy-2-methylpropoxy)-2,2,6,6-tetramethyl-4-piperdinol; 1-(2-hydroxy-2-methylpropoxy)-4-octadecanoyloxy-2,2,6,6-tetramethylpiperidine; 1-(4-octadecanoyloxy-2,2,6,6-tetramethylpiperidin-1-yloxy)-2-octadecanoyloxy-2-methylpropane; 1-(2-hydroxyethyl)-2,2,6,6-tetramethyl-4-piperdinol; a reaction product of 1-(2-hydroxyethyl)-2,2,6,6-tetramethyl-4-piperdinol and dimethylsuccinate; 2,2,4,4-tetramethyl-7-oxa-3,20-diazadispiro[5.1.11.2]heneicosan-21-one; the ester of 2,2,6,6-tetramethyl-4-piperidinol with higher fatty acids; 3-dodecyl-1-(2,2,6,6-tetramethyl-4-piperidyl)pyrrolidine-2,5-dione; 1H-Pyrrole-2,5-dione, 1-octadecyl-, polymer with (1-methylethenyl)benzene and 1-(2,2,6,6-tetramethyl-4-piperidinyl)-1H-pyrrole-2,5-dione; piperazinone, 1,1',1"-[1,3,5-triazine-2,4,6-triyltris[(cyclohexylimino)-2,1-ethanediyl]]tris[3,3,5,5-tetramethyl-; piperazinone, 1,1',1"-[1,3,5-triazine-2,4,6-triyltris[(cyclohexylimino)-2,1-ethanediyl]]tris[3,3,4,5,5-pentamethyl-; the reaction product of 7,7,9,9-tetramethyl-2-cycloundecyl-1-oxa-3,8-diaza-4-oxospiro[4.5]decane and epichlorohydrin; the condensate of N,N'-bis(2,2,6,6-tetramethylpiperidin-4-yl)hexamethylenediamine and 4-cyclohexylamino-2,6-dichloro-1,3,5-triazine; the condensate of 1,2-bis(3-aminopropylamino)ethane, 2,4,6-trichloro-1,3,5-triazine and 4-butylamino-2,2,6,6-tetramethylpiperidine; the condensate of N,N'-bis(2,2,6,6-tetramethylpiperidin-4-yl)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-bis(4-n-butylamino-1,2,2,6,6-pentamethylpiperidyl)-1,3,5-triazine and 1,2-bis-(3-aminopropylamino)ethane; 2-[(2-hydroxyethyl)amino]-4,6-bis[N-(1-cyclohexyloxy-2,2,6,6-tetramethylpiperidin-4-yl)butylamino-1,3,5-triazine; propanedioic acid, [(4-methoxyphenyl)-methylene]-bis-(1,2,2,6,6-pentamethyl-4-piperidinyl) ester; tetrakis(2,2,6,6-tetramethylpiperidin-4-yl)-1,2,3,4-butanetetracarboxylate; benzenepropanoic acid, 3,5-bis(1,1-dimethylethyl)-4-hydroxy-, 1-[2-[3-[3,5-bis(1,1-dimethylethyl)-4-hydroxyphenyl]-1-oxopropoxy]ethyl]-2,2,6,6-tetramethyl-4-piperidinyl ester; N-(1-octyloxy-2,2,6,6-tetramethylpiperidin-4-yl)-N'-dodecyloxalamide; tris(2,2,6,6-tetramethylpiperidin-4-yl) nitrilotriacetate; 1,5-dioxaspiro{5,5}undecane-3,3-dicarboxylic acid, bis(1,2,2,6,6-pentamethyl-4-piperidinyl): 1,5-dioxaspiro {5,5} undecane-3,3 -dicarboxylic acid, bis(2,2,6,6-tetramethyl-4-piperidinyl); the condensate of 1-(2-hydroxyethyl)-2,2,6,6-tetramethyl-4-hydroxypiperidine and succinic acid; the condensate of N,N'-bis(2,2,6,6-tetramethylpiperidin-4-yl)hexamethylenediamine and 4-tert-octylamino-2,6-dichloro-1,3,5-triazine; 1,2,3,4-butanetetracarboxylic acid, 1,2,2,6,6-pentamethyl-4-piperidinyl tridecyl ester; tetrakis(2,2,6,6-tetramethylpiperidin-4-yl)-1,2,3,4-butanetetracarboxylate; 1,2,3,4-butanetetracarboxylic acid, 2,2,6,6-tetramethyl-4-piperidinyl tridecyl ester; tetrakis(1,2,2,6,6-pentamethylpiperidin-4-yl)-1,2,3,4-butanetetracarboxylate; mixture of 2,2,4,4-tetramethyl-21-oxo-7-oxa-3.20-diazaspiro(5.1.11.2)-heneicosane-20-propanoic acid-dodecylester and 2,2,4,4-tetramethyl-21-oxo-7-oxa-3.20-diazaspiro(5.1.11.2)-heneicosane-20-propanoic acid-tetra-

decylester; 1H,4H,5H,8H-2,3a,4a,6,7a,8a-hexaazacyclopenta[def]fluorene-4,8-dione, hexahydro-2,6-bis(2,2,6,6-tetramethyl-4-piperidinyl)-; polymethyl[propyl-3-oxy(2',2',6',6'-tetramethyl-4,4'-piperidinyl)]siloxane; polymethyl[propyl-3-oxy(1',2',2',6',6'-pentamethyl-4,4'-piperidinyl)]siloxane; copolymer of methylmethacrylate with ethyl acrylate and 2,2,6,6-tetramethylpiperidin-4-yl acrylate; copolymer of mixed C_{20} to C_{24} alpha-olefins and (2,2,6,6-tetramethylpiperidin-4-yl)succinimide; 1,2,3,4-butanetetracarboxylic acid, polymer with β,β,β',β'-tetramethyl-2,4,8,10-tetraoxaspiro[5.5]undecane-3,9-diethanol, 1,2,2,6,6-pentamethyl-4-piperidinyl ester; 1,2,3,4-butanetetracarboxylic acid, polymer with β,β,β',β'-tetramethyl-2,4,8,10-tetraoxaspiro[5.5]undecane-3,9-diethanol, 2,2,6,6-tetramethyl-4-piperidinyl ester copolymer; 1,3-benzenedicarboxamide, N,N'-bis(2,2,6,6-tetramethyl-4-piperidinyl; 1,1'-(1,10-dioxo-1,10-decanediyl)-bis(hexahydro-2,2,4,4,6-pentamethylpyrimidine; ethane diamide, N-(1-acetyl-2,2,6,6-tetramethylpiperidinyl)-N'-dodecyl; formamide, N,N'-1,6-hexanediylbis[N-(2,2,6,6-tetramethyl-4-piperidinyl); D-glucitol, 1,3:2,4-bis-O-(2,2,6,6-tetramethyl-4-piperidinylidene)-; 2,2,4,4-tetramethyl-7-oxa-3,20-diaza-21-oxo-dispiro[5.1.11.2]heneicosane; propanamide, 2-methyl-N-(2,2,6,6-tetramethyl-4-piperidinyl)-2-[(2,2,6,6-tetramethyl-4-piperidinyl)amino]-; 7-oxa-3,20-diazadispiro[5.1.11.2]heneicosane-20-propanoic acid, 2,2,4,4-tetramethyl-21-oxo-, dodecyl ester; N-(2,2,6,6-tetramethylpiperidin-4-yl)-β-aminopropionic acid dodecyl ester; N-(2,2,6,6-tetramethylpiperidin-4-yl)-N'-aminooxalamide; propanamide, N-(2,2,6,6-tetramethyl-4-piperidinyl)-3-[(2,2,6,6-tetramethyl-4-piperidinyl)amino]-; mixture of 4-hexadecyloxy- and 4-stearyloxy-2,2,6,6-tetramethylpiperidine; 3-dodecyl-1-(1,2,2,6,6-pentamethylpiperidin-4-yl)pyrrolidine-2,5-dione; 3-dodecyl-1-(1-ethanoyl-2,2,6,6-pentamethylpiperidin-4-yl)pyrrolidine-2,5-dione; bis(2,2,6,6-tetramethylpiperidin-4-yl)succinate; bis(1,2,2,6,6-pentamethylpiperidin-4-yl) n-butyl 3,5-di-tert-butyl-4-hydroxybenzylmalonate; tris(2,2,6,6-tetramethylpiperidin-4-yl) nitrilotriacetate; 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]decan-2,4-dione; bis(1-octyloxy-2,2,6,6-tetramethylpiperidyl)sebacate; bis(1-octyloxy-2,2,6,6-tetramethylpiperidyl)succinate; 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-tetramethylpiperidin-4-yl)pyrrolidin-2,5-dione; 3-dodecyl-1-(1-ethanoyl-2,2,6,6-tetramethylpiperidin-4-yl)pyrrolidin-2,5-dione; 3-dodecyl-1-(1,2,2,6,6-pentamethylpiperidin-4-yl)pyrrolidine-2,5-dione; a mixture of 4-hexadecyloxy- and 4-stearyloxy-2,2,6,6-tetramethylpiperidine; 2-undecyl-7,7,9,9-tetramethyl-1-oxa-3,8-diaza-4-oxospiro[4.5]decane; 1,5-dioxaspiro{5,5}undecane-3,3-dicarboxylic acid, bis(2,2,6,6-tetramethyl-4-piperidinyl) and 1,5-dioxaspiro{5,5}undecane-3,3-dicarboxylic acid, bis(1,2,2,6,6-pentamethyl-4-piperidinyl); N^1-(β-hydroxyethyl)3,3-pentamethylene-5,5-dimethylpiperazin-2-one; N^1-tert-octyl-3,3,5,5-tetramethyl-diazepin-2-one; N^1-tert-octyl-3,3-pentamethylene-5,5-hexamethylene-diazepin-2-one; N^1-tert-octyl-3,3-pentamethylene-5,5-dimethylpiperazin-2-one; trans-1,2-cyclohexane-bis-(N^1-5,5-dimethyl-3,3-pentamethylene-2-piperazinone; trans-1,2-cyclohexane-bis-(N^1-3,3,5,5-dispiropentamethylene-2-piperazinone); N^1-isopropyl-1,4-diazadispiro-(3,3,5,5)pentamethylene-2-piperazinone; N^1-isopropyl-1,4-diazadispiro-3,3-pentamethylene-5,5-tetramethylene-2-piperazinone; N^1-isopropyl-5,5-dimethyl-3,3-pentamethylene-2-piperazinone; trans-1,2-cyclohexane-bis-N^1-(dimethyl-3,3-pentamethylene-2-piperazinone); N^1-octyl-5,5-dimethyl-3,3-pentamethylene-1,4-diazepin-2-one; N^1-octyl-1,4-diazadispiro-(3,3,5,5)pentamethylene-1,5-diazepin-2-one; and mixtures thereof.

Embodiment 6. The thermal and UV light stabilizing composition according to any one of the preceding embodiments, wherein the hindered hydroxybenzoate compound is according to Formula (III):



Formula (III)

wherein R_{17} in Formula (III) is a C_1-C_8 alkyl and R_{18} in Formula (III) is a C_1-C_{24} alkyl or substituted or unsubstituted C_6-C_{24} aryl.

Embodiment 7. The thermal and UV light stabilizing composition according to any one of the preceding embodiments, wherein the hindered hydroxybenzoate compound is selected from the group consisting of 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-

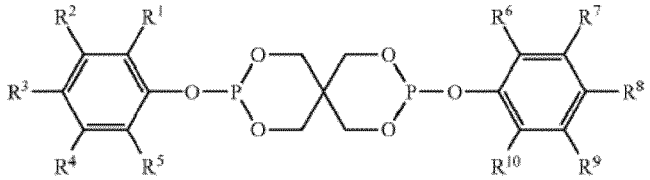
hydroxybenzoate; octyl 3,5-di-tert-butyl-4-hydroxybenzoate; tetradecyl 3,5-di-tert-butyl-4-hydroxybenzoate; behenylyl 3,5-di-tert-butyl-4-hydroxybenzoate; 2-methyl-4,6-di-tert-butylphenyl 3,5-di-tert-butyl-4-hydroxybenzoate and butyl 3-[3-t-butyl-4-(3,5-di-t-butyl-4-hydroxybenzoyloxy)phenyl]propionate; and mixtures thereof.

Embodiment 8. The thermal and UV light stabilizing composition according to any one of the preceding embodiments, wherein the acid scavenger is selected from the group consisting of zinc oxide, calcium lactate, natural and synthetic hydrotalcites, natural and synthetic hydrocalumites, alkali metal salts and alkaline earth metal salts of higher fatty acids, calcium stearate, zinc stearate, magnesium behenate, magnesium stearate, sodium stearate, sodium ricinoleate and potassium palmitate, antimony pyrocatecholate, zinc pyrocatecholate and mixtures thereof.

Embodiment 9. The thermal and UV light stabilizing composition according to any one of the preceding embodiments, wherein R_{18} and R_{37} in Formulae (IVa), (IVb) and (IVc) are chosen from methyl and t-butyl.

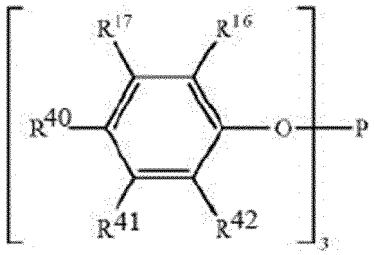
Embodiment 10. The thermal and UV light stabilizing composition according to any one of the preceding embodiments, wherein the at least one hindered phenol compound is chosen from: (1,3,5-Tris(4-t-butyl-3-hydroxy-2,6-dimethylbenzyl)-1,3,5-triazine-2,4,6-(1H,3H,5H)-trione; 1,3,5-tris(3,5-di-tert-butyl-4-hydroxybenzyl)-1,3,5-triazine-2,4,6(1H,3H,SH)-trione; 1,1,3-Tris(2'-methyl-4'-hydroxy-5'-*t*-butylphenyl)butane; Triethylene glycol bis[3-(3-*t*-butyl-4-hydroxy-5-methylphenyl)propionate]; 4,4'-Thiobis(2-*t*-butyl-5-methylphenol); 2,2'-Thiodiethylene bis[3-(3-*t*-butyl-4-hydroxyl-5-methylphenyl)propionate]; Octadecyl 3-(3'-*t*-butyl-4'-hydroxy-5'-methylphenyl)propionate; Tetrakis-methylene(3-*t*-butyl-4-hydroxy-5-methylhydrocinnamate)methane; *N,N'*-Hexamethylene bis[3-(3-*t*-butyl-4-hydroxy-5-methylphenyl)propionamide]; Di(4-tertiarybutyl-3-hydroxy-2,6-dimethyl benzyl) thiodipropionate; and octadecyl 3,5-di-(tert)-butyl-4-hydroxyhydrocinnamate; and mixtures thereof.

Embodiment 11. The thermal and UV light stabilizing composition according to any one of the preceding embodiments, wherein the phosphite compound is a hindered arylalkyl phosphite compound according to Formula (V):



Formula (V)

wherein R^1, R^2, R^3, R^4, R^5, R^6, R^7, R^8, R^9, and R^{10} in Formula (V) are each individually selected from hydrogen, C_1-C_{12} alkyl, C_3-C_{12} cycloalkyl, C_4-C_{12} alkyl cycloalkyl, C_6-C_{10} aryl, and C_7-C_{12} alkylaryl, wherein R^1 and R^5 together comprise at least 5 carbons and at least one of R^1 and R^5 comprises a tertiary carbon, wherein R^6 and R^{10} together comprise at least 5 carbons and at least one of R^6 and R^{10} comprises a tertiary carbon; or a trisarylphosphite according to Formula (VI):



Formula (VI)

wherein R^{16}, R^{17}, R^{40}, R^{41}, and R^{42} in Formula (VI) are each individually selected from hydrogen, C_1-C_{20} alkyl, C_3-C_{20} cycloalkyl, C_4-C_{20} alkyl cycloalkyl, C_6-C_{10} aryl, and C_7-C_{20} alkylaryl;
or mixtures thereof.

Embodiment 12. The thermal and UV light stabilizing composition according to embodiment 11, wherein the hindered arylalkyl phosphite is selected from the group consisting of bis-(2,6-di-t-butyl-4-methlphenyl)pentaerythritol diphosphite, (bis-(2,4-dicumylphenyl)pentaerythritol diphosphite, bis-(2,4-di-t-butyl-phenyl)pentaerythritol diphosphite, and bis-(2,4,6-tri-t-butyl-phenyl)pentaerythritol diphosphite; and mixtures thereof.

Embodiment 13. The thermal and UV light stabilizing composition according to embodiment 11, wherein the trisarylphosphite is selected from the group consisting of tris-(2,4-di-t-butylphenyl)phosphite, tris(4-nonylphenyl) phosphite and triphenyl phosphite; and mixtures thereof.

Embodiment 14. The thermal and UV light stabilizing composition according to any one of embodiments 2-15, wherein the thioester compound is selected from the group consisting of dilauryl thiodipropionate, distearyl thiodipropionate, pentaerythrithol tetrakis-(3-dodecylthipropionate), tetra-alkyl thioethyl thiodisuccinate, 2,12-dihydroxy-4,10-dithia-7-oxatridecamethylene bis[3-(dodecylthio)propionate], polyalkanol esters of alkylthio-alkanoic acids, and dialkyl 3,3'-thiodipropionates; and mixtures thereof.

Embodiment 15. The thermal and UV light stabilizing composition according to any one of embodiments 2-16, wherein:

the ortho-hydroxyl tris-aryl-s-triazine compound is 2-[4,6-bis(2,4-dimethylphenyl)-1,3,5-triazin-2-yl]-5-(octyloxy) phenol;

the hindered amine light stabilizer compound is a mixture of fatty acids, and C_{12} - C_{21}, C_{18} unsaturated 2,2,6,6,-tetramethyl - 4- piperidinyl esters;

the hindered hydroxybenzoate compound is 3,5 - di -tert-butyl-4-hydroxybenzoic acid, hexadecyl ester;

the acid scavenger is selected from the group consisting of magnesium oxide, aluminum oxide, magnesium hydroxide, aluminum hydroxide, carbonates thereof and mixtures thereof;

the phosphite compound is bis(2,4-dicumylphenyl) pentaerythritol diphosphite);

the hindered phenol antioxidant compound is 1,3,5 - Tris (4-tert-butyl-3-hydroxy-2,6-dimethylbenzyl)-1,3,5-triazine-2,4,6-(1H, 3H, 5H)-trione; and

the thioester is pentaerythrithol tetrakis-(3-dodecylthiopropionate) or Distearyl thiodipropionate.

Embodiment 16. A composition comprising:
a thermal and UV light stabilizing composition according to any one of embodiments 1 to 15; and a material to be stabilized.

Embodiment 17. A composition according to embodiment 16, wherein the material to be stabilized is selected from the group consisting of: polyolefins, polyesters, polyethers, polyketones, polyamides, natural and synthetic rubbers, polyurethanes, polystyrenes, high-impact polystyrenes, polyacrylates, polymethacrylates, polyacetals, polyacrylonitriles, polybutadienes, polystyrenes, acrylonitrile-butadiene-styrene, styrene acrylonitrile, acrylate styrene acrylonitrile, cellulosic acetate butyrate, cellulosic polymers, polyimides, polyamideimides, polyetherimides, polyphenylsulfides, polyphenyloxidepolysulfones, polyethersulfones, polyvinylchlorides, polycarbonates, polyketones, aliphatic polyketones, thermoplastic olefins, aminoresin cross-linked polyacrylates and polyesters, polyisocyanate cross-linked polyesters and polyacrylates, phenol/formaldehyde, urea/formaldehyde and melamine/formaldehyde resins, drying and non-drying alkyd resins, alkyd resins, polyester resins, acrylate resins cross-linked with melamine resins, urea resins, isocyanates, isocyanurates, carbamates, and epoxy resins, cross-linked epoxy resins derived from aliphatic, cycloaliphatic, heterocyclic and aromatic glycidyl compounds, which are cross-linked with anhydrides or amines, polysiloxanes, Michael addition polymers, amines, blocked amines with activated unsaturated and methylene compounds, ketimines with activated unsaturated and methylene compounds, polyketimines in combination with unsaturated acrylic polyacetoacetate resins, polyketimines in combination with unsaturated acrylic resins, radiation curable compositions, epoxymelamine resins, organic dyes, cosmetic products, cellulose-based paper formulations, photographic film paper, fibers, waxes, inks, and blends thereof.

Embodiment 18. The composition according to embodiment 16 or embodiment 17, wherein the material to be

stabilized is selected from the group consisting of thermoplastic olefins, acrylonitrile-butadiene-styrene, polyesters, polyvinylchloride, polyamides, polyurethanes, or homo- and copolymers of propylene, isobutylene, butene, methylpentene, hexene, heptene, octene, isoprene, butadiene, hexadiene, dicyclopentadiene, ethylidene cyclopentene and norbornene.

Embodiment 19. The composition according to any one of embodiments 16-18, wherein the material to be stabilized is polypropylene or polyethylene.

Embodiment 20. The composition according to embodiment 16, wherein the material to be stabilized is vinyl siding, vinyl siding trim, a shutter, a gable vent, an eave, fascia, a soffit, a molding, a roofing shingle, a roofing underlayment, a roofing membrane, a batten systems, a batten extender, flashing, a tile pan, a ridge vent, a weather block, a hip and ridge system, an eave riser, a taper strip, a gable end wedge, rake trim, a geomembrane, a composite deck material, a railing or a window frame.

Embodiment 21. The composition according to any one of embodiments 16-19, wherein the composition is a master batch and the thermal and UV light stabilizing composition is present in an amount from about 10 wt.% to about 80 wt. % based on a total weight of the master batch composition, and the material to be stabilized is present in an amount from about 20 wt.% to about 90 wt.% based on the total weight of the master batch composition.

Embodiment 22. The composition according to embodiment 21, wherein the composition is a master batch and the thermal and UV light stabilizing composition is present in an amount from about 30 wt.% to about 60 wt. % based on a total weight of the master batch composition, and the material to be stabilized is present in an amount from about 40 wt.% to about 70 wt.% based on the total weight of the master batch composition.

Embodiment 23. The composition according to any one of embodiments 21-22, wherein the composition is a master batch and the thermal and UV light stabilizing composition is present in an amount between about 40 wt.% to about 50 wt. % based on a total weight of the master batch composition, and the material to be stabilized is present in an amount between about 50 wt.% to about 60 wt.% based on the total weight of the master batch composition.

Embodiment 24. The composition according to any one of embodiments 16-20, wherein the thermal and UV light stabilizing composition is present in an amount from 0.01 wt. % to 5 wt. % based on a total weight of the stabilized composition.

Embodiment 25. The composition according to embodiment 24, wherein the thermal and UV light stabilizing composition is present in an amount from 0.05 wt. % to 2 wt. % based on a total weight of the stabilized composition.

Embodiment 26. The composition according to any one of embodiments 24-25, wherein an amount of the ortho-hydroxyl tris-aryl-s-triazine compound is from about 0.002 wt.% to about 0.50 wt.%, an amount of the hindered amine light stabilizer compound is from about 0.01 wt.% to about 1.20 wt.%, an amount of the hindered hydroxybenzoate compound is from about 0.01 wt.% to about 1.20 wt.%, an amount of the acid scavenger is from about 0.001 wt.% to about 0.50 wt.%, an amount of the hindered phenol antioxidant compound is from about 0.001 wt.% to about 0.50 wt.%, and an amount of the phosphite compound is from about 0.005 wt.% to about 1.00 wt.%, and an amount of the thioester compound is from about 0.001 wt.% to about 0.80 wt.%, based on the total weight of the stabilized composition.

Embodiment 27. The composition according to embodiment 26,wherein the amount of the ortho-hydroxyl tris-aryl-s-triazine compound is from about 0.004 wt.% to about 0.20 wt.%, the amount of the hindered amine light stabilizer compound is from about 0.02 wt.% to about 0.80 wt.%, the amount of the hindered hydroxybenzoate compound is from about 0.02 wt.% to about 0.80 wt.%, the amount of the acid scavenger is from about 0.003 wt.% to about 0.25 wt.%, the amount of the hindered phenol antioxidant compound is from about 0.002 wt.% to about 0.25 wt.%, and the amount of the phosphite composition is from about 0.01 wt.% to about 0.80 wt.%, and an amount of the thioester compound is from about 0.001 wt.% to about 0.80 wt.%, based on a total weight of the stabilized composition.

Embodiment 28. The composition according to any one of the embodiments 22-27, wherein the amount of the thioester compound is from about 0.003 wt.% to about 0.4 wt. %, based on a total weight of the stabilized composition.

Embodiment 29. A process for preparing a composition according to any one of embodiments 16-28, wherein the material to be stabilized is combined with the thermal and UV light stabilizing composition.

Embodiment 30. The process according to embodiment 29, wherein the material to be stabilized is selected from the group consisting of thermoplastic olefins, acrylonitrile-butadiene-styrene, polyesters, polyvinylchloride, polyamides, polyurethanes, or homo- and copolymers of propylene, isobutylene, butene, methylpentene, hexene, heptene, octene, isoprene, butadiene, hexadiene, dicyclopentadiene, ethylidene cyclopentene and norbornene.

Embodiment 31. The process according to embodiment 29 or embodiment 30, wherein the material to be stabilized is polypropylene or polyethylene.

Embodiment 32. The process according to embodiment 29, wherein the material to be stabilized is vinyl siding, vinyl siding trim, a shutter, a gable vent, an eave, fascia, a soffit, a molding, a roofing shingle, a roofing underlayment, a roofing membrane, a batten systems, a batten extender, flashing, a tile pan, a ridge vent, a weather block, a hip and ridge system, an eave riser, a taper strip, a gable end wedge, rake trim, a geomembrane, a composite deck material, a railing or a window frame.

[0050] The compositions disclosed herein may be used in a variety of applications, including, but not limited to automotive applications such as air vents, instrument panels, control consoles, battery house, and exterior parts such as bumpers, side moldings and mirror housings. The compositions may also be used in geomembrane applications such as, for example, pond liners, ground covers, underlayment, water barriers, erosion control membranes, and the like. Other applications that would benefit from thermal and UV stabilization are also contemplated herein.

EXAMPLES 1-14:

[0051] The invention will now be illustrated by the following examples. The examples are not intended to limit the scope of the present invention. In conjunction with the general and detailed descriptions above, the examples provide further understanding of the present invention.

[0052] **Materials**: Thermoplastic olefin (TPO) number AHXPT053A1100NT101 from Asahi Kasei Corporation is used as base polymer. The various additives (designated A - H) and their wt. % loading are listed in Table 1 below, which will be used henceforth. The additives are used as received.

Table 1

Additive Designation	Additives	Loading (wt%)
A	CYASORB® UV 3853 is Fatty acids, C_{12}-C_{21}, C_{18} unsaturated 2,2,6,6,-tetramethyl - 4- Piperidinyl esters (a hindered amine) (available from Cytec Industries Inc., NJ)	0.5500
B	CYASORB® UV 2908 is 3,5 - di -tert-butyl-4-hydroxybenzoic acid, hexadecyl ester (a hindered hydroxybenzoate) (available from Cytec Industries Inc., NJ)	0.1800
C	CYASORB® UV 1164 is 2-[4,6-bis(2,4-dimethylphenyl)-1,3,5-triazin-2-yl]-5-(octyloxy) phenol (a ortho-hydroxyl tris-aryl-s-triazine compound) (available from Cytec Industries Inc., NJ)	0.0700
D	DOVERPHOS® 9228 is bis(2,4-dicumylphenyl) pentaerythritol diphosphite) from Dover Chemical Corporation (a phosphite) (available from Dover Chemical Corporation)	0.0548
E	CYANOX® 1790 is 1,3,5 - Tris (4-tert-butyl-3-hydroxy-2,6-dimethyl benzyl)-1,3,5-triazine-2,4,6-(1H, 3H, 5H)-trione (a hindered phenol Antioxidant) (available from Cytec Industries Inc., NJ)	0.0328
F	DHT-4A is a mixture of MgO/Al_2O_3 (1:4.5) (an Acid scavenger) (available from Kyowa Chemical Industry Co. Ltd.)	0.0548
G	CYANOX® STDP is Distearyl thiodipropionate (Stearyl chloride, stearyl alcohol, 3, 3' - Thiodipropione acid, distearyl easter) (Thioester) (available from Cytec Industries Inc., NJ)	0.0548
H	SEENOX 412S is Pentaerythrithol tetrakis-(3-dodecylthiopropionate) (Thioester) (available from Shipro Kasei Kaisha)	0.0548

[0053] **Melt Mixing of Polymer Additives:** First, the additives are weighed and mixed with polymer pellets. The solid mixture is vigorously shaken to achieve uniform mixing of additives. The solid mixture is then fed into the twin screw extruder hopper. The compounding of additives is performed using a Twin Screw extruder. The conditions during compounding are as follows: rotor speed: 130 rpm; melt temperature: 232°C; feed rate: 800 rpm; temperature profile range: 171-230 °C. The average pressure reading during compounding is 36-40 %. Compounded samples are pelletized using a Conair pelletizer. The pellets are air dried for 24 hrs. before further use.

[0054] **Sample Preparation**: Samples for thermal and weathering tests are prepared using an Arburg injection molder. The conditions during injection molding are as follows: nozzle temperature: 230 °C; injection pressure: 60, shot size: 14.5. For tensile testing, tensile bars according to ASTM638-Type 5 are prepared. Plaques having standard 2 x 2 x 0.125 inch dimension are used for both thermal and weathering tests.

[0055] **Thermal and Weathering Test Conditions**: For thermal performance, samples (Tensile bars and plaques) are kept at 150 °C for a total of 1000 hrs. Samples are analyzed for gloss retention, Delta E, and mechanical strength (stress at break) at 200 hr. intervals. Surface gloss is measured using micro-TRI-Gloss from BYK-Gardner under ASTM Test Procedure D523 with a 60° angle. The gloss retention value is calculated based on unexposed sample. Change in sample color is measured using a Macbeth Color Eye Colorimeter using ASTM D2244-79 with 1" view and D65/10° observer. From the raw data, Delta E, which is the difference between total color change before and after exposure, is calculated. Lower Delta E indicates less color change respectively, indicating better performance. For tensile strength, five tensile bars for each data point are tested on an Instron Engineering Company Tensile Tester (Model TTB). The average tensile strength of the five test samples are measured using ASTM D638 type-5 method. The cross-head speed of the tensile tester is 2 inch (0.508 cm.) per minute.

[0056] For UV weathering, samples are exposed to Xenon Weather-ometer under ASTM-G-155 testing conditions, PV1303, SAEJ1885 (J2412) and SAEJ1960 (J2527). Samples are analyzed for gloss retention and Delta E after set exposure interval.

[0057] Thirteen samples with various stabilizer additive combinations are formulated as described above and then tested for extreme thermal performance (tensile strength, gloss and color change) and extreme weathering performance (gloss and color change) against a control sample (no stabilizer composition added). Those samples denoted by a "C" are comparative and represent control samples (i.e., no stabilizing compositions added), or samples containing formulations previously known to those skilled in the art. Example 2C, for example, is based on a formulation described in U.S. Patent No. 6,843,939. Results of the thermal and weathering tests for the samples as prepared above are presented in Tables 2-5 below.

Table 2: Extreme Thermal Performance of Examples 1 to 14: Tensile strength

Examples	Description of Stabilizer Composition added to Polymer	Tensile Strength	Tensile Strength	% Retained Tensile Strength
		0 hr.	1000 hr.	1000 hr.
1C	No stabilizer composition	4005	16	0.4
2C	A+B+C	4125	79	1.9
3C	A+B+C+D	4162	41	1.0
4C	A+B+C+D+E	4209	9	0.2
5 (reference example)	A+B+C+D+G	4251	79	1.9
6 (reference example)	A+B+C+D+H	4318	18	0.4
7 (reference example)	A+B+C+D+F	4424	23	0.5
8 (reference example)	A+B+C+D+E+H	4204	309	7.3
9 (reference example)	A+B+C+D+E+G	4277	175	4.1
10 (reference example)	A+B+C+D+E+F	4273	369	8.6

(continued)

Examples	Description of Stabilizer Composition added to Polymer	Tensile Strength	Tensile Strength	% Retained Tensile Strength
11 (reference example)	A+B+C+D+F+G	4247	249	5.9
12 (reference example)	A+B+C+D+F+H	4391	113	2.6
13 (inventive example)	A+B+C+D+E+F+G	4282	1519	35.5
14 (inventive example)	A+B+C+D+E+F+H	4249	3330	78.4

[0058] Examples 1C - 4C performed poorly with regard to retaining tensile strength under extreme thermal conditions as compared to certain compositions as described herein (e.g., Examples 5-14).

Table 3: Extreme Thermal Performance of Examples 1 to 14 : Percentage Gloss Retention and Total Color Change

Examples	Description of Stabilizer Composition added to Polymer	% Gloss Retention (60°)	Total Color Change (ΔE)
		1200 hr.	1200 hr.
1C	No stabilizer composition	15	47.1
2C	A+B+C	16	46.8
3C	A+B+C+D	7	47.2
4C	A+B+C+D+E	17	46.9
5 (reference example)	A+B+C+D+G	22	46.7
6 (reference example)	A+B+C+D+H	23	49. 8
7 (reference example)	A+B+C+D+F	15	47.7
8 (reference example)	A+B+C+D+E+H	25	35.3
9 (reference example)	A+B+C+D+E+G	44	26.2
10 (reference example)	A+B+C+D+E+F	34	50.0
11 (reference example)	A+B+C+D+F+G	23	24.6
12 (reference example)	A+B+C+D+F+H	19	46.5
13 (inventive example)	A+B+C+D+E+F+G	69	15.0
14 (inventive example)	A+B+C+D+E+F+H	65	13.8

[0059] Compositions according to the invention as described herein (e.g., Examples 13 and 14) provide the best extreme thermal performance in terms of highest gloss retention and lowest color change as compared to control samples

and samples containing formulations known to those skilled in the art (i.e., Examples 1C - 4C). This result is also visually demonstrated by Figures 1A - 1E. Plaques with no stabilizer composition (FIG. 1A) or with stabilizer composition based on US 6,843,939 (FIG. 1B) show blooming under extreme thermal conditions, whereas plaques with stabilizing compositions according to the invention as described herein (FIGS. 1C, 1D, and 1E) show significantly less, or no blooming under the same conditions.

Table 4: Extreme Weathering Performance of examples 1 to 14 Percentage Gloss Retention

Examples	Description of Stabilizer Composition added to Polymer	% Gloss Retention		
		Interior	**Exterior**	**PV1303**
		2500 kJ	2500kJ	10th Cycle
1C	No stabilizer composition	Surface crack	surface crack	0
2C	A+B+C	95	89	93
3C	A+B+C+D	98	92	92
4C	A+B+C+D+E	99	89	94
5 (reference example)	A+B+C+D+G	99	90	96
6 (reference example)	A + B + C + D + H	100	91	94
7 (reference example)	A+B+C+D+F	100	91	94
8 (reference example)	A+B+C+D+E+H	101	89	92
9 (reference example)	A+B+C+D+E+G	100	95	95
10 (reference example)	A+B+C+D+E+F	100	92	90
11 (reference example)	A+B+C+D+F+G	100	90	94
12 (reference example)	A+B+C+D+F+H	99	91	94
13 (inventive example)	A+B+C+D+E+F+G	99	94	93
14 (inventive example)	A+B+C+D+E+F+H	98	95	94

[0060] Compositions according to the invention as described herein (Examples 13, and 14) do not adversely affect the good weathering performance in terms of highest gloss retention when compared to control samples and samples containing formulations known to those skilled in the art (i.e., Examples 1C - 4C).

Table 5: Extreme Weathering Performance of Examples 1 to 14: Total Color Change (Delta E)

Examples	Description of Stabilizer Composition added to Polymer	Total Color Change (∆E)		
		Interior	**Exterior**	**PV1303**
		2500 kJ	2500kJ	10th Cycle
1C	No stabilizer composition	Surface Crack	Surface crack	13.7
2C	A+B+C	5.6	1.9	3.8
3C	A+B+C+D	5.7	1.8	4.0

(continued)

Examples	Description of Stabilizer Composition added to Polymer	Total Color Change (ΔE)		
		Interior	Exterior	PV1303
		2500 kJ	2500kJ	10th Cycle
4C	A+B+C+D+E	5.9	1.8	4.3
5 (reference example)	A+B+C+D+G	6.4	1.8	4.6
6 (reference example)	A+B+C+D+H	6.4	1.7	4.7
7 (reference example)	A+B+C+D+F	6.5	2.0	4.8
8 (reference example)	A+B+C+D+E+H	6.2	1.8	4.4
9 (reference example)	A+B+C+D+E+G	5.7	1.6	4.4
10 (reference example)	A+B+C+D+E+F	6.1	1.9	4.2
11 (reference example)	A + B + C + D + F + G	6.5	1.9	4.6
12 (reference example)	A+B+C+D+F+H	6.5	1.9	4.9
13 (inventive example)	A+B+C+D+E+F+G	5.7	1.7	4.0
14 (inventive example)	A+B+C+D+E+F+H	5.9	1.7	4.0

[0061] Compositions according to the invention as described herein (Examples 13, and 14) do not adversely affect the good weathering performance in terms of lowest color change when compared to control samples and samples containing formulations known to those skilled in the art (i.e., Examples 1C - 4C).

[0062] Thus, based on the results above, it is surprisingly shown that compositions according to the invention as described herein not only display a synergistic effect and provide enhanced thermal performance in terms of retaining tensile strength under extreme conditions as compared to control samples and samples containing formulations known to those skilled in the art, but the compositions according to the invention as described herein also do not have any antagonistic effect against the good weathering performance demonstrated by samples containing formulations known to those skilled in the art.

EXAMPLES 15-19: Multipass Processing Stabilization Study

[0063] In Examples 15-19, the additives listed in Table 1 are utilized to conduct a multipass processing stabilization study.

[0064] **Melt Mixing of Polymer Additives:** First, the additives are weighed and mixed with polypropylene (Profax 6301) resin. The solid mixture is vigorously shaken to achieve uniform mixing of additives. The solid mixture is fed into the single screw extruder hopper. The compounding of additives is performed using a single screw extruder. The conditions during compounding are as follows: rotor speed: 100 rpm; melt temperature: 230°C; feed rate: 70-100 rpm; temperature profile range: 215-230°C. The average pressure reading during compounding is 36-40%. Compounded samples are pelletized using a Conair pelletizer.

[0065] **Multipass Extrusion Processing:** The pellets are passed through the single screw extruder five times and about 200g of sample are collected from the first, third, and fifth passes. To determine the processing characteristics, the relative melt flow of the compounded polypropylene pellets are measured using the Dynisco Melt Flow Indexer (MFI). This procedure is specific for ASTM D1238 Method B - Automatically Timed Flow Rate Measurement. A lower Melt flow rate (MFR - g/10 min) indicates higher viscosity properties, demonstrating better stability performance of the polymer.

The results are shown in Table 6 below as well as in a graph presented in FIG. 2.

Table 6: Processing stabilization performance: Melt Flow Index (g/ 10 min)

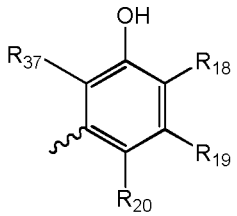
Examples	Description	Melt Flow Index (g/ 10 min)		
		Pass 1	Pass 3	Pass 5
15C	No stabilizer composition	16.90	22.08	26.21
16C	A+B+C	16.27	19.93	23.45
17 (reference example)	A+B+C+D+E+F	14.91	14.66	15.62
18 (inventive example)	A+B+C+D+E+F+G	14.20	13.74	14.29
19 (inventive example)	A+B+C+D+E+F+H	13.96	13.71	14.33

[0066] As show in Table 6 and in the graph of FIG. 2, compositions according to the invention as described herein (Examples 18 and 19) have improved processability, *i.e.*, remain stabilized and maintain low melt flow rates, as compared to other compositions.

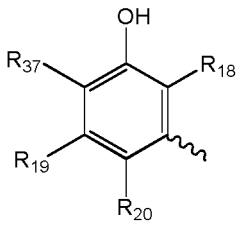
Claims

1. A thermal and ultraviolet (UV) light stabilizer composition comprising :

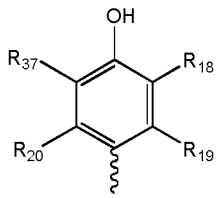
an ortho-hydroxyl tris-aryl-s-triazine compound;
a hindered amine light stabilizer compound;
a hindered hydroxybenzoate compound;
an acid scavenger;
a phosphite compound;
a hindered phenol antioxidant compound comprising a molecular fragment according to one or more of Formula (IVa), (IVb), or (IVc):



Formula (IVa)



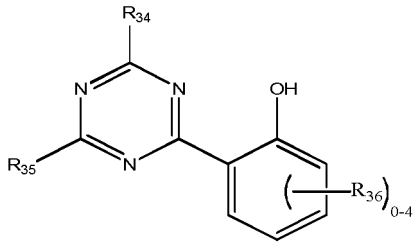
Formula (IVb)



Formula (IVc)

wherein
R_{18} in Formulae (IVa), (IVb) and (IVc) is chosen from hydrogen and a C_{1-4} hydrocarbyl;
R_{19} and R_{20} in Formulae (IVa), (IVb) and (IVc) are each individually chosen from hydrogen and a C_1-C_{20} hydrocarbyl; and
R_{37} in Formulae (IVa), (IVb) and (IVc) is chosen from C_1-C_{12} hydrocarbyl, and
a thioester compound.

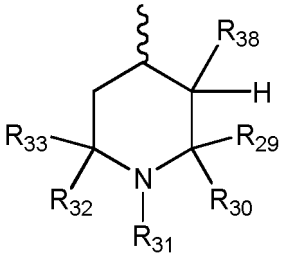
2. The thermal and UV light stabilizer composition according to claim 1, wherein the ortho-hydroxyl tris-aryl-s-triazine compound is a 2-(2'-hydroxyphenyl)-1,3,5-triazine compound according to Formula (I):



Formula (I)

wherein each of R_{34} and R_{35} in Formula (I) is independently chosen from C_6-C_{10} aryl optionally substituted, C_1-C_{10} hydrocarbyl-substituted amino, C_1-C_{10} acyl and C_1-C_{10} alkoxyl; and wherein R_{36} in Formula (I) is a substituent that is the same or different at from 0 to 4 positions of the phenoxy portion of Formula I and is independently chosen from hydroxyl, C_1-C_{12} hydrocarbyl, C_1-C_{12} alkoxyl, C_1-C_{12} alkoxyester, and C_1-C_{12} acyl; and preferably wherein the 2-(2'-hydroxyphenyl)-1,3,5-triazine compound is chosen from: 4,6-bis-(2,4-dimethylphenyl)-2-(2-hydroxy-4-octyloxyphenyl)-s-triazine; 4,6-bis-(2,4-dimethylphenyl)-2-(2,4-- dihydroxyphenyl)-s-triazine; 2,4-bis(2,4-dihydroxyphenyl)-6-(4-chlorophenyl)-s-triazine; 2,4-bis[2-hydroxy-4-(2-hydroxy-ethoxy)phenyl]-6-(4-chlorophenyl)-s-triazine; 2,4-bis[2-hydroxy-4-(2-hydroxy-4-(2-hydroxy-ethoxy)phenyl]-6-(2,4-dimethylphenyl)-s-triazine; 2,4-bis[2-hydroxy-4-(2-hydroxyethoxy)phenyl]-6-(4-bromophenyl)-s-triazine; 2,4-bis[2-hydroxy-4-(2-acetoxyethoxy)phenyl]-6-(4-chlorophenyl)-s-triazine; 2,4-bis(2,4-dihydroxyphenyl)-6-(2,4-dimethylphenyl)-s-triazine; 2,4-bis(4-biphenylyl)-6-[2-hydroxy-4-[(octyloxycarbonyl)ethylideneoxy]phenyl]-s-triazine; 2,4-bis(4-biphenylyl)-6-[2-hydroxy-4-(2-ethylhexyloxy)phenyl]-s-triazine; 2-phenyl-4-[2-hydroxy-4-(3-sec-butyloxy-2-hydroxypropyloxy)phenyl]-6-[2-hydroxy-4-(3-sec-amyloxy-2-hydroxypropyloxy)phenyl]-s-triazine; 2,4-bis(2,4-dimethylphenyl)-6-[2-hydroxy-4(- 3-benzyloxy-2-hydroxypropyloxy)phenyl]-s-triazine; 2,4-bis(2-hydroxy-4-n-butyloxyphenyl)-6-(2,4-di-n-butyloxyphenyl)-s-triazine; 2,4-bis(2,4-dimethylphenyl)-6-[2-hydroxy-4-(3-nonyloxy-2-hydroxypropylox-y)-5-α-cumylphenyl]-s-triazine; methylenebis-{2,4-bis(2,4-dimethylphenyl)-6-[2-hydroxy-4-(3-butyloxy-2-hydroxypropoxy)phenyl]-s-triazine}; methylene bridged dimer mixture bridged in the 3:5', 5:5' and 3:3' positions in a 5:4:1 ratio; 2,4,6-tris(2-hydroxy-4-isooctyloxycarbonyliso-propylideneoxy-phenyl)-s-triazine; 2,4-bis(2,4-dimethylphenyl)-6-(2-hydroxy-4-hexyloxy-5-α-cumylphenyl)-s-triazine; 2-(2,4,6-trimethylphenyl)-4,6-bis[2-hydroxy-4-(3-butyloxy-2-hydroxypropyloxy)phenyl]-s-triazine; 2,4,6-tris[2-hydroxy-4-(3-sec-butyloxy-2-hydroxypropyloxy)-phenyl]-s-triazine; mixture of 4,6-bis-(2,4-dimethylphenyl)-2-(2-hydroxy-4-(3-dodecyloxy-2-hydroxypropoxy)phenyl)-s-triazine and 4,6-bis-(2,4-dimethylphenyl)-2-(2-hydroxy-4-(3-tridecyloxy-2-hydroxypropoxy)phenyl)-s-triazine; 4,6-bis-(2,4-dimethylphenyl)-2-(2-hydroxy-4(3-(2-ethylhexyloxy)-2-hydroxypropoxy)-phenyl)-s-triazine; 4,6-diphenyl-2-(4-hexyloxy-2-hydroxyphenyl)-s-triazine; 2-(4,6-Diphenyl-1,3,5-triazin-2-yl)-5-[2-(2-ethylhexanoyloxy)ethoxy]phenol; 2,4,6-tris(2-hydroxy-4-octyloxyphenyl)-1,3,5-triazine; propanoic acid, 2,2',2"-[1,3,5-triazine-2,4,6-triyltris[(3-hydroxy-4, 1-phenylene)oxy]]tris-1,1',1" -trioctyl ester; propanoic acid, 2-[4-[4,6-bis([1,1'-biphenyl]-4-yl)-1,3,5-triazin-2yl]-3-hydroxyphenoxyl]-isooctyl ester; and combinations thereof.

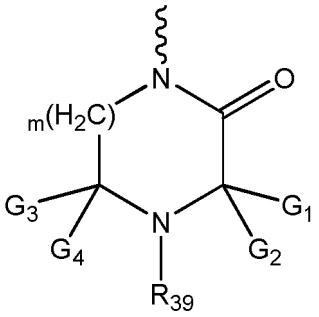
3. The thermal and UV light stabilizer composition according to any one of the preceding claims, wherein the hindered amine light stabilizer compound comprises a molecular fragment according to Formula (II):



Formula (II)

wherein

R_{31} in Formula (II) is chosen from: hydrogen; OH; C_1-C_{20} hydrocarbyl; - CH_2CN; C_1-C_{12} acyl; and C_1-C_{18} alkoxy; R_{38} in Formula (II) is chosen from: hydrogen; and C_1-C_8 hydrocarbyl; and each of R_{29}, R_{30}, R_{32}, and R_{33} in Formula (II) is independently chosen from C_1-C_{20} hydrocarbyl, or R_{29} and R_{30} and/or R_{32} and R_{33} in Formula (II) taken together with the carbon to which they are attached form a C_5-C_{10} cycloalkyl;
or Formula (IIa)



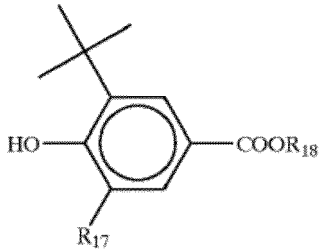
Formula (IIa)

wherein
m in Formula (IIa) is an integer from 1 to 2; R_{39} in Formula (IIa) is chosen from: hydrogen; OH; C_1-C_{20} hydrocarbyl; -CH_2CN; C_1-C_{12} acyl; and C_1-C_{18} alkoxy; and each of G_1-G_4 in Formula (IIa) is independently chosen from C_1-C_{20} hydrocarbyl;
and preferably wherein the hindered amine light stabilizer is chosen from: bis(2,2,6,6-tetramethylpiperidin-4-yl) sebacate; bis(2,2,6,6-tetramethylpiperidin-4-yl)succinate; bis(1,2,2,6,6-pentamethylpiperidin-4-yl)sebacate; bis(1-octyloxy-2,2,6,6-tetramethylpiperidin-4-yl)sebacate; bis(1,2,2,6,6-pentamethylpiperidin-4-yl) n-butyl 3,5-di-tert-butyl-4-hydroxybenzylmalonate; a condensate of 1-(2-hydroxyethyl)-2,2,6,6-tetramethyl-4-hydroxypiperidine and succinic acid; 2,2,6,6-tetramethylpiperidin-4-yl stearate; 2,2,6,6-tetramethylpiperidin-4-yl dodecanate; 1,2,2,6,6-pentamethylpiperidin-4-yl stearate; 1,2,2,6,6-pentamethylpiperidin-4-yl dodecanate; a condensate of N,N'-bis(2,2,6,6-tetramethylpiperidin-4-yl)hexamethylenediamine and 4-tert-octylamino-2,6-dichloro-1,3,5-triazine; tris(2,2,6,6-tetramethylpiperidin-4-yl) nitrilotriacetate; tetrakis(2,2,6,6-tetramethylpiperidin-4-yl)-1,2,3,4-butanetetracarboxylate; 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]decan-2,4-dione; bis(1-octyloxy-2,2,6,6-tetramethylpiperidyl)sebacate; bis(1-octyloxy-2,2,6,6-tetramethylpiperidyl)succinate; a condensate of N,N'-bis(2,2,6,6-tetramethylpiperidin-4-yl)hexamethylenediamine and 4-morpholino-2,6-dichloro-1,3,5-triazine; a condensate of N,N'-bis(2,2,6,6-tetramethylpiperidin-4-yl)hexamethylenediamine and 4-morpholino-2,6-dichloro-1,3,5-triazine, methylated; a 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; a condensate of 2-chloro-4,6-bis(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-tetramethylpiperidin-4-yl)pyrrolidin-2,5-dione; 3-dodecyl-1-(1-ethanoyl-2,2,6,6-tetramethylpiperidin-4-yl)pyrrolidin-2,5-dione; 3-dodecyl-1-(1,2,2,6,6-pentamethylpiperidin-4-yl)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-tetramethylpiperidin-4-yl)hexamethylenediamine and 4-cyclohexylamino-2,6-dichloro-1,3,5-triazine; a condensate of 1,2-bis(3-aminopropylamino)ethane, 2,4,6-trichloro-1,3,5-triazine and 4-butylamino-2,2,6,6-tetramethylpiperidine; 2-undecyl-7,7,9,9-tetramethyl-1-oxa-3,8-diaza-4-oxospiro[4.5]decane; oxo-piperanzinyl-triazines; a reaction product of 7,7,9,9-tetramethyl-2-cycloundecyl-1-oxa-3,8-diaza-4-oxospiro[4.5]decane and epichlorohydrin; tetrakis(2,2,6,6-tetramethyl-4-piperidyl) butane-1,2,3,4-tetracarboxylate; 1,2,3,4-butanetetracarboxylic acid, tetrakis(1,2,2,6,6-pentamethyl-4-piperidinyl)ester; 1,2,3,4-butanetetracarboxylic acid, 1,2,2,6,6-pentamethyl-4-piperdinyl tridecyl ester; 1,2,3,4-butanetetracarboxylic acid, 2,2,6,6-tetramethyl-4-piperidinyl tridecyl ester; 1,2,3,4-butanetetracarboxylic acid, polymer with 2,2,6,6-tetramethyl-2,4,8,10-tetraoxaspiro[5.5]-undecane-3,9-diethanol,1,2,2,6,6-pentamethyl-4-piperdinyl ester; 1,2,3,4-butanetetracarboxylic acid, polymer with 2,2,6,6-tetramethyl-2,4,8,10-tetraoxaspiro[5.5]-undecane-3,9-diethanol, 2,2,6,6-tetramethyl-4-piperdinyl ester; bis(1-undecanoxy-2,2,6,6-tetramethylpiperidin-4-yl)carbonate; 1-(2-hy-

droxy-2-methylpropoxy)-2,2,6,6-tetramethyl-4-piperdinol; 1-(2-hydroxy-2-methylpropoxy)-4-octadecanoyloxy-2,2,6,6-tetramethylpiperidine; 1-(4-octadecanoyloxy-2,2,6,6-tetramethylpiperidin-1-yloxy)-2-octadecanoyloxy-2-methylpropane; 1-(2-hydroxyethyl)-2,2,6,6-tetramethyl-4-piperdinol; a reaction product of 1-(2-hydroxyethyl)-2,2,6,6-tetramethyl-4-piperdinol and dimethylsuccinate; 2,2,4,4-tetramethyl-7-oxa-3,20-diazadispiro[5.1.11.2]heneicosan-21-one; the ester of 2,2,6,6-tetramethyl-4-piperidinol with higher fatty acids; 3-dodecyl-1-(2,2,6,6-tetramethyl-4-piperidyl)pyrrolidine-2,5-dione; 1H-Pyrrole-2,5-dione, 1-octadecyl-, polymer with (1-methylethenyl)benzene and 1-(2,2,6,6-tetramethyl-4-piperidinyl)-1H-pyrrole-2,5-dione; piperazinone, 1,1',1"-[1,3,5-triazine-2,4,6-triyltris[(cyclohexylimino)-2,1-ethanediyl]]tris[3,3,5,5-tetramethyl-; piperazinone, 1,1',1"-[1,3,5-triazine-2,4,6-triyltris[(cyclohexylimino)-2,1 - ethanediyl]]tris[3,3,4,5,5-pentamethyl-; the reaction product of 7,7,9,9-tetramethyl-2-cycloundecyl-1-oxa-3,8-diaza-4-oxospiro[4.5]decane and epichlorohydrin; the condensate of N,N'-bis(2,2,6,6-tetramethylpiperidin-4-yl)hexamethylenediamine and 4-cyclohexylamino-2,6-dichloro-1,3,5-triazine; the condensate of 1,2-bis(3-aminopropylamino)ethane, 2,4,6-trichloro-1,3,5-triazine and 4-butylamino-2,2,6,6-tetramethylpiperidine; the condensate of N,N'-bis(2,2,6,6-tetramethylpiperidin-4-yl)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-bis(4-n-butylamino-1,2,2,6,6-pentamethylpiperidyl)-1,3,5-triazine and 1,2-bis-(3-aminopropylamino)ethane; 2-[(2-hydroxyethyl)amino]-4,6-bis[N-(1-cyclohexyloxy-2,2,6,6-tetramethylpiperidin-4-yl)butylamino-1,3,5-triazine; propanedioic acid, [(4-methoxyphenyl)-methylene]-bis-(1,2,2,6,6-pentamethyl-4-piperidinyl) ester; tetrakis(2,2,6,6-tetramethylpiperidin-4-yl)-1,2,3,4-butanetetracarboxylate; benzenepropanoic acid, 3,5-bis(1,1-dimethylethyl)-4-hydroxy-, 1-[2-[3-[3,5-bis(1,1-dimethylethyl)-4-hydroxyphenyl]-1-oxopropoxy]ethyl]-2,2,6,6-tetramethyl-4-piperidinyl ester; N-(1-octyloxy-2,2,6,6-tetramethylpiperidin-4-yl)-N'-dodecyloxalamide; tris(2,2,6,6-tetramethylpiperidin-4-yl) nitrilotriacetate; 1,5-dioxaspiro{5,5}undecane-3,3-dicarboxylic acid, bis(1,2,2,6,6-pentamethyl-4-piperidinyl): 1,5-dioxaspiro{ 5,5}undecane-3,3-dicarboxylic acid, bis(2,2,6,6-tetramethyl-4-piperidinyl); the condensate of 1-(2-hydroxyethyl)-2,2,6,6-tetramethyl-4-hydroxypiperidine and succinic acid; the condensate of N,N'-bis(2,2,6,6-tetramethylpiperidin-4-yl)hexamethylenediamine and 4-tert-octylamino-2,6-dichloro-1,3,5-triazine; 1,2,3,4-butanetetracarboxylic acid, 1,2,2,6,6-pentamethyl-4-piperidinyl tridecyl ester; tetrakis(2,2,6,6-tetramethylpiperidin-4-yl)-1,2,3,4-butanetetracarboxylate; 1,2,3,4-butanetetracarboxylic acid, 2,2,6,6-tetramethyl-4-piperidinyl tridecyl ester; tetrakis(1,2,2,6,6-pentamethylpiperidin-4-yl)-1,2,3,4-butanetetracarboxylate; mixture of 2,2,4,4-tetramethyl-21-oxo-7-oxa-3.20-diazaspiro(5.1.11.2)-heneicosane-20-propanoic acid-dodecylester and 2,2,4,4-tetramethyl-21-oxo-7-oxa-3 .20-diazaspiro(5.1.11.2)-heneicosane-20-propanoic acid-tetradecylester; 1H,4H,5H,8H-2,3a,4a,6,7a,8a-hexaazacyclopenta[def]fluorene-4,8-dione, hexahydro-2,6-bis(2,2,6,6-tetramethyl-4-piperidinyl)-; polymethyl[propyl-3-oxy(2',2',6',6'-tetramethyl-4,4'-piperidinyl)]siloxane; polymethyl[propyl-3-oxy(1',2',2',6',6'-pentamethyl-4,4'-piperidinyl)]siloxane; copolymer of methylmethacrylate with ethyl acrylate and 2,2,6,6-tetramethylpiperidin-4-yl acrylate; copolymer of mixed C_{20} to C_{24} alphaolefins and (2,2,6,6-tetramethylpiperidin-4-yl)succinimide; 1,2,3,4-butanetetracarboxylic acid, polymer with β,β,β',β'-tetramethyl-2,4,8,10-tetraoxaspiro[5.5]undecane-3,9-diethanol, 1,2,2,6,6-pentamethyl-4-piperidinyl ester; 1,2,3,4-butanetetracarboxylic acid, polymer with β,β,β',β'-tetramethyl-2,4,8,10-tetraoxaspiro[5.5]undecane-3,9-diethanol, 2,2,6,6-tetramethyl-4-piperidinyl ester copolymer; 1,3-benzenedicarboxamide, N,N'-bis(2,2,6,6-tetramethyl-4-piperidinyl; 1,1'-(1,10-dioxo-1,10-decanediyl)-bis(hexahydro-2,2,4,4,6-pentamethylpyrimidine; ethane diamide, N-(1-acetyl-2,2,6,6-tetramethylpiperidinyl)-N'-dodecyl; formamide, N,N'-1,6-hexanediylbis[N-(2,2,6,6-tetramethyl-4-piperidinyl); D-glucitol, 1,3:2,4-bis-O-(2,2,6,6-tetramethyl-4-piperidinylidene)-; 2,2,4,4-tetramethyl-7-oxa-3,20-diaza-21-oxo-dispiro[5.1.11.2]heneicosane; propanamide, 2-methyl-N-(2,2,6,6-tetramethyl-4-piperidinyl)-2-[(2,2,6,6-tetramethyl-4-piperidinyl)amino]-; 7-oxa-3,20-diazadispiro[5.1.11.2]heneicosane-20-propanoic acid, 2,2,4,4-tetramethyl-21-oxo-, dodecyl ester; N-(2,2,6,6-tetramethylpiperidin-4-yl)-β-aminopropionic acid dodecyl ester; N-(2,2,6,6-tetramethylpiperidin-4-yl)-N'-aminooxalamide; propanamide, N-(2,2,6,6-tetramethyl-4-piperidinyl)-3-[(2,2,6,6-tetramethyl-4-piperidinyl)amino]-; mixture of 4-hexadecyloxy- and 4-stearyloxy-2,2,6,6-tetramethylpiperidine; 3-dodecyl-1-(1,2,2,6,6-pentamethylpiperidin-4-yl)pyrrolidine-2,5-dione; 3-dodecyl-1-(1-ethanoyl-2,2,6,6-pentamethylpiperidin-4-yl)pyrrolidine-2,5-dione; bis(2,2,6,6-tetramethylpiperidin-4-yl)succinate; bis(1,2,2,6,6-pentamethylpiperidin-4-yl) n-butyl 3,5-di-tert-butyl-4-hydroxybenzylmalonate; tris(2,2,6,6-tetramethylpiperidin-4-yl) nitrilotriacetate; 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]decan-2,4-dione; bis(1-octyloxy-2,2,6,6-tetramethylpiperidyl)sebacate; bis(1-octyloxy-2,2,6,6-tetramethylpiperidyl)succinate; 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-tetramethylpiperidin-4-yl)pyrrolidin-2,5-dione; 3-dodecyl-1-(1-ethanoyl-2,2,6,6-tetramethylpiperidin-4-yl)pyrrolidin-2,5-dione; 3-dodecyl-1-(1,2,2,6,6-pentamethylpiperidin-4-yl)pyrrolidine-2,5-dione; a mixture of 4-hexadecyloxy- and 4-stearyloxy-2,2,6,6-tetramethylpiperidine; 2-undecyl-7,7,9,9-tetramethyl-1-oxa-3,8-diaza-

4-oxospiro[4.5]decane; 1,5-dioxaspiro{ 5,5}undecane-3,3-dicarboxylic acid, bis(2,2,6,6-tetramethyl-4-piperidinyl) and 1,5-dioxaspiro{ 5,5}undecane-3,3-dicarboxylic acid, bis(1,2,2,6,6-pentamethyl-4-piperidinyl); N^1-(β-hydroxyethyl)3,3-pentamethylene-5,5-dimethylpiperazin-2-one; N^1-tert-octyl-3,3,5,5-tetramethyl-diazepin-2-one; N^1-tert-octyl-3,3-pentamethylene-5,5-hexamethylene-diazepin-2-one; N^1-tert-octyl-3,3-pentamethylene-5,5-dimethylpiperazin-2-one; trans-1,2-cyclohexane-bis-(N^1-5,5-dimethyl-3,3-pentamethylene-2-piperazinone; trans-1,2-cyclohexane-bis-(N^1-3,3,5,5-dispiropentamethylene-2-piperazinone); N^1-isopropyl-1,4-diazadispiro-(3,3,5,5)pentamethylene-2-piperazinone; N^1-isopropyl-1,4-diazadispiro-3,3-pentamethylene-5,5-tetramethylene-2-piperazinone; N^1-isopropyl-5,5-dimethyl-3,3-pentamethylene-2-piperazinone; trans-1,2-cyclohexane-bis-N^1-(dimethyl-3,3-pentamethylene-2-piperazinone); N^1-octyl-5,5-dimethyl-3,3-pentamethylene-1,4-diazepin-2-one; N^1-octyl-1,4-diazadispiro-(3,3,5,5)pentamethylene-1,5-diazepin-2-one; and mixtures thereof.

4. The thermal and UV light stabilizer composition according to any one of the preceding claims, wherein the hindered hydroxybenzoate compound is according to Formula (III):



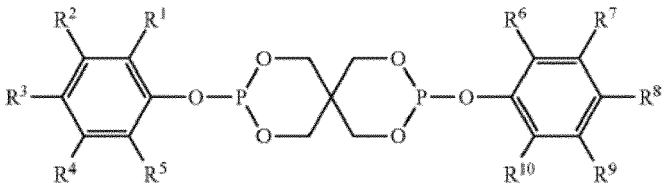
Formula (III)

wherein R_{17} in Formula (III) is a C_1-C_8 alkyl and R_{18} in Formula (III) is a C_1-C_{24} alkyl or substituted or unsubstituted C_6-C_{24} aryl;
and preferably wherein the hindered hydroxybenzoate compound is selected from the group consisting of 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; octyl 3,5-di-tert-butyl-4-hydroxybenzoate; tetradecyl 3,5-di-tert-butyl-4-hydroxybenzoate; behenylyl 3,5-di-tert-butyl-4-hydroxybenzoate; 2-methyl-4,6-di-tert-butylphenyl 3,5-di-tert-butyl-4-hydroxybenzoate and butyl 3-[3-t-butyl-4-(3,5-di-t-butyl-4-hydroxybenzoyloxy)phenyl]propionate; and mixtures thereof.

5. The thermal and UV light stabilizer composition according to any one of the preceding claims, wherein the acid scavenger is selected from the group consisting of zinc oxide, calcium lactate, natural and synthetic hydrotalcites, natural and synthetic hydrocalumites, alkali metal salts and alkaline earth metal salts of higher fatty acids, calcium stearate, zinc stearate, magnesium behenate, magnesium stearate, sodium stearate, sodium ricinoleate and potassium palmitate, antimony pyrocatecholate, zinc pyrocatecholate and mixtures thereof.

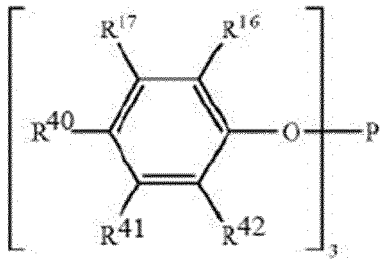
6. The thermal and UV light stabilizer composition according to any one of the preceding claims,
wherein R_{18} and R_{37} in Formulae (IVa), (IVb) and (IVc) are chosen from methyl and t-butyl;
and preferably wherein the at least one hindered phenol compound is chosen from: (1,3,5-Tris(4-t-butyl-3-hydroxy-2,6-dimethylbenzyl)-1,3,5-triazine-2,4,6-(1H,3H,5H)-trione; 1,3,5-tris(3,5-di-tert-butyl-4-hydroxybenzyl)-1,3,5-triazine-2,4,6(1H,3H,SH)-trione; 1,1,3-Tris(2'-methyl-4'-hydroxy-5'-*t*-butylphenyl)butane; Triethylene glycol bis[3-(3-t-butyl-4-hydroxy-5-methylphenyl)propionate]; 4,4'-Thiobis(2-*t*-butyl-5-methylphenol); 2,2'-Thiodiethylene bis[3-(3-*t*-butyl-4-hydroxyl-5-methylphenyl)propionate]; Octadecyl 3-(3'-*t*-butyl-4' -hydroxy-5' -methylphenyl)propionate; Tetrakismethylene(3-*t*-butyl-4-hydroxy-5-methylhydrocinnamate)methane; *N,N*'-Hexamethylene bis[3-(3-*t*-butyl-4-hydroxy-5-methylphenyl)propionamide]; Di(4-tertiarybutyl-3-hydroxy-2,6-dimethyl benzyl) thiodipropionate; and octadecyl 3,5-di-(tert)-butyl-4-hydroxyhydrocinnamate; and mixtures thereof.

7. The thermal and UV light stabilizer composition according to any one of the preceding claims, wherein the phosphite compound is a hindered arylalkyl phosphite compound according to Formula (V):



Formula (V)

wherein R^1, R^2, R^3, R^4, R^5, R^6, R^7, R^8, R^9, and R^{10} in Formula (V) are each individually selected from hydrogen, C_1-C_{12} alkyl, C_3-C_{12} cycloalkyl, C_4-C_{12} alkyl cycloalkyl, C_6-C_{10} aryl, and C_7-C_{12} alkylaryl, wherein R^1 and R^5 together comprise at least 5 carbons and at least one of R^1 and R^5 comprises a tertiary carbon, wherein R^6 and R^{10} together comprise at least 5 carbons and at least one of R^6 and R^{10} comprises a tertiary carbon; preferably selected from the group consisting of bis-(2,6-di-t-butyl-4-methlphenyl)pentaerythritol diphosphite, (bis-(2,4-dicumylphenyl)pentaerythritol diphosphite, bis-(2,4-di-t-butylphenyl)pentaerythritol diphosphite, and bis-(2,4,6-tri-t-butylphenyl)pentaerythritol diphosphite; and mixtures thereof;
or
a trisarylphosphite according to Formula (VI):



Formula (VI)

wherein R^{16}, R^{17}, R^{40}, R^{41}, and R^{42} in Formula (VI) are each individually selected from hydrogen, C_1-C_{20} alkyl, C_3-C_{20} cycloalkyl, C_4-C_{20} alkyl cycloalkyl, C_6-C_{10} aryl, and C_7-C_{20} alkylaryl; preferably selected from the group consisting of tris-(2,4-di-t-butylphenyl)phosphite, tris(4-nonylphenyl) phosphite and triphenyl phosphite; and mixtures thereof;

or mixtures thereof.

8. The thermal and UV light stabilizer composition according to any one of the preceding claims, wherein the thioester compound is selected from the group consisting of dilauryl thiodipropionate, distearyl thiodipropionate, pentaerythrithol tetrakis-(3-dodecylthipropionate), tetra-alkyl thioethyl thiodisuccinate, 2,12-dihydroxy-4,10-dithia-7-oxatridecamethylene bis[3-(dodecylthio)propionate], polyalkanol esters of alkylthio-alkanoic acids, and dialkyl 3,3'-thiodipropionates; and mixtures thereof.

9. The thermal and UV light stabilizer composition according to any one of the preceding claims, wherein:

the ortho-hydroxyl tris-aryl-s-triazine compound is 2-[4,6-bis(2,4-dimethylphenyl)-1,3,5-triazin-2-yl]-5-(octyloxy) phenol;
the hindered amine light stabilizer compound is a mixture of fatty acids, and C_{12}-C_{21}, C_{18} unsaturated 2,2,6,6,-tetramethyl - 4- piperidinyl esters;
the hindered hydroxybenzoate compound is 3,5 - di -tert-butyl-4-hydroxybenzoic acid, hexadecyl ester;
the acid scavenger is selected from the group consisting of magnesium oxide, aluminum oxide, magnesium hydroxide, aluminum hydroxide, carbonates thereof and mixtures thereof;
the phosphite compound is bis(2,4-dicumylphenyl) pentaerythritol diphosphite);

the hindered phenol antioxidant compound is 1,3,5 - Tris (4-tert-butyl-3-hydroxy-2,6-dimethyl benzyl)-1,3,5-triazine-2,4,6-(1H, 3H, 5H)-trione; and
the thioester is pentaerythrithol tetrakis-(3-dodecylthiopropionate) or Distearyl thiodipropionate.

10. The thermal and UV light stabilizer composition according to any one of the preceding claims, wherein:

the ortho-hydroxyl tris-aryl-s-triazine compound is present in an amount from 1 wt. % to 10 wt.% based on a total wt. % of the thermal and UV light stabilizer composition;
the hindered amine light stabilizer compound is present in an amount from 20 wt. % to 50 wt.% based on the total wt. % of the thermal and UV light stabilizer composition;
the hindered hydroxybenzoate compound is present in an amount from 20 wt. % to 50 wt. % based on the total wt. % of the thermal and UV light stabilizer composition;
the acid scavenger is present in an amount from 1 wt. % to 10 wt. % based on the total wt. % of the thermal and UV light stabilizer composition;
the phosphite compound is present in an amount from 5 wt. % to 40 wt.% based on the total wt. % of the thermal and UV light stabilizer composition; and
the hindered phenol antioxidant compound is present in an amount from 1 wt. % to 10 wt.% based on the total wt. % of the thermal and UV light stabilizer composition.

11. The thermal and UV light stabilizer composition according to any one of claims 1-9, wherein

the ortho-hydroxyl tris-aryl-s-triazine compound is present in an amount from 1 wt. % to 10 wt.% based on a total wt. % of the thermal and UV light stabilizer composition;
the hindered amine light stabilizer compound is present in an amount from 20 wt. % to 50 wt.% based on the total wt. % of the thermal and UV light stabilizer composition;
the hindered hydroxybenzoate compound is present in an amount from 20 wt. % to 50 wt. % based on the total wt. % of the thermal and UV light stabilizer composition;
the acid scavenger is present in an amount from 1 wt. % to 10 wt. % based on the total wt. % of the thermal and UV light stabilizer composition;
the phosphite compound is present in an amount from 5 wt. % to 25 wt.% based on the total wt. % of the thermal and UV light stabilizer composition;
the hindered phenol antioxidant compound is present in an amount from 1 wt. % to 10 wt.% based on the total wt. % of the thermal and UV light stabilizer composition; and
the thioester compound is present in an amount from 1 wt. % to 15 wt. % based on the total wt. % of the thermal and UV light stabilizer composition.

12. A composition comprising:

a thermal and UV light stabilizer composition according to any one of claims 1 to 11; and
a material to be stabilized; preferably selected from the group consisting of: polyolefins, polyesters, polyethers, polyketones, polyamides, natural and synthetic rubbers, polyurethanes, polystyrenes, high-impact polystyrenes, polyacrylates, polymethacrylates, polyacetals, polyacrylonitriles, polybutadienes, polystyrenes, acrylonitrile-butadiene-styrene, styrene acrylonitrile, acrylate styrene acrylonitrile, cellulosic acetate butyrate, cellulosic polymers, polyimides, polyamideimides, polyetherimides, polyphenyl sulfides, polyphenyloxidepolysulfones, polyethersulfones, polyvinylchlorides, polycarbonates, polyketones, aliphatic polyketones, thermoplastic olefins, aminoresin cross-linked polyacrylates and polyesters, polyisocyanate cross-linked polyesters and polyacrylates, phenol/formaldehyde, urea/formaldehyde and melamine/formaldehyde resins, drying and non-drying alkyd resins, alkyd resins, polyester resins, acrylate resins cross-linked with melamine resins, urea resins, isocyanates, isocyanurates, carbamates, and epoxy resins, cross-linked epoxy resins derived from aliphatic, cycloaliphatic, heterocyclic and aromatic glycidyl compounds, which are cross-linked with anhydrides or amines, polysiloxanes, Michael addition polymers, amines, blocked amines with activated unsaturated and methylene compounds, ketimines with activated unsaturated and methylene compounds, polyketimines in combination with unsaturated acrylic polyacetoacetate resins, polyketimines in combination with unsaturated acrylic resins, radiation curable compositions, epoxymelamine resins, organic dyes, cosmetic products, cellulose-based paper formulations, photographic film paper, fibers, waxes, inks, and blends thereof; more preferably selected from the group consisting of thermoplastic olefins, acrylonitrile-butadiene-styrene, polyesters, polyvinylchloride, polyamides, polyurethanes, or homo- and copolymers of propylene, isobutylene, butene, methylpentene, hexene, heptene, octene, isoprene, butadiene, hexadiene, dicyclopentadiene, ethylidene cyclopentene and norbornene; and most

preferably the material to be stabilized is polypropylene or polyethylene;
preferably wherein the composition is a master batch and the thermal and UV light stabilizer composition is present in an amount from about 10 wt.% to about 80 wt. %, preferably in an amount from about 30 wt.% to about 60 wt. % and more preferably in an amount between about 40 wt.% to about 50 wt. %, based on a total weight of the master batch composition, and the material to be stabilized is present in an amount from about 20 wt.% to about 90 wt.%, preferably in an amount from about 40 wt.% to about 70 wt.% and more preferably in an amount between about 50 wt.% to about 60 wt.%, based on the total weight of the master batch composition.

13. A composition according to claim 12, wherein the material to be stabilized is used in the construction or renovation of buildings, and is preferably chosen from vinyl siding, vinyl siding trim, a shutter, a gable vent, an eave, fascia, a soffit, a molding, a roofing shingle, a roofing underlayment, a roofing membrane, a batten system, a batten extender, flashing, a tile pan, a ridge vent, a weather block, a hip and ridge system, an eave riser, a taper strip, a gable end wedge, rake trim, a geomembrane, a composite deck material, a railing or a window frame.

14. The composition according to either one of claim 12 or 13, wherein the thermal and UV light stabilizer composition is present in an amount from 0.01 wt. % to 5 wt. % based on a total weight of the stabilized composition;

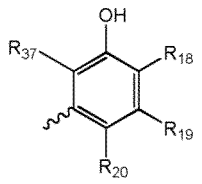
preferably wherein the thermal and UV light stabilizer composition is present in an amount from 0.05 wt. % to 2 wt. % based on a total weight of the stabilized composition;
more preferablywherein an amount of the ortho-hydroxyl tris-aryl-s-triazine compound is from about 0.002 wt.% to about 0.50 wt.%, an amount of the hindered amine light stabilizer compound is from about 0.01 wt.% to about 1.20 wt.%, an amount of the hindered hydroxybenzoate compound is from about 0.01 wt.% to about 1.20 wt.%, an amount of the acid scavenger is from about 0.001 wt.% to about 0.50 wt.%, an amount of the hindered phenol antioxidant compound is from about 0.001 wt.% to about 0.50 wt.%, and an amount of the phosphite compound is from about 0.005 wt.% to about 1.00 wt.%, based on the total weight of the stabilized composition;
most preferably wherein the amount of the ortho-hydroxyl tris-aryl-s-triazine compound is from about 0.004 wt.% to about 0.20 wt.%, the amount of the hindered amine light stabilizer compound is from about 0.02 wt.% to about 0.80 wt.%, the amount of the hindered hydroxybenzoate compound is from about 0.02 wt.% to about 0.80 wt.%, the amount of the acid scavenger is from about 0.003 wt.% to about 0.25 wt.%, the amount of the hindered phenol antioxidant compound is from about 0.002 wt.% to about 0.25 wt.%, and the amount of the phosphite composition is from about 0.01 wt.% to about 0.80 wt.%, based on a total weight of the stabilized composition;
and particulary most preferably wherein the thermal and UV light stabilizer composition further comprises a thioester compound, wherein an amount of the thioester compound is from about 0.001 wt.% to about 0.80 wt.%, preferably from about 0.003 wt.% to about 0.4 wt. %, based on a total weight of the stabilized composition.

15. A process for achieving stability against thermal and UV light degradation of a material selected from the group consisting of polyolefins, polyesters, polyethers, polyketones, polyamides, natural and synthetic rubbers, polyurethanes, polystyrenes, high-impact polystyrenes, polyacrylates, polymethacrylates, polyacetals, polyacrylonitriles, polybutadienes, polystyrenes, acrylonitrile-butadiene-styrene, styrene acrylonitrile, acrylate styrene acrylonitrile, cellulosic acetate butyrate, cellulosic polymers, polyimides, polyamideimides, polyetherimides, polyphenyl sulfides, polyphenyloxidepolysulfones, polyethersulfones, polyvinylchlorides, polycarbonates, polyketones, aliphatic polyketones, thermoplastic olefins, aminoresin cross-linked polyacrylates and polyesters, polyisocyanate cross-linked polyesters and polyacrylates, phenol/formaldehyde, urea/formaldehyde and melamine/formaldehyde resins, drying and non-drying alkyd resins, alkyd resins, polyester resins, acrylate resins cross-linked with melamine resins, urea resins, isocyanates, isocyanurates, carbamates, and epoxy resins, cross-linked epoxy resins derived from aliphatic, cycloaliphatic, heterocyclic and aromatic glycidyl compounds, which are cross-linked with anhydrides or amines, polysiloxanes, Michael addition polymers, amines, blocked amines with activated unsaturated and methylene compounds, ketimines with activated unsaturated and methylene compounds, polyketimines in combination with unsaturated acrylic polyacetoacetate resins, polyketimines in combination with unsaturated acrylic resins, radiation curable compositions, epoxymelamine resins, organic dyes, cosmetic products, cellulose-based paper formulations, photographic film paper, fibers, waxes, inks, and blends thereof, the process comprising adding a stabilizing amount of a stabilizer composition according to any one of claims 1-11 to the material.

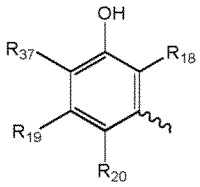
Patentansprüche

1. Wärmestabilisator- und Ultraviolett(UV)-Lichtschutzmittelzusammensetzung, umfassend:

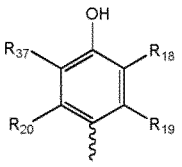
eine ortho-Hydroxyltris-aryl-s-triazin-Verbindung;
eine Lichtschutzmittelverbindung vom Typ gehindertes Amin;
eine gehinderte Hydroxybenzoatverbindung;
einen Säurefänger;
eine Phosphitverbindung;
eine Antioxidansverbindung vom Typ gehindertes Phenol, umfassend ein Molekülfragment gemäß einer oder mehreren der Formeln (IVa), (IVb) oder (IVc):



Formel (IVa)



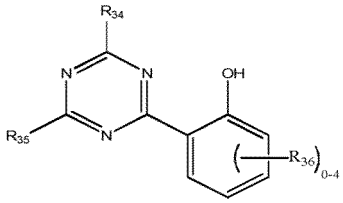
Formel (IVb)



Formel (IVc)

wobei
R_{18} in den Formeln (IVa), (IVb) und (IVc) aus Wasserstoff und einem C_{1-4}-Hydrocarbyl ausgewählt ist;
R_{19} und R_{20} in den Formeln (IVa), (IVb) und (IVc) jeweils individuell aus Wasserstoff und einem C_1-C_{20}-Hydrocarbyl ausgewählt sind; und
R_{37} in den Formeln (IVa), (IVb) und (IVc) aus C_1-C_{12}-Hydrocarbyl ausgewählt ist;
und eine Thioesterverbindung.

2. Wärmestabilisator- und UV-Lichtschutzmittelzusammensetzung nach Anspruch 1, wobei es sich bei der ortho-Hydroxyltris-aryl-s-triazin-Verbindung um eine 2-(2'-Hydroxyphenyl)-1,3,5-triazin-Verbindung gemäß Formel (I) handelt:

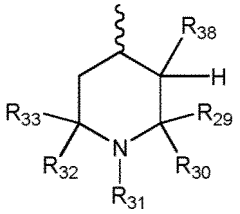


Formel (I)

wobei R_{34} und R_{35} in Formel (I) jeweils unabhängig aus gegebenenfalls substituiertem C_6-C_{10}-Aryl, C_1-C_{10}-hydrocarbylsubstituiertem Amino, C_1-C_{10}-Acyl und C_1-C_{10}-Alkoxyl ausgewählt sind; und wobei R_{36} in Formel (I) für einen Substituenten steht, der an 0 bis 4 Positionen des Phenoxy-Teils der Formel I gleich oder verschieden ist und unabhängig aus Hydroxyl, C_1-C_{12}-Hydrocarbyl, C_1-C_{12}-Alkoxyl, C_1-C_{12}-Alkoxyester und C_2-C_{12}-Acyl ausgewählt ist; und vorzugsweise wobei die 2-(2'-Hydroxyphenyl)-1,3,5-triazin-Verbindung ausgewählt ist aus: 4,6-Bis(2,4-dimethylphenyl)-2-(2-hydroxy-4-octyloxyphenyl)-s-triazin, 4,6-Bis(2,4-dimethylphenyl)-2-(2,4-dihydroxyphenyl)-s-triazin, 2,4-Bis(2,4-dihydroxyphenyl)-6-(4-chlorphenyl)-s-triazin, 2,4-Bis[2-hydroxy-4-(2-hydroxy-ethoxy)phenyl]-6-(4-chlorphenyl)-s-triazin, 2,4-Bis[2-hydroxy-4-(2-hydroxy-4-(2-hydroxy-ethoxy)phenyl]-6-(2,4-dimethylphenyl)-s-triazin, 2,4-Bis[2-hydroxy-4-(2-hydroxyethoxy)phenyl]-6-(4-bromphenyl)-s-triazin, 2,4-Bis[2-hydroxy-4-(2-acetoxyethoxy)phenyl]-6-(4-chlorphenyl)-s-triazin, 2,4-Bis(2,4-dihydroxyphenyl)-6-(2,4-dimethylphenyl)-s-triazin, 2,4-Bis(4-biphenylyl)-6-[2-hydroxy-4-[(octyloxycarbonyl)ethylidenoxy]phenyl]-s-triazin, 2,4-Bis(4-biphenylyl)-6-[2-hydroxy-4-(2-ethylhexyloxy)phenyl]-s-triazin, 2-Phenyl-4-[2-hydroxy-4-(3-sec-butyloxy-2-hydroxypropyloxy)phenyl]-6-[2-hydroxy-4-(3-sec-amyloxy-2-hydroxypropyloxy)phenyl]-s-triazin, 2,4-Bis(2,4-dimethylphenyl)-6-[2-hydroxy-4(-3-benzyloxy-2-hydroxypropyloxy)phenyl]-s-triazin, 2,4-Bis(2-hydroxy-4-n-butyloxyphenyl)-6-(2,4-di-n-butyloxyphenyl)-s-triazin, 2,4-Bis(2,4-dimethylphenyl)-6-[2-hydroxy-4-(3-nonyloxy-2-hydroxypropyloxy)-5-α-cumylphenyl]-s-triazin, Methylenbis-{2,4-bis(2,4-dimethylphenyl)-6-[2-hydroxy-4-(3-butyloxy-2-hydroxypropoxy)phenyl]-s-triazin}, einem Gemisch von methylenverbrückten Dimeren, die in den 3:5'-, 5:5'- und 3:3'-Positionen verbrückt sind, im Verhältnis 5:4:1, 2,4,6-Tris(2-hydroxy-4-isooctyloxycarbonylisopropylidenoxy-phenyl)-s-triazin, 2,4-Bis(2,4-dimethylphenyl)-6-(2-hydroxy-4-hexyloxy-5-α-cumylphenyl)-s-triazin, 2-(2,4,6-Trimethylphenyl)-4,6-bis[2-hydroxy-4-(3-butyloxy-2-hydroxypropyloxy)phenyl]-s-triazin, 2,4,6-Tris[2-hydroxy-4-(3-sec-butyloxy-2-hydroxypropyloxy)-phenyl]-s-triazin,

einem Gemisch von 4,6-Bis(2,4-dimethylphenyl)-2-(2-hydroxy-4-(3-dodecyloxy-2-hydroxypropoxy)phenyl)-s-triazin und 4,6-Bis(2,4-dimethylphenyl)-2-(2-hydroxy-4-(3-tridecyloxy-2-hydroxypropoxy)phenyl)-s-triazin, 4,6-Bis(2,4-dimethylphenyl)-2-(2-hydroxy-4(3-(2-ethylhexyloxy)-2-hydroxypropoxy)-phenyl)-s-triazin, 4,6-Diphenyl-2-(4-hexyloxy-2-hydroxyphenyl)-s-triazin, 2-(4,6-Diphenyl-1,3,5-triazin-2-yl)-5-[2-(2-ethylhexanoyloxy)ethoxy]phenol, 2,4,6-Tris(2-hydroxy-4-octyloxyphenyl)-1,3,5-triazin, Propansäure-2,2',2"-[1,3,5-triazin-2,4,6-triyltris[(3-hydroxy-4,1-phenylen)oxy]]tris-1,1',1" '-trioctylester, Propansäure-2-[4-[4,6-bis([1,1'-biphenyl]-4-yl)-1,3,5-triazin-2-yl]-3-hydroxyphenoxyl]isooctylester und Kombinationen davon.

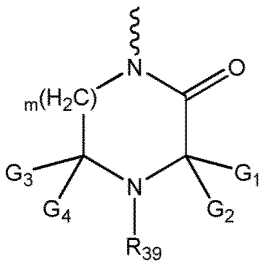
3. Wärmestabilisator- und UV-Lichtschutzmittelzusammensetzung nach einem der vorhergehenden Ansprüche, wobei die Lichtschutzmittelverbindung vom Typ gehindertes Amin in Molekülfragment gemäß Formel (II):



Formel (II)

wobei

R_{31} in Formel (II) aus Wasserstoff, OH, C_1-C_{20}-Hydrocarbyl, -CH_2CN, C_1-C_{12}-Acyl und C_1-C_{18}-Alkoxy ausgewählt ist;
R_{38} in Formel (II) aus Wasserstoff und C_1-C_8-Hydrocarbyl ausgewählt ist; und
R_{29}, R_{30}, R_{32} und R_{33} in Formel (II) jeweils unabhängig aus C_1-C_{20}-Hydrocarbyl ausgewählt sind oder R_{29} und R_{30} und/oder R_{32} und R_{33} in Formel (II) zusammen mit dem Kohlenstoff, an den sie gebunden sind, ein C_5-C_{10}-Cycloalkyl bilden;
oder Formel (IIa)



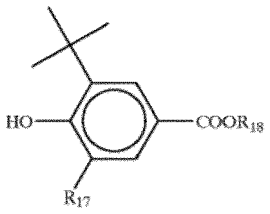
Formel (IIa)

wobei
m in Formel (IIa) für eine ganze Zahl von 1 bis 2 steht; R_{39} in Formel (IIa) aus Wasserstoff, OH, C_1-C_{20}-Hydrocarbyl, -CH_2CN, C_1-C_{12}-Acyl und C_1-C_{18}-Alkoxy ausgewählt ist; und G_1-G_4 in Formel (IIa) jeweils unabhängig aus C_1-C_{20}-Hydrocarbyl ausgewählt sind;
umfasst;
und vorzugsweise wobei das Lichtschutzmittel vom Typ gehindertes Amin aus Bis(2,2,6,6-tetramethylpiperidin-4-yl)sebacat, Bis(2,2,6,6-tetramethylpiperidin-4-yl)succinat, Bis(1,2,2,6,6-pentamethylpiperidin-4-yl)sebacat, Bis(1-octyloxy-2,2,6,6-tetramethylpiperidin-4-yl)sebacat, Bis(1,2,2,6,6-pentamethylpiperidin-4-yl)-n-butyl-3,5-di-tert-butyl-4-hydroxybenzylmalonat, einem Kondensat von 1-(2-Hydroxyethyl)-2,2,6,6-tetramethyl-4-hydroxypiperidin und Bernsteinsäure, 2,2,6,6-Tetramethylpiperidin-4-ylstearat, 2,2,6,6-Tetramethylpiperidin-4-yldodecanat, 1,2,2,6,6-Pentamethylpiperidin-4-ylstearat, 1,2,2,6,6-Pentamethylpiperidin-4-yldodecanat, einem Kondensat von N,N'-Bis(2,2,6,6-tetramethylpiperidin-4-yl)hexamethylendiamin und 4-tert-Octylamino-2,6-dichlor-1,3,5-triazin, Tris(2,2,6,6-tetramethylpiperidin-4-yl)nitrilotriacetat, Tetrakis(2,2,6,6-tetramethylpiperidin-4-yl)-1,2,3,4-butantetracarboxylat, 4-Benzoyl-2,2,6,6-tetramethylpiperidin, 4-Stearyloxy-2,2,6,6-tetramethylpiperi-

din, Bis(1,2,2,6,6-pentamethylpiperidyl)-2-n-butyl-2-(2-hydroxy-3,5-di-tert-butylbenzyl)malonat, 3-n-Octyl-7,7,9,9-tetramethyl-1,3,8-triazaspiro[4.5]decan-2,4-dion, Bis(1-octyloxy-2,2,6,6-tetramethylpiperidyl) sebacat, Bis(1-octyloxy-2,2,6,6-tetramethylpiperidyl) succinat, einem Kondensat von N,N'-Bis(2,2,6,6-tetramethylpiperidin-4-yl)hexamethylendiamin und 4-Morpholino-2,6-dichlor-1,3,5-triazin, einem Kondensat von N,N'-Bis(2,2,6,6-tetramethylpiperidin-4-yl)hexamethylendiamin und 4-Morpholino-2,6-dichlor-1,3,5-triazin, methyliert, einem Kondensat von 2-Chlor-4,6-bis(4-n-butylamino-2,2,6,6-tetramethylpiperidyl)-1,3,5-triazin und 1,2-Bis(3-aminopropylamino)ethan, einem Kondensat von 2-Chlor-4,6-bis(4-n-butylamino-1,2,2,6,6-pentamethylpiperidyl)-1,3,5-triazin und 1,2-Bis(3-aminopropylamino)ethan, 8-Acetyl-3-dodecyl-7,7,9,9-tetramethyl-1,3,8-triazaspiro[4.5]decan-2,4-dion, 3-Dodecyl-1-(2,2,6,6-tetramethylpiperidin-4-yl)pyrrolidin-2,5-dion, 3-Dodecyl-1-(1-ethanoyl-2,2,6,6-tetramethylpiperidin-4-yl)pyrrolidin-2,5-dion, 3-Dodecyl-1-(1,2,2,6,6-pentamethylpiperidin-4-yl)pyrrolidin-2,5-dion, einem Gemisch von 4-Hexadecyloxy- und 4-Stearyloxy-2,2,6,6-tetramethylpiperidin, einem Kondensat von N,N'-Bis(2,2,6,6-tetramethylpiperidin-4-yl)hexamethylendiamin und 4-Cyclohexylamino-2,6-dichlor-1,3,5-triazin, einem Kondensat von 1,2-Bis(3-aminopropylamino)ethan, 2,4,6-Trichlor-1,3,5-triazin und 4-Butylamino-2,2,6,6-tetramethylpiperidin, 2-Undecyl-7,7,9,9-tetramethyl-1-oxa-3,8-diaza-4-oxospiro[4.5]decan, Oxopiperazinyltriazinen, einem Reaktionsprodukt von 7,7,9,9-Tetramethyl-2-cycloundecyl-1-oxa-3,8-diaza-4-oxospiro[4.5]decan und Epichlorhydrin, Tetrakis(2,2,6,6-tetramethyl-4-piperidyl)butan-1,2,3,4-tetracarboxylat, 1,2,3,4-Butantetracarbonsäuretetrakis(1,2,2,6,6-pentamethyl-4-piperidinyl)ester, 1,2,3,4-Butantetracarbonsäure-1,2,2,6,6-pentamethyl-4-piperdinyltridecylester, 1,2,3,4-Butantetracarbonsäure-2,2,6,6-tetramethyl-4-piperidinyltridecylester, 1,2,3,4-Butantetracarbonsäure, Polymer mit 2,2,6,6-Tetramethyl-2,4,8,10-tetraoxaspiro[5.5]-undecan-3,9-diethanol, 1,2,2,6,6-Pentamethyl-4-piperidinylester, 1,2,3,4-Butantetracarbonsäure, Polymer mit 2,2,6,6-Tetramethyl-2,4,8,10-tetraoxaspiro[5.5]-undecan-3,9-diethanol, 2,2,6,6-Tetramethyl-4-piperidinylester, Bis(1-undecanoxy-2,2,6,6-tetramethylpiperidin-4-yl)carbonat, 1-(2-Hydroxy-2-methylpropoxy)-2,2,6,6-tetramethyl-4-piperidinol, 1-(2-Hydroxy-2-methylpropoxy)-4-octadecanoyloxy-2,2,6,6-tetramethylpiperidin, 1-(4-Octadecanoyloxy-2,2,6,6-tetramethylpiperidin-1-yloxy)-2-octadecanoyloxy-2-methylpropan, 1-(2-Hydroxyethyl)-2,2,6,6-tetramethyl-4-piperidinol, einem Reaktionsprodukt von 1-(2-Hydroxyethyl)-2,2,6,6-tetramethyl-4-piperidinol und Dimethylsuccinat, 2,2,4,4-Tetramethyl-7-oxa-3,20-diazadispiro[5.1.11.2]heneicosan-21-on, einem Ester von 2,2,6,6-Tetramethyl-4-piperidinol mit höheren Fettsäuren, 3-Dodecyl-1-(2,2,6,6-tetramethyl-4-piperidyl)pyrrolidin-2,5-dion, 1-Octadecyl-1H-pyrrol-2,5-dion, Polymer mit (1-Methylethenyl)benzol und 1-(2,2,6,6-Tetramethyl-4-piperidinyl)-1H-pyrrol-2,5-dion, 1,1',1"-[1,3,5-Triazin-2,4,6-triyltris[(cyclohexylimino)-2,1-ethandiyl]]tris[3,3,5,5-tetramethylpiperazinon, 1,1',1"-[1,3,5-Triazin-2,4,6-triyltris[(cyclohexylimino)-2,1-ethandiyl]]tris[3,3,4,5,5-pentamethylpiperazinon, dem Reaktionsprodukt von 7,7,9,9-Tetramethyl-2-cycloundecyl-1-oxa-3,8-diaza-4-oxospiro[4.5]decan und Epichlorhydrin, dem Kondensat von N,N'-Bis(2,2,6,6-tetramethylpiperidin-4-yl)hexamethylendiamin und 4-Cyclohexylamino-2,6-dichlor-1,3,5-triazin, dem Kondensat von 1,2-Bis(3-aminopropylamino)ethan, 2,4,6-Trichlor-1,3,5-triazin und 4-Butylamino-2,2,6,6-tetramethylpiperidin, dem Kondensat von N,N'-Bis(2,2,6,6-tetramethylpiperidin-4-yl)hexamethylendiamin und 4-Morpholino-2,6-dichlor-1,3,5-triazin, dem Kondensat von 2-Chlor-4,6-bis(4-n-butylamino-2,2,6,6-tetramethylpiperidyl)-1,3,5-triazin und 1,2-Bis(3-aminopropylamino)ethan, dem Kondensat von 2-Chlor-4,6-bis(4-n-butylamino-1,2,2,6,6-pentamethylpiperidyl)-1,3,5-triazin und 1,2-Bis(3-aminopropylamino)ethan, 2-[(2-Hydroxyethyl)amino]-4,6-bis[N-(1-cyclohexyloxy-2,2,6,6-tetramethylpiperidin-4-yl)butylamino-1,3,5-triazin, Propandisäure[(4-methoxyphenyl)methylen]bis(1,2,2,6,6-pentamethyl-4-piperidinyl)ester, Tetrakis(2,2,6,6-tetramethylpiperidin-4-yl)-1,2,3,4-butantetracarboxylat, 3,5-Bis(1,1-dimethylethyl)-4-hydroxybenzolpropansäure-1-[2-[3-[3,5-bis(1,1-dimethylethyl)-4-hydroxyphenyl]-1-oxopropoxy]ethyl]-2,2,6,6-tetramethyl-4-piperidinylester, N-(1-Octyloxy-2,2,6,6-tetramethylpiperidin-4-yl)-N'-dodecyloxalamid, Tris(2,2,6,6-tetramethylpiperidin-4-yl)nitrilotriacetat, 1,5-Dioxaspiro{5,5}undecan-3,3-dicarbonsäurebis(1,2,2,6,6-pentamethyl-4-piperidinyl), 1,5-Dioxaspiro{5,5}undecan-3,3-dicarbonsäurebis(2,2,6,6-tetramethyl-4-piperidinyl), dem Kondensat von 1-(2-Hydroxyethyl)-2,2,6,6-tetramethyl-4-hydroxypiperidin und Bernsteinsäure, dem Kondensat von N,N'-Bis(2,2,6,6-tetramethylpiperidin-4-yl)hexamethylendiamin und 4-tert-Octylamino-2,6-dichlor-1,3,5-triazin, 1,2,3,4-Butantetracarbonsäure-1,2,2,6,6-pentamethyl-4-piperidinyltridecylester, Tetrakis(2,2,6,6-tetramethylpiperidin-4-yl)-1,2,3,4-butantetracarboxylat, 1,2,3,4-Butantetracarbonsäure-2,2,6,6-tetramethyl-4-piperidinyltridecylester, Tetrakis(1,2,2,6,6-pentamethylpiperidin-4-yl)-1,2,3,4-butantetracarboxylat, einem Gemisch von 2,2,4,4-Tetramethyl-21-oxo-7-oxa-3.20-diazaspiro(5.1.11.2)-heneicosan-20-propansäuredodecylester und 2,2,4,4-Tetramethyl-21-oxo-7-oxa-3.20-diazaspiro(5.1.11.2)-heneicosan-20-propansäuretetradecylester, Hexahydro-2,6-bis(2,2,6,6-tetramethyl-4-piperidinyl)-1H,4H,5H,8H-2,3a,4a,6,7a,8a-hexaazacyclopenta[def]fluoren-4,8-dion, Polymethyl[propyl-3-oxy(2',2',6',6'-tetramethyl-4,4'-piperidinyl)]siloxan, Polymethyl[propyl-3-oxy(1',2',2',6',6'-pentamethyl-4,4'-piperidinyl)]siloxan, einem Copolymer von Methylmethacrylat mit Ethylacrylat und 2,2,6,6-Tetramethylpiperidin-4-ylacrylat, einem Copolymer von gemischten C_{20}- bis C_{24}-alpha-Olefinen und (2,2,6,6-Tetramethylpiperidin-4-yl)succinimid, 1,2,3,4-Butantetracarbonsäure, Polymer mit β,β,β',β'-Tetramethyl-2,4,8,10-tetraoxaspiro[5.5]undecan-3,9-diethanol, 1,2,2,6,6-Pentamethyl-4-piperidinylester, 1,2,3,4-Butante-

tracarbonsäure, Polymer mit β,β,β',β'-Tetramethyl-2,4,8,10-tetraoxaspiro[5.5]undecan-3,9-diethanol, 2,2,6,6-Tetramethyl-4-piperidinylester-Copolymer, N,N'-Bis(2,2,6,6-tetramethyl-4-piperidinyl-1,3-benzoldicarboxamid, 1,1'-(1,10-Dioxo-1,10-decandiyl)bis(hexahydro-2,2,4,4,6-pentamethylpyrimidin, N-(1-Acetyl-2,2,6,6-tetramethylpiperidinyl)-N'-dodecylethandiamid, N,N'-1,6-Hexandiylbis[N-(2,2,6,6-tetramethyl-4-piperidinyl)formamid, 1,3:2,4-Bis-O-(2,2,6,6-tetramethyl-4-piperidinyliden)-D-glucitol, 2,2,4,4-Tetramethyl-7-oxa-3,20-diaza-21-oxodispiro[5.1.11.2]heneicosan, 2-Methyl-N-(2,2,6,6-tetramethyl-4-piperidinyl)-2-[(2,2,6,6-tetramethyl-4-piperidinyl)amino]propanamid, 7-Oxa-3,20-diazadispiro[5.1.11.2]heneicosan-20-propansäure-2,2,4,4-tetramethyl-21-oxododecylester, N-(2,2,6,6-Tetramethylpiperidin-4-yl)-β-aminopropionsäuredodecylester, N-(2,2,6,6-Tetramethylpiperidin-4-yl)-N'-aminooxalamid, N-(2,2,6,6-Tetramethyl-4-piperidinyl)-3-[(2,2,6,6-tetramethyl-4-piperidinyl)amino]propanamid, einem Gemisch von 4-Hexadecyloxy- und 4-Stearyloxy-2,2,6,6-tetramethylpiperidin, 3-Dodecyl-1-(1,2,2,6,6-pentamethylpiperidin-4-yl)pyrrolidin-2,5-dion, 3-Dodecyl-1-(1-ethanoyl-2,2,6,6-pentamethylpiperidin-4-yl)pyrrolidin-2,5-dion, Bis(2,2,6,6-tetramethylpiperidin-4-yl)succinat, Bis(1,2,2,6,6-pentamethylpiperidin-4-yl)-n-butyl-3,5-di-tert-butyl-4-hydroxybenzylmalonat, Tris(2,2,6,6-tetramethylpiperidin-4-yl)nitrilotriacetat, 1,1'-(1,2-Ethandiyl)bis(3,3,5,5-tetramethylpiperazinon), 4-Benzoyl-2,2,6,6-tetramethylpiperidin, 4-Stearyloxy-2,2,6,6-tetramethylpiperidin, Bis(1,2,2,6,6-pentamethylpiperidyl)-2-n-butyl-2-(2-hydroxy-3,5-di-tert-butylbenzyl)malonat, 3-n-Octyl-7,7,9,9-tetramethyl-1,3,8-triazaspiro[4.5]decan-2,4-dion, Bis(1-octyloxy-2,2,6,6-tetramethylpiperidyl) sebacat, Bis(1-octyloxy-2,2,6,6-tetramethylpiperidyl) succinat, 8-Acetyl-3-dodecyl-7,7,9,9-tetramethyl-1,3,8-triazaspiro[4.5]decan-2,4-dion, 3-Dodecyl-1-(2,2,6,6-tetramethylpiperidin-4-yl)pyrrolidin-2,5-dion, 3-Dodecyl-1-(1-ethanoyl-2,2,6,6-tetramethylpiperidin-4-yl)pyrrolidin-2,5-dion, 3-Dodecyl-1-(1,2,2,6,6-pentamethylpiperidin-4-yl)pyrrolidin-2,5-dion, einem Gemisch von 4-Hexadecyloxy- und 4-Stearyloxy-2,2,6,6-tetramethylpiperidin, 2-Undecyl-7,7,9,9-tetramethyl-1-oxa-3,8-diaza-4-oxospiro[4.5]decan, Bis(2,2,6,6-tetramethyl-4-piperidinyl)-1,5-dioxaspiro{5,5}undecan-3,3-dicarbonsäure und Bis(1,2,2,6,6-pentamethyl-4-piperidinyl)-1,5-dioxaspiro{5,5}undecan-3,3-dicarbonsäure, N^1-(β-Hydroxyethyl)-3,3-pentamethylen-5,5-dimethylpiperazin-2-on, N^1-tert-Octyl-3,3,5,5-tetramethyldiazepin-2-on, N^1-tert-Octyl-3,3-pentamethylen-5,5-hexamethylendiazepin-2-on, N^1-tert-Octyl-3,3-pentamethylen-5,5-dimethylpiperazin-2-on, trans-1,2-Cyclohexanbis(N^1-5,5-dimethyl-3,3-pentamethylen-2-piperazinon, trans-1,2-Cyclohexanbis(N^1-3,3,5,5-dispiropentamethylen-2-piperazinon), N^1-Isopropyl-1,4-diazadispiro-(3,3,5,5)pentamethylen-2-piperazinon, N^1-Isopropyl-1,4-diazadispiro-3,3-pentamethylen-5,5-tetramethylen-2-piperazinon, N^1-Isopropyl-5,5-dimethyl-3,3-pentamethylen-2-piperazinon, trans-1,2-Cyclohexanbis-N^1-(dimethyl-3,3-pentamethylen-2-piperazinon), N^1-Octyl-5,5-dimethyl-3,3-pentamethylen-1,4-diazepin-2-on, N^1-Octyl-1,4-diazadispiro(3,3,5,5)pentamethylen-1,5-diazepin-2-on und Mischungen davon ausgewählt ist.

4. Wärmestabilisator- und UV-Lichtschutzmittelzusammensetzung nach einem der vorhergehenden Ansprüche, wobei die gehinderte Hydroxybenzoatverbindung der Formel (III) entspricht:



Formel (III)

wobei R_{17} in Formel (III) für ein C_1-C_8-Alkyl steht und R_{18} in Formel (III) für ein C_1-C_{24}-Alkyl oder substituiertes oder unsubstituiertes C_6-C_{24}-Aryl steht; und vorzugsweise wobei die gehinderte Hydroxybenzoatverbindung aus der Gruppe bestehend aus 2,4-Di-tert-butylphenyl-3,5-di-tert-butyl-4-hydroxybenzoat; Hexadecyl-3,5-di-tert-butyl-4-hydroxybenzoat; Octadecyl-3,5-di-tert-butyl-4-hydroxybenzoat; Octyl-3,5-di-tert-butyl-4-hydroxybenzoat; Tetradecyl-3,5-di-tert-butyl-4-hydroxybenzoat; Behenylyl-3,5-di-tert-butyl-4-hydroxybenzoat; 2-Methyl-4,6-di-tert-butylphenyl-3,5-di-tert-butyl-4-hydroxybenzoat und Butyl-3-[3-t-butyl-4-(3,5-di-t-butyl-4-hydroxybenzoyloxy)phenyl]propionat und Mischungen davon ausgewählt ist.

5. Wärmestabilisator- und UV-Lichtschutzmittelzusammensetzung nach einem der vorhergehenden Ansprüche, wobei der Säurefänger aus der Gruppe bestehend aus Zinkoxid, Calciumlactat, natürlichen und synthetischen Hydrotalciten, natürlichen und synthetischen Hydrocalumiten, Alkalimetallsalzen und Erdalkalimetallsalzen höherer Fettsäuren, Calciumstearat, Zinkstearat, Magnesiumbehenat, Magnesiumstearat, Natriumstearat, Natriumricinoleat und Kaliumpalmitat, Antimonbrenzcatechinat, Zinkbrenzcatechinat und Mischungen davon ausgewählt ist.

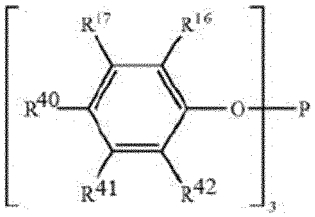
6. Wärmestabilisator- und UV-Lichtschutzmittelzusammensetzung nach einem der vorhergehenden Ansprüche,

wobei R_{18} und R_{37} in den Formeln (IVa), (IVb) und (IVc) aus Methyl und t-Butyl ausgewählt sind;
und vorzugsweise wobei die mindestens eine gehinderte Phenolverbindung aus (1,3,5-Tris(4-t-butyl-3-hydroxy-2,6-dimethylbenzyl)-1,3,5-triazin-2,4,6-(1H,3H,5H)-trion; 1,3,5-Tris(3,5-di-tert-butyl-4-hydroxybenzyl)-1,3,5-triazin-2,4,6(1H,3H,5H)-trion; 1,1,3-Tris(2'-methyl-4'-hydroxy-5'-t-butylphenyl)butan; Triethylenglykolbis[3-(3-t-butyl-4-hydroxy-5-methylphenyl)propionat]; 4,4'-Thiobis(2-t-butyl-5-methylphenol); 2,2'-Thiodiethylenbis[3-(3-t-butyl-4-hydroxyl-5-methylphenyl)propionat]; Octadecyl-3-(3'-t-butyl-4'-hydroxy-5'-methylphenyl)propionat; Tetrakismethylen(3-t-butyl-4-hydroxy-5-methylhydrocinnamat)methan; *N,N*-Hexamethylenbis[3-(3-t-butyl-4-hydroxy-5-methylphenyl)propionamid]; Di(4-*t*-butyl-3-hydroxy-2,6-dimethylbenzyl)thiodipropionat und Octadecyl-3,5-di-*tert*-butyl-4-hydroxyhydrocinnamat und Mischungen davon ausgewählt ist.

7. Wärmestabilisator- und UV-Lichtschutzmittelzusammensetzung nach einem der vorhergehenden Ansprüche, wobei es sich bei der Phosphitverbindung um eine gehinderte Arylalkylphosphitverbindung gemäß Formel (V):

Formel (V)

wobei R^1, R^2, R^3, R^4, R^5, R^6, R^7, R^8, R^9 und R^{10} in Formel (V) jeweils individuell aus Wasserstoff, C_1-C_{12}-Alkyl, C_3-C_{12}-Cycloalkyl, C_4-C_{12}-Alkylcycloalkyl, C_6-C_{10}-Aryl und C_7-C_{12}-Alkylaryl ausgewählt sind, wobei R^1 und R^5 zusammen mindestens fünf Kohlenstoffatome umfassen und mindestens eines von R^1 und R^5 einen tertiären Kohlenstoff umfasst, wobei R^6 und R^{10} zusammen mindestens fünf Kohlenstoffatome umfassen und mindestens eines von R^6 und R^{10} einen tertiären Kohlenstoff umfasst; vorzugsweise ausgewählt aus der Gruppe bestehend aus Bis(2,6-di-t-butyl-4-methylphenyl)pentaerythritoldiphosphit, Bis(2,4-dicumylphenyl)pentaerythritoldiphosphit, Bis(2,4-di-t-butylphenyl)pentaerythritoldiphosphit und Bis(2,4,6-tri-t-butylphenyl)pentaerythritoldiphosphit und Mischungen davon;
oder
ein Trisarylphosphit gemäß Formel (VI):



Formel (VI)

wobei R^{16}, R^{17}, R^{40}, R^{41} und R^{42} in Formel (VI) jeweils individuell aus Wasserstoff, C_1-C_{20}-Alkyl, C_3-C_{20}-Cycloalkyl, C_4-C_{20}-Alkylcycloalkyl, C_6-C_{10}-Aryl und C_7-C_{12}-Alkylaryl ausgewählt sind; vorzugsweise ausgewählt aus der Gruppe bestehend aus Tris(2,4-di-t-butylphenyl)phosphit, Tris(4-nonylphenyl)phosphit und Triphenylphosphit und Mischungen davon;
oder Mischungen davon handelt.

8. Wärmestabilisator- und UV-Lichtschutzmittelzusammensetzung nach einem der vorhergehenden Ansprüche, wobei die Thioesterverbindung aus der Gruppe bestehend aus Dilaurylthiodipropionat, Distearylthiodipropionat, Pentaerythritholtetrakis(3-dodecylthipropionat), Tetraalkylthioethylthiodisuccinat, 2,12-Dihydroxy-4,10-dithia-7-oxatridecamethylenbis[3-(dodecylthio)propionat], Polyalkanolestern von Alkylthioalkansäuren und Dialkyl-3,3'-thiodipropionaten und Mischungen davon ausgewählt ist.

9. Wärmestabilisator- und UV-Lichtschutzmittelzusammensetzung nach einem der vorhergehenden Ansprüche, wobei:

es sich bei der ortho-Hydroxyltris-aryl-s-triazin-Verbindung um 2-[4,6-Bis(2,4-dimethylphenyl)-1,3,5-triazin-2-yl]-5-(octyloxy)phenol handelt;
es sich bei der Lichtschutzmittelverbindung vom Typ gehindertes Amin um 2,2,6,6-Tetramethyl-4-piperidinylester eines Gemischs von C_{12}-C_{21}- und ungesättigten C_{18}-Fettsäuren handelt;
es sich bei der gehinderten Hydroxybenzoatverbindung um 3,5-Di-tert-butyl-4-hydroxybenzoesäurehexadecylester handelt;
der Säurefänger aus der Gruppe bestehend aus Magnesiumoxid, Aluminiumoxid, Magnesiumhydroxid, Aluminiumhydroxid, Carbonaten davon und Mischungen davon ausgewählt ist;
es sich bei der Phosphitverbindung um Bis(2,4-dicumylphenyl)pentaerythritoldiphosphit handelt;
es sich bei der Antioxidansverbindung vom Typ gehindertes Phenol um 1,3,5-Tris(4-tert-butyl-3-hydroxy-2,6-dimethylbenzyl)-1,3,5-triazin-2,4,6-(1H,3H,5H)-trion handelt und
es sich bei dem Thioester um Pentaerythritoltetrakis(3-dodecylthiopropionat) oder Distearylthiodipropionat handelt.

10. Wärmestabilisator- und UV-Lichtschutzmittelzusammensetzung nach einem der vorhergehenden Ansprüche, wobei:

die ortho-Hydroxyltris-aryl-s-triazin-Verbindung in einer Menge von 1 Gew.-% bis 10 Gew.-%, bezogen auf die Gew.-%-Summe der Wärmestabilisator- und UV-Lichtschutzmittelzusammensetzung, vorliegt;
die Lichtschutzmittelverbindung vom Typ gehindertes Amin in einer Menge von 20 Gew.-% bis 50 Gew.-%, bezogen auf die Gew.-%-Summe der Wärmestabilisator- und UV-Lichtschutzmittelzusammensetzung, vorliegt;
die gehinderte Hydroxybenzoatverbindung in einer Menge von 20 Gew.-% bis 50 Gew.-%, bezogen auf die Gew.-%-Summe der Wärmestabilisator- und UV-Lichtschutzmittelzusammensetzung, vorliegt;
der Säurefänger in einer Menge von 1 Gew.-% bis 10 Gew.-%, bezogen auf die Gew.-%-Summe der Wärmestabilisator- und UV-Lichtschutzmittelzusammensetzung, vorliegt;
die Phosphitverbindung in einer Menge von 5 Gew.-% bis 40 Gew.-%, bezogen auf die Gew.-%-Summe der Wärmestabilisator- und UV-Lichtschutzmittelzusammensetzung, vorliegt; und
die Antioxidansverbindung vom Typ gehindertes Phenol in einer Menge von 1 Gew.-% bis 10 Gew.-%, bezogen auf die Gew.-%-Summe der Wärmestabilisator- und UV-Lichtschutzmittelzusammensetzung, vorliegt.

11. Wärmestabilisator- und UV-Lichtschutzmittelzusammensetzung nach einem der Ansprüche 1-9, wobei:

die ortho-Hydroxyltris-aryl-s-triazin-Verbindung in einer Menge von 1 Gew.-% bis 10 Gew.-%, bezogen auf die Gew.-%-Summe der Wärmestabilisator- und UV-Lichtschutzmittelzusammensetzung, vorliegt;
die Lichtschutzmittelverbindung vom Typ gehindertes Amin in einer Menge von 20 Gew.-% bis 50 Gew.-%, bezogen auf die Gew.-%-Summe der Wärmestabilisator- und UV-Lichtschutzmittelzusammensetzung, vorliegt;
die gehinderte Hydroxybenzoatverbindung in einer Menge von 20 Gew.-% bis 50 Gew.-%, bezogen auf die Gew.-%-Summe der Wärmestabilisator- und UV-Lichtschutzmittelzusammensetzung, vorliegt;
der Säurefänger in einer Menge von 1 Gew.-% bis 10 Gew.-%, bezogen auf die Gew.-%-Summe der Wärmestabilisator- und UV-Lichtschutzmittelzusammensetzung, vorliegt;
die Phosphitverbindung in einer Menge von 5 Gew.-% bis 25 Gew.-%, bezogen auf die Gew.-%-Summe der Wärmestabilisator- und UV-Lichtschutzmittelzusammensetzung, vorliegt;
die Antioxidansverbindung vom Typ gehindertes Phenol in einer Menge von 1 Gew.-% bis 10 Gew.-%, bezogen auf die Gew.-%-Summe der Wärmestabilisator- und UV-Lichtschutzmittelzusammensetzung, vorliegt; und
die Thioesterverbindung in einer Menge von 1 Gew.-% bis 15 Gew.-%, bezogen auf die Gew.-%-Summe der Wärmestabilisator- und UV-Lichtschutzmittelzusammensetzung, vorliegt.

12. Zusammensetzung, umfassend:

eine Wärmestabilisator- und UV-Lichtschutzmittelzusammensetzung nach einem der Ansprüche 1 bis 11 und ein zu stabilisierendes Material; vorzugsweise ausgewählt aus der Gruppe bestehend aus Polyolefinen, Polyestern, Polyethern, Polyketonen, Polyamiden, natürlichen und synthetischen Kautschuken, Polyurethanen, Polystyrolen, schlagzähen Polystyrolen, Polyacrylaten, Polymethacrylaten, Polyacetalen, Polyacrylnitrilen, Polybutadienen, Polystyrolen, Acrylnitril-Butadien-Styrol, Styrol-Acrylnitril, Acrylat-Styrol-Acrylnitril, Celluloseacetatbutyrat, Cellulosepolymeren, Polyimiden, Polyamidimiden, Polyetherimiden, Polyphenylsulfiden, Polyphenyloxidpolysulfonen, Polyethersulfonen, Polyvinylchloriden, Polycarbonaten, Polyketonen, aliphatischen Polyketonen, thermoplastischen Olefinen, Aminoharz-vernetzten Polyacrylaten und Polyestern, Polyisocyanat-vernetzten Polyestern und Polyacrylaten, Phenol/Formaldehyd-, Harnstoff/Formaldehyd- und Melamin/Formalde-

hyd-Harzen, trocknenden und nichttrocknenden Alkydharzen, Alkydharzen, Polyesterharzen, mit Melaminharzen vernetzten Acrylatharzen, Harnstoffharzen, Isocyanaten, Isocyanuraten, Carbamaten und Epoxidharzen, vernetzten Epoxidharzen, die sich von aliphatischen, cycloaliphatischen, heterocyclischen und aromatischen Glycidylverbindungen ableiten, die mit Anhydriden oder Aminen vernetzt sind, Polysiloxanen, Michael-Additionspolymeren, Aminen, blockierten Aminen mit aktivierten ungesättigten und Methylenverbindungen, Ketiminen mit aktivierten ungesättigten und Methylenverbindungen, Polyketiminen in Kombination mit ungesättigten Acrylpolyacetoacetatharzen, Polyketiminen in Kombination mit ungesättigten Acrylharzen, strahlungshärtbaren Zusammensetzungen, Epoxymelaminharzen, organischen Farbstoffen, Kosmetikprodukten, Papierformulierungen auf Cellulosebasis, photographischem Filmpapier, Fasern, Wachsen, Tinten und Mischungen davon; weiter bevorzugt ausgewählt aus der Gruppe bestehend aus thermoplastischen Olefinen, Acrylnitril-Butadien-Styrol, Polyestern, Polyvinylchlorid, Polyamiden, Polyurethanen oder Homo- und Copolymeren von Propylen, Isobutylen, Buten, Methylpenten, Hexen, Hepten, Octen, Isopren, Butadien, Hexadien, Dicyclopentadien, Ethylidencyclopenten und Norbornen; wobei sich bei dem zu stabilisierenden Material ganz besonders bevorzugt um Polypropylen oder Polyethylen handelt;
vorzugsweise wobei es sich bei der Zusammensetzung um einen Masterbatch handelt und die Wärmestabilisator- und UV-Lichtschutzmittelzusammensetzung in einer Menge von etwa 10 Gew.-% bis etwa 80 Gew.-%, vorzugsweise in einer Menge von etwa 30 Gew.-% bis etwa 60 Gew.-% und weiter bevorzugt in einer Menge zwischen etwa 40 Gew.-% bis etwa 50 Gew.-%, bezogen auf das Gesamtgewicht der Masterbatchzusammensetzung, vorliegt und das zu stabilisierenden Material in einer Menge von etwa 20 Gew.-% bis etwa 90 Gew.-%, vorzugsweise in einer Menge von etwa 40 Gew.-% bis etwa 70 Gew.-% und weiter bevorzugt in einer Menge zwischen etwa 50 Gew.-% bis etwa 60 Gew.-%, bezogen auf das Gesamtgewicht der Masterbatchzusammensetzung, vorliegt.

13. Zusammensetzung nach Anspruch 12, wobei das zu stabilisierende Material beim Bau oder bei der Renovierung von Gebäuden verwendet wird und vorzugsweise aus einer Vinylverkleidung, einer Vinylverkleidungsleiste, einem Fensterladen, einer Giebelentlüftung, einer Traufe, einem Gurtsims, einem Windbrett, einem Formkörper, einer Dachschindel, einer Dachunterspannbahn, einer Dachmembran, einem Lattungssystem, einer Lattenverlängerung, einem Eindeckrahmen, einer Dachziegelpfanne, einer Firstentlüftung, einer Wetterschutzvorrichtung, einem Grat- und Firstsystem, einem Traufensetzer, einem Verjüngungsstreifen, einem Giebelkeil, einer Sparrenverkleidung, einer Geomembran, einem Verbunddeckmaterial, einem Geländer oder einem Fensterrahmen ausgewählt ist.

14. Zusammensetzung nach Anspruch 12 oder 13, wobei die Wärmestabilisator- und UV-Lichtschutzmittelzusammensetzung in einer Menge von 0,01 Gew.-% bis 5 Gew.-%, bezogen auf das Gesamtgewicht der stabilisierten Zusammensetzung, vorliegt;

vorzugsweise wobei die Wärmestabilisator- und UV-Lichtschutzmittelzusammensetzung in einer Menge von 0 0,05 Gew.-% bis 2 Gew.-%, bezogen auf das Gesamtgewicht der stabilisierten Zusammensetzung, vorliegt;
weiter bevorzugt wobei die Menge der ortho-Hydroxyltris-aryl-s-triazin-Verbindung etwa 0,002 Gew.-% bis etwa 0,50 Gew.-% beträgt, die Menge der Lichtschutzmittelverbindung vom Typ gehindertes Amin etwa 0,01 Gew.-% bis etwa 1,20 Gew.-% beträgt, die Menge der gehinderten Hydroxybenzoatverbindung etwa 0,01 Gew.-% bis etwa 1,20 Gew.-% beträgt, die Menge des Säurefängers etwa 0,001 Gew.-% bis etwa 0,50 Gew.-% beträgt, die Menge der Antioxidansverbindung vom Typ gehindertes Phenol etwa 0,001 Gew.-% bis etwa 0,50 Gew.-% beträgt und die Menge der Phosphitverbindung etwa 0,005 Gew.-% bis etwa 1,00 Gew.-% beträgt, bezogen auf das Gesamtgewicht der stabilisierten Zusammensetzung;
ganz besonders bevorzugt wobei die Menge der ortho-Hydroxyltris-aryl-s-triazin-Verbindung etwa 0,004 Gew.-% bis etwa 0,20 Gew.-% beträgt, die Menge der Lichtschutzmittelverbindung vom Typ gehindertes Amin etwa 0,02 Gew.-% bis etwa 0,80 Gew.-% beträgt, die Menge der gehinderten Hydroxybenzoatverbindung etwa 0,02 Gew.-% bis etwa 0,80 Gew.-% beträgt, die Menge des Säurefängers etwa 0,003 Gew.-% bis etwa 0,25 Gew.-% beträgt, die Menge der Antioxidansverbindung vom Typ gehindertes Phenol etwa 0,002 Gew.-% bis etwa 0,25 Gew.-% beträgt und die Menge der Phosphitzusammensetzung etwa 0,01 Gew.-% bis etwa 0,80 Gew.-% beträgt, bezogen auf das Gesamtgewicht der stabilisierten Zusammensetzung;
und insbesondere ganz besonders bevorzugt wobei die Wärmestabilisator- und UV-Lichtschutzmittelzusammensetzung ferner eine Thioesterverbindung umfasst, wobei die Menge der Thioesterverbindung etwa 0,001 Gew.-% bis etwa 0,80 Gew.-%, vorzugsweise etwa 0,003 Gew.-% bis etwa 0,4 Gew.-%, bezogen auf das Gesamtgewicht der stabilisierten Zusammensetzung, beträgt.

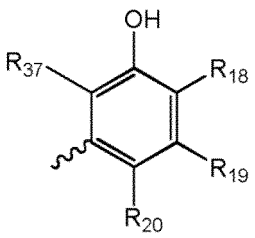
15. Verfahren zur Erzielung von Stabilität gegenüber thermischem Abbau und UV-Licht-Abbau eines Materials, das aus der Gruppe bestehend aus Polyolefinen, Polyestern, Polyethern, Polyketonen, Polyamiden, natürlichen und syn-

thetischen Kautschuken, Polyurethanen, Polystyrolen, schlagzähen Polystyrolen, Polyacrylaten, Polymethacrylaten, Polyacetalen, Polyacrylnitrilen, Polybutadienen, Polystyrolen, Acrylnitril-Butadien-Styrol, Styrol-Acrylnitril, Acrylat-Styrol-Acrylnitril, Celluloseacetatbutyrat, Cellulosepolymeren, Polyimiden, Polyamidimiden, Polyetherimiden, Polyphenylsulfiden, Polyphenyloxidpolysulfonen, Polyethersulfonen, Polyvinylchloriden, Polycarbonaten, Polyketonen, aliphatischen Polyketonen, thermoplastischen Olefinen, Aminoharz-vernetzten Polyacrylaten und Polyestern, Polyisocyanat-vernetzten Polyestern und Polyacrylaten, Phenol/Formaldehyd-, Harnstoff/Formaldehyd- und Melamin/Formaldehyd-Harzen, trocknenden und nichttrocknenden Alkydharzen, Alkydharzen, Polyesterharzen, mit Melaminharzen vernetzten Acrylatharzen, Harnstoffharzen, Isocyanaten, Isocyanuraten, Carbamaten und Epoxidharzen, vernetzten Epoxidharzen, die sich von aliphatischen, cycloaliphatischen, heterocyclischen und aromatischen Glycidylverbindungen ableiten, die mit Anhydriden oder Aminen vernetzt sind, Polysiloxanen, Michael-Additionspolymeren, Aminen, blockierten Aminen mit aktivierten ungesättigten und Methylenverbindungen, Ketiminen mit aktivierten ungesättigten und Methylenverbindungen, Polyketiminen in Kombination mit ungesättigten Acrylpolyacetoacetatharzen, Polyketiminen in Kombination mit ungesättigten Acrylharzen, strahlungshärtbaren Zusammensetzungen, Epoxymelaminharzen, organischen Farbstoffen, Kosmetikprodukten, Papierformulierungen auf Cellulosebasis, photographischem Filmpapier, Fasern, Wachsen, Tinten und Mischungen davon ausgewählt ist, wobei das Verfahren das Zugeben einer stabilisierend wirkenden Menge einer Stabilisatorzusammensetzung nach einem der Ansprüche 1-11 zu dem Material umfasst.

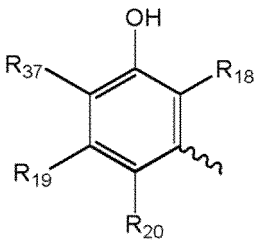
Revendications

1. Composition de stabilisant contre la chaleur et la lumière ultraviolette (UV) comprenant :

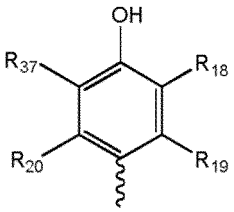
un composé ortho-hydroxy-tris-aryl-s-triazine ;
un composé photostabilisant de type amine encombrée ;
un composé hydroxybenzoate encombré ;
un fixateur d'acide ;
un composé phosphite ;
un composé antioxydant de type phénol encombré comprenant un fragment moléculaire répondant à une ou plusieurs des formules (IVa), (IVb) ou (IVc) :



Formule (IVa)



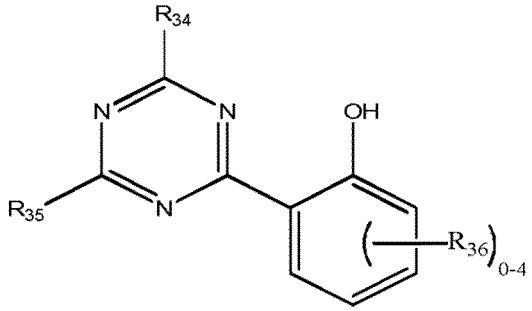
Formule (IVb)



Formule (IVc)

dans laquelle
R_{18} dans les formules (IVa), (IVb) et (IVc) est choisi parmi hydrogène et un hydrocarbyle en C_{1-4} ;
R_{19} et R_{20} dans les formules (IVa), (IVb) et (IVc) sont chacun individuellement choisis parmi hydrogène et un hydrocarbyle en C_1-C_{20} ; et
R_{37} dans les formules (IVa), (IVb) et (IVc) est choisi parmi hydrocarbyle en C_1-C_{12} et
un composé thioester.

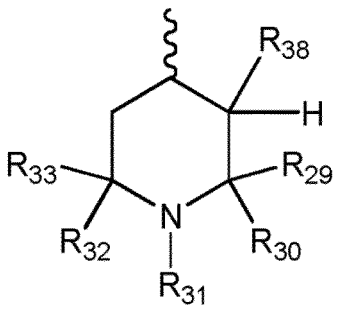
2. Composition de stabilisant contre la chaleur et la lumière UV selon la revendication 1, dans laquelle le composé ortho-hydroxy-tris-aryl-s-triazine est un composé 2-(2'-hydroxyphényl)-1,3,5-triazine répondant à la formule (I) :



Formule (I)

dans laquelle chacun de R_{34} et R_{35} dans la formule (I) est indépendamment choisi parmi aryle en C_6-C_{10} éventuellement substitué, amino substitué par hydrocarbyle en C_1-C_{10}, acyle en C_1-C_{10} et alcoxy en C_1-C_{10} ; et dans laquelle R_{36} dans la formule (I) est un substituant qui est identique ou différent en 0 à 4 positions de la partie phénoxy de la formule I et est indépendamment choisi parmi hydroxyle, hydrocarbyle en C_1-C_{12}, alcoxy en C_1-C_{12}, alcoxyester en C_1-C_{12} et acyle en C_1-C_{12} ; et de préférence dans laquelle le composé 2-(2'-hydroxyphényl)-1,3,5-triazine est choisi parmi : 4,6-bis(2,4-diméthylphényl)-2-(2-hydroxy-4-octyloxyphényl) - s-triazine ; 4,6-bis(2,4-diméthylphényl)-2-(2,4-dihydroxyphényl)-s-triazine ; 2,4-bis(2,4-dihydroxyphényl)-6-(4-chlorophényl)-s-triazine ; 2,4-bis[2-hydroxy-4-(2-hydroxy-éthoxy)phényl]-6-(4-chlorophényl)-s-triazine ; 2,4-bis[2-hydroxy-4-(2-hydroxy-4-(2-hydroxy-éthoxy)phényl]-6-(2,4-diméthylphényl)-s-triazine ; 2,4-bis[2-hydroxy-4-(2-hydroxyéthoxy)phényl]-6-(4-bromophényl)-s-triazine ; 2,4-bis[2-hydroxy-4-(2-acétoxyéthoxy)phényl]-6-(4-chlorophényl)-s-triazine ; 2,4-bis(2,4-dihydroxyphényl)-6-(2,4-diméthylphényl)-s-triazine ; 2,4-bis(4-biphénylyl)-6-[2-hydroxy-4-[(octyloxycarbonyl)éthylidèneoxy]phényl]-s-triazine ; 2,4-bis(4-biphénylyl)-6-[2-hydroxy-4-(2-éthylhexyloxy)phényl]-s-triazine ; 2-phényl-4-[2-hydroxy-4-(3-sec-butyloxy-2-hydroxypropyloxy)phényl]-6-[2-hydroxy-4-(3-sec-amyloxy-2-hydroxypropyloxy)phényl]-s-triazine ; 2,4-bis(2,4-diméthylphényl)-6-[2-hydroxy-4-(3-benzyloxy-2-hydroxypropyloxy)phényl]-s-triazine ; 2,4-bis(2-hydroxy-4-n-butyloxyphényl)-6-(2,4-di-n-butyloxyphényl)-s-triazine ; 2,4-bis(2,4-diméthylphényl)-6-[2-hydroxy-4-(3-nonyloxy-2-hydroxypropyloxy)-5-α-cumylphényl]-s-triazine ; méthylènebis{2,4-bis(2,4-diméthylphényl)-6-[2-hydroxy-4-(3-butyloxy-2-hydroxypropoxy)phényl]-s-triazine} ; mélange de dimères pontés par méthylène pontés aux positions 3:5', 5:5' et 3:3' dans un rapport 5:4:1 ; 2,4,6-tris(2-hydroxy-4-isooctyloxycarbonyliso-propylidèneoxyphényl)-s-triazine ; 2,4-bis(2,4-diméthylphényl)-6-(2-hydroxy-4-hexyloxy-5-α-cumylphényl)-s-triazine ; 2-(2,4,6-triméthylphényl)-4,6-bis[2-hydroxy-4-(3-butyloxy-2-hydroxypropyloxy)phényl]-s-triazine ; 2,4,6-tris[2-hydroxy-4-(3-sec-butyloxy-2-hydroxypropyloxy)phényl]-s-triazine ; mélange de 4,6-bis(2,4-diméthylphényl)-2-(2-hydroxy-4-(3-dodécyloxy-2-hydroxypropoxy)phényl)-s-triazine et de 4,6-bis(2,4-diméthylphényl)-2-(2-hydroxy-4-(3-tridécyloxy-2-hydroxypropoxy)phényl)-s-triazine ; 4,6-bis(2,4-diméthylphényl)-2-(2-hydroxy-4-(3-(2-éthylhexyloxy)-2-hydroxypropoxy)phényl)-s-triazine ; 4,6-diphényl-2-(4-hexyloxy-2-hydroxyphényl)-s-triazine ; 2-(4,6-diphényl-1,3,5-triazin-2-yl)-5-[2-(2-éthylhexanoyloxy)éthoxy]phénol ; 2,4,6-tris(2-hydroxy-4-octyloxyphényl)-1,3,5-triazine ; acide propanoïque, ester de 2,2',2"-[1,3,5-triazine-2,4,6-triyltris[(3-hydroxy-4,1-phénylène)oxy]]tris-1,1',1"-trioctyle ; acide propanoïque, ester de 2-[4-[4,6-bis([1,1'-biphényl]-4-yl)-1,3,5-triazin-2yl]-3-hydroxyphénoxyl]isooctyle ; et les combinaisons de ceux-ci .

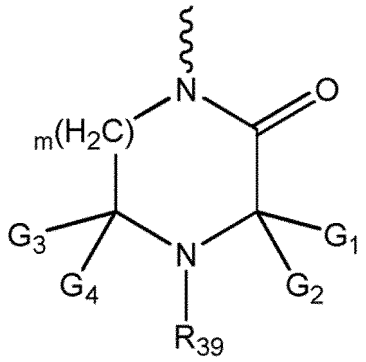
3. Composition de stabilisant contre la chaleur et la lumière UV selon l'une quelconque des revendications précédentes, dans laquelle le composé photostabilisant de type amine encombrée comprend un fragment moléculaire répondant à la formule (II) :



Formule (II)

dans laquelle

R_{31} dans la formule (II) est choisi parmi : hydrogène ; OH ; hydrocarbyle en C_1-C_{20} ; -CH_2CN ; acyle en C_1-C_{12} ; et alcoxy en C_1-C_{18} ;
R_{38} dans la formule (II) est choisi parmi : hydrogène ; et hydrocarbyle en C_1-C_8 ; et
chacun de R_{29}, R_{30}, R_{32} et R_{33} dans la formule (II) est indépendamment choisi parmi hydrocarbyle en C_1-C_{20} ou R_{29} et R_{30} et/ou R_{32} et R_{33} dans la formule (II) forment conjointement avec l'atome de carbone auquel ils sont liés un cycloalkyle en C_5-C_{10} ;
ou à la formule (IIa)



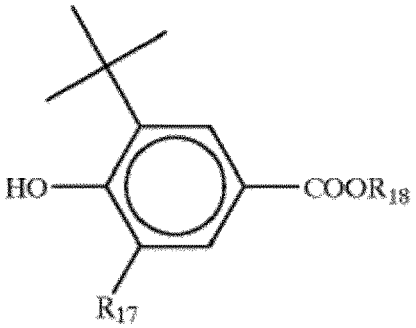
Formule (IIa)

dans laquelle
m dans la formule (IIa) est un entier allant de 1 à 2 ; R_{39} dans la formule (IIa) est choisi parmi : hydrogène ; OH ; hydrocarbyle en C_1-C_{20} ; -CH_2CN ; acyle en C_1-C_{12} ; et alcoxy en C_1-C_{18} ; et chacun de G_1 à G_4 dans la formule (IIa) est indépendamment choisi parmi hydrocarbyle en C_1-C_{20} ;
et de préférence dans laquelle le photostabilisant de type amine encombrée est choisi parmi : sébacate de bis(2,2,6,6-tétraméthylpipéridin-4-yle) ; succinate de bis(2,2,6,6-tétraméthylpipéridin-4-yle) ; sébacate de bis(1,2,2,6,6-pentaméthylpipéridin-4-yle) ; sébacate de bis(1-octyloxy-2,2,6,6-tétraméthylpipéridin-4-yle) ; 3,5-di-tert-butyl-4-hydroxybenzylmalonate de bis(1,2,2,6,6-pentaméthylpipéridin-4-yle)-n-butyle ; un condensat de 1-(2-hydroxyéthyl)-2,2,6,6-tétraméthyl-4-hydroxypipéridine et d'acide succinique ; stéarate de 2,2,6,6-tétraméthylpipéridin-4-yle ; dodécanate de 2,2,6,6-tétraméthylpipéridin-4-yle ; stéarate de 1,2,2,6,6-pentaméthylpipéridin-4-yle ; dodécanate de 1,2,2,6,6-pentaméthylpipéridin-4-yle ; un condensat de N,N'-bis (2,2,6,6-tétraméthylpipéridin-4-yl)hexaméthylènediamine et de 4-tert-octylamino-2,6-dichloro-1,3,5-triazine ; nitrilotriacétate de tris(2,2,6,6-tétraméthylpipéridin-4-yle) ; 1,2,3,4-butanetétracarboxylate de tétrakis(2,2,6,6-tétraméthylpipéridin-4-yle) ; 4-benzoyl-2,2,6,6-tétraméthylpipéridine ; 4-stéaryloxy-2,2,6,6-tétraméthylpipéridine ; 2-(2-hydroxy-3,5-di-tert-butylbenzyl)malonate de bis(1,2,2,6,6-pentaméthylpipéridyl)-2-n-butyle ; 3-n-octyl-7,7,9,9-tétraméthyl-1,3,8-triazaspiro[4.5]décane-2,4-dione ; sébacate de bis(1-octyloxy-2,2,6,6-tétraméthylpipéridyle) ; succinate de bis(1-octyloxy-2,2,6,6-tétraméthylpipéridyle) ; un condensat de N,N'-bis(2,2,6,6-tétraméthylpipéridin-4-yl)hexaméthylènediamine et de 4-morpholino-2,6-dichloro-1,3,5-triazine ; un condensat de N,N'-bis(2,2,6,6-tétraméthylpipéridin-4-yl)hexaméthylènediamine et de 4-morpholino-2,6-dichloro-1,3,5-triazine, méthylé ; un condensat de 2-chloro-4,6-bis(4-n-butylamino-2,2,6,6-tétraméthylpipéridyl)-1,3,5-triazine et de 1,2-bis(3-aminopropylamino)éthane ; un condensat de 2-chloro-4,6-bis(4-n-butylamino-1,2,2,6,6-pentaméthylpipéridyl)-1,3,5-triazine et de 1,2-bis-(3-aminopropylamino)éthane ; 8-acétyl-3-dodécyl-7,7,9,9-tétraméthyl-1,3,8-triazaspiro[4.5]décane-2,4-dione ; 3-dodécyl-1-(2,2,6,6-tétraméthylpipéridin-4-yl)pyrrolidine-2,5-dione ; 3-dodécyl-1-(1-éthanoyl-2,2,6,6-tétraméthylpipéridin-4-yl)pyrrolidine-2,5-dione ; 3-dodécyl-1-(1,2,2,6,6-pentaméthylpipéridin-4-yl)pyrrolidine-2,5-dione ; un mélange de 4-hexadécyloxy- et de 4-stéaryloxy-2,2,6,6-tétraméthylpipéridine ; un condensat de N,N'-bis(2,2,6,6-tétraméthylpipéridin-4-yl)hexaméthylènediamine et de 4-cyclohexylamino-2,6-dichloro-1,3,5-triazine ; un condensat de 1,2-bis(3-aminopropylamino)éthane, de 2,4,6-trichloro-1,3,5-triazine et de 4-butylamino-2,2,6,6-tétraméthylpipéridine ; 2-undécyl-7,7,9,9-tétraméthyl-1-oxa-3,8-diaza-4-oxospiro[4.5]décane ; oxo-pipérazinyl-triazines ; un produit de réaction de 7,7,9,9-tétraméthyl-2-cycloundécyl-1-oxa-3,8-diaza-4-oxospiro[4.5]décane et d'épichlorhydrine ; butane-1,2,3,4-tétracarboxylate de tétrakis(2,2,6,6-tétraméthyl-4-pipéridyle) ; acide 1,2,3,4-butanetétracarboxylique, ester de tétrakis(1,2,2,6,6-pentaméthyl-4-pipéridinyle) ; acide 1,2,3,4-butanetétracarboxylique, ester de 1,2,2,6,6-pentaméthyl-4-pipéridinyle et de tridécyle ; acide 1,2,3,4-butanetétracarboxylique, ester de 2,2,6,6-tétraméthyl-4-pipéridinyle et de

tridécyle ; acide 1,2,3,4-butanetétracarboxylique, polymère avec l'ester de 1,2,2,6,6-pentaméthyl-4-pipérdinyle de 2,2,6,6-tétraméthyl-2,4,8,10-tétraoxaspiro[5.5]undécane-3,9-diéthanol ; acide 1,2,3,4-butanetétracarboxylique, polymère avec l'ester de 2,2,6,6-tétraméthyl-4-pipérdinyle de 2,2,6,6-tétraméthyl-2,4,8,10-tétraoxaspiro[5.5]undécane-3,9-diéthanol ; carbonate de bis(1-undécanoxy-2,2,6,6-tétraméthylpipéridin-4-yle) ; 1-(2-hydroxy-2-méthylpropoxy)-2,2,6,6-tétraméthyl-4-pipéridinol ; 1-(2-hydroxy-2-méthylpropoxy)-4-octadécanoyloxy-2,2,6,6-tétraméthylpipéridine ; 1-(4-octadécanoyloxy-2, 2, 6, 6-tétraméthylpipéridin-1-yloxy)-2-octadécanoyloxy-2-méthylpropane ; 1-(2-hydroxyéthyl)-2,2,6,6-tétraméthyl-4-pipéridinol ; un produit de réaction de 1-(2-hydroxyéthyl)-2,2,6,6-tétraméthyl-4-pipéridinol et de succinate de diméthyle ; 2,2,4,4-tétraméthyl-7-oxa-3,20-diazadispiro[5.1.11.2]hénéicosan-21-one ; l'ester de 2,2,6,6-tétraméthyl-4-pipéridinol avec des acides gras supérieurs ; 3-dodécyl-1-(2,2,6,6-tétraméthyl-4-pipéridyl)pyrrolidine-2,5-dione ; 1H-pyrrole-2,5-dione, 1-octadécyl-, polymère avec le (1-méthyléthényl)benzène et la 1-(2,2,6,6-tétraméthyl-4-pipéridinyl)-1H-pyrrole-2,5-dione ; pipérazinone, 1,1',1"-[1,3,5-triazine-2,4,6-triyltris[(cyclohexylimino)-2,1-éthanediyl]]tris[3,3,5,5-tétraméthyl- ; pipérazinone, 1, 1' , 1"-[1,3,5-triazine-2,4,6-triyltris[(cyclohexylimino)-2,1-éthanediyl]]tris[3,3,4,5,5-pentaméthyl- ; le produit de réaction de 7,7,9,9-tétraméthyl-2-cycloundécyl-1-oxa-3,8-diaza-4-oxospiro[4.5]décane et d'épichlorhydrine ; le condensat de N,N'-bis(2,2,6,6-tétraméthylpipéridin-4-yl)hexaméthylènediamine et de 4-cyclohexylamino-2,6-dichloro-1,3,5-triazine ; le condensat de 1,2-bis(3-aminopropylamino)éthane, de 2,4,6-trichloro-1,3,5-triazine et de 4-butylamino-2,2,6,6-tétraméthylpipéridine ; le condensat de N,N'-bis(2,2,6,6-tétraméthylpipéridin-4-yl)hexaméthylènediamine et de 4-morpholino-2,6-dichloro-1,3,5-triazine ; le condensat de 2-chloro-4,6-bis(4-n-butylamino-2,2,6,6-tétraméthylpipéridyl)-1,3,5-triazine et de 1,2-bis(3-aminopropylamino)éthane ; le condensat de 2-chloro-4,6-bis(4-n-butylamino-1,2,2,6,6-pentaméthylpipéridyl)-1,3,5-triazine et de 1,2-bis(3-aminopropylamino)éthane ; 2-[(2-hydroxyéthyl)amino]-4,6-bis[N-(1-cyclohexyloxy-2,2,6,6-tétraméthylpipéridin-4-yl)butylamino-1,3,5-triazine ; acide propanedioïque, ester de [(4-méthoxyphényl)-méthylène]bis(1,2,2,6,6-pentaméthyl-4-pipéridinyle) ; 1,2,3,4-butanetétracarboxylate de tétrakis(2,2,6,6-tétraméthylpipéridin-4-yle) ; acide benzènepropanoïque, 3,5-bis(1,1-diméthyléthyl)-4-hydroxy-, ester de 1-[2-[3-[3,5-bis(1,1-diméthyléthyl)-4-hydroxyphényl]-1-oxopropoxy]éthyl]-2,2,6,6-tétraméthyl-4-pipéridinyle ; N-(1-octyloxy-2,2,6,6-tétraméthylpipéridin-4-yl)-N'-dodécyloxalamide ; nitrilotriacétate de tris(2,2,6,6-tétraméthylpipéridin-4-yle) ; acide 1,5-dioxaspiro{5,5}undécane-3,3-dicarboxylique, bis(1,2,2,6,6-pentaméthyl-4-pipéridinyle) ; acide 1,5-dioxaspiro{5,5}undécane-3,3-dicarboxylique, bis(2,2,6,6-tétraméthyl-4-pipéridinyle) ; le condensat de 1-(2-hydroxyéthyl)-2,2,6,6-tétraméthyl-4-hydroxypipéridine et d'acide succinique ; le condensat de N,N'-bis(2,2,6,6-tétraméthylpipéridin-4-yl)hexaméthylènediamine et de 4-tert-octylamino-2,6-dichloro-1,3,5-triazine ; acide 1,2,3,4-butanetétracarboxylique, ester de 1,2,2,6,6-pentaméthyl-4-pipéridinyle et de tridécyle ; 1,2,3,4-butanetétracarboxylate de tétrakis(2,2,6,6-tétraméthylpipéridin-4-yle) ; acide de 1,2,3,4-butanetétracarboxylique, ester de 2,2,6,6-tétraméthyl-4-pipéridinyle et de tridécyle ; 1,2,3,4-butanetétracarboxylate de tétrakis(1,2,2,6,6-pentaméthylpipéridin-4-yle) ; mélange d'ester de dodécyle d'acide 2,2,4,4-tétraméthyl-21-oxo-7-oxa-3.20-diazaspiro[5.1.11.2]hénéicosane-20-propanoïque et d'ester de tétradécyle d'acide 2,2,4,4-tétraméthyl-21-oxo-7-oxa-3,20-diazaspiro[5.1.11.2]hénéicosane-20-propanoïque ; 1H,4H,5H,8H-2,3a,4a,6,7a,8a-hexazacyclopenta[def]fluorène-4,8-dione, hexahydro-2,6-bis(2,2,6,6-tétraméthyl-4-pipéridinyl)- ; polyméthyl[propyl-3-oxy(2',2',6',6'-tétraméthyl-4,4'-pipéridinyl)]siloxane ; polyméthyl[propyl-3-oxy(1',2',2',6',6'-pentaméthyl-4,4'-pipéridinyl)]siloxane ; copolymère de méthacrylate de méthyle avec l'acrylate d'éthyle et l'acrylate de 2,2,6,6-tétraméthylpipéridin-4-yle ; copolymère d'un mélange d'alpha-oléfines en C_{20} à C_{24} et de (2,2,6,6-tétraméthylpipéridin-4-yl)succinimide ; acide 1,2,3,4-butanetétracarboxylique, polymère avec le β,β,β',β'-tétraméthyl-2,4,8,10-tétraoxaspiro[5.5]undécane-3,9-diéthanol, ester de 1,2,2,6,6-pentaméthyl-4-pipéridinyle ; acide 1,2,3,4-butanetétracarboxylique, polymère avec le β,β,β',β'-tétraméthyl-2,4,8,10-tétraoxaspiro[5.5]undécane-3,9-diéthanol, copolymère d'ester de 2,2,6,6-tétraméthyl-4-pipéridinyle ; 1,3-benzènedicarboxamide, N,N'-bis(2,2,6,6-tétraméthyl-4-pipéridinyle ; 1,1'-(1,10-dioxo-1,10-décanediyl)bis(hexahydro-2,2,4,4,6-pentaméthylpyrimidine ; éthanediamide, N-(1-acétyl-2,2,6,6-tétraméthylpipéridinyl)-N'-dodécyle ; formamide, N,N'-1,6-hexanediylbis[N-(2,2,6,6-tétraméthyl-4-pipéridinyle) ; D-glucitol, 1,3:2,4-bis-O-(2,2,6,6-tétraméthyl-4-pipéridinylidène)- ; 2,2,4,4-tétraméthyl-7-oxa-3,20-diaza-21-oxodispiro[5.1.11.2]hénéicosane ; propanamide, 2-méthyl-N-(2,2,6,6-tétraméthyl-4-pipéridinyl)-2-[(2,2,6,6-tétraméthyl-4-pipéridinyl)amino]- ; acide 7-oxa-3,20-diazadispiro[5.1.11.2]hénéicosane-20-propanoïque, 2,2,4,4-tétraméthyl-21-oxo-, ester de dodécyle ; acide N-(2,2,6,6-tétraméthylpipéridin-4-yl)-β-aminopropionique, ester de dodécyle ; N-(2,2,6,6-tétraméthylpipéridin-4-yl)-N'-aminooxalamide ; propanamide, N-(2,2,6,6-tétraméthyl-4-pipéridinyl)-3-[(2,2,6,6-tétraméthyl-4-pipéridinyl)amino]- ; mélange de 4-hexadécyloxy- et de 4-stéaryloxy-2,2,6,6-tétraméthylpipéridine ; 3-dodécyl-1-(1,2,2,6,6-pentaméthylpipéridin-4-yl)pyrrolidine-2,5-dione ; 3-dodécyl-1-(1-éthanoyl-2,2,6,6-pentaméthylpipéridin-4-yl)pyrrolidine-2,5-dione ; succinate de bis(2,2,6,6-tétraméthylpipéridin-4-yle) ; 3,5-di-tert-butyl-4-hydroxybenzylmalonate de bis(1,2,2,6,6-pentaméthylpipéridin-4-yl)-n-butyle ; nitrilotriacétate de tris(2,2,6,6-tétraméthylpipéridin-4-yle) ; 1,1'-(1,2-éthanediyl)bis(3,3,5,5-tétraméthylpipérazinone) ; 4-benzoyl-2,2,6,6-tétraméthylpipéridine ; 4-stéaryloxy-2,2,6,6-

tétraméthylpipéridine ; 2-n-butyl-2-(2-hydroxy-3,5-di-tert-butylbenzyl)malonate de bis(1,2,2,6,6-pentaméthylpipéridyle) ; 3-n-octyl-7,7,9,9-tétraméthyl-1,3,8-triazaspiro[4.5]décan-2,4-dione ; sébacate de bis(1-octyloxy-2,2,6,6-tétraméthylpipéridyle) ; succinate de bis(1-octyloxy-2,2,6,6-tétraméthylpipéridyle) ; 8-acétyl-3-dodécyl-7,7,9,9-tétraméthyl-1,3,8-triazaspiro[4.5]décane-2,4-dione ; 3-dodécyl-1-(2,2,6,6-tétraméthylpipéridin-4-yl)pyrrolidine-2,5-dione ; 3-dodécyl-1-(1-éthanoyl-2,2,6,6-tétraméthylpipéridin-4-yl)pyrrolidine-2,5-dione ; 3-dodécyl-1-(1,2,2,6,6-pentaméthylpipéridin-4-yl)pyrrolidine-2,5-dione ; un mélange de 4-hexadécyloxy- et de 4-stéaryloxy-2,2,6,6-tétraméthylpipéridine ; 2-undécyl-7,7,9,9-tétraméthyl-1-oxa-3,8-diaza-4-oxospiro[4.5]décane ; acide 1,5-dioxaspiro[5.5]undécane-3,3-dicarboxylique, bis(2,2,6,6-tétraméthyl-4-pipéridinyle) et acide 1,5-dioxaspiro[5.5]undécane-3,3-dicarboxylique, bis(1,2,2,6,6-pentaméthyl-4-pipéridinyle) ; N^1-(β-hydroxyéthyl)-3,3-pentaméthylène-5,5-diméthylpipérazin-2-one ; N^1-tert-octyl-3,3,5,5-tétraméthyldiazépin-2-one ; N^1-tert-octyl-3,3-pentaméthylène-5,5-hexaméthylènediazépin-2-one ; N^1-tert-octyl-3,3-pentaméthylène-5,5-diméthylpipérazin-2-one ; trans-1,2-cyclohexanebis(N^1-5,5-diméthyl-3,3-pentaméthylène-2-pipérazinone ; trans-1,2-cyclohexanebis(N^1-3,3,5,5-dispiropentaméthylène-2-pipérazinone) ; N^1-isopropyl-1,4-diazadispiro-(3,3,5,5)pentaméthylène-2-pipérazinone ; N^1-isopropyl-1,4-diazadispiro-3,3-pentaméthylène-5,5-tétraméthylène-2-pipérazinone ; N^1-isopropyl-5,5-diméthyl-3,3-pentaméthylène-2-pipérazinone ; trans-1,2-cyclohexane-bis-N^1-(diméthyl-3,3-pentaméthylène-2-pipérazinone) ; N^1-octyl-5,5-diméthyl-3,3-pentaméthylène-1,4-diazépin-2-one ; N^1-octyl-1,4-diazadispiro-(3,3,5,5)pentaméthylène-1,5-diazépin-2-one ; et les mélanges de ceux-ci.

4. Composition de stabilisant contre la chaleur et la lumière UV selon l'une quelconque des revendications précédentes, dans laquelle le composé hydroxybenzoate encombré répond à la formule (III) :



Formule (III)

dans laquelle R_{17} dans la formule (III) est un alkyle en C_1-C_8 et R_{18} dans la formule (III) est un alkyle en C_1-C_{24} ou aryle en C_6-C_{24} substitué ou non substitué ;
et de préférence dans laquelle le composé hydroxybenzoate encombré est choisi dans le groupe constitué de 3,5-di-tert-butyl-4-hydroxybenzoate de 2,4-di-tert-butylphényle ; 3,5-di-tert-butyl-4-hydroxybenzoate d'hexadécyle ; 3,5-di-tert-butyl-4-hydroxybenzoate d'octadécyle ; 3,5-di-tert-butyl-4-hydroxybenzoate d'octyle ; 3,5-di-tert-butyl-4-hydroxybenzoate de tétradécyle ; 3,5-di-tert-butyl-4-hydroxybenzoate de béhényle ; 3,5-di-tert-butyl-4-hydroxybenzoate de 2-méthyl-4,6-di-tert-butylphényle et 3-[3-t-butyl-4-(3,5-di-t-butyl-4-hydroxybenzoyloxy)phényl]propionate de butyle ; et des mélanges de ceux-ci.

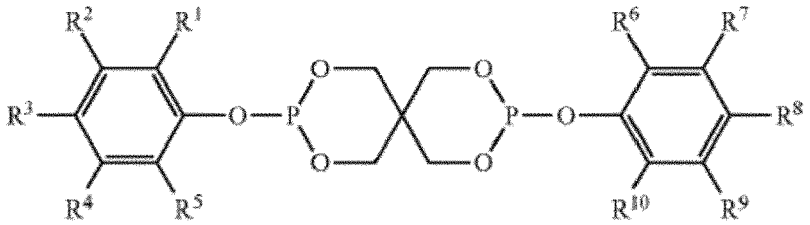
5. Composition de stabilisant contre la chaleur et la lumière UV selon l'une quelconque des revendications précédentes, dans laquelle le fixateur d'acide est choisi dans le groupe constitué d'oxyde de zinc, lactate de calcium, hydrotalcites naturelles et synthétiques, hydrocalumites naturelles et synthétiques, sels de métaux alcalins et sels de métaux alcalinoterreux d'acides gras supérieurs, stéarate de calcium, stéarate de zinc, béhénate de magnésium, stéarate de magnésium, stéarate de sodium, ricinoléate de sodium et palmitate de potassium, pyrocatécholate d'antimoine, pyrocatécholate de zinc et des mélanges de ceux-ci.

6. Composition de stabilisant contre la chaleur et la lumière UV selon l'une quelconque des revendications précédentes,

dans laquelle R_{18} et R_{37} dans les formules (IVa), (IVb) et (IVc) sont choisis parmi méthyle et t-butyle ;
et de préférence dans laquelle l'au moins un composé phénol encombré est choisi parmi : (1,3,5-tris(4-t-butyl-3-hydroxy-2,6-diméthylbenzyl)-1,3,5-triazine-2,4,6-(1H,3H,5H)-trione ; 1,3,5-tris(3,5-di-tert-butyl-4-hydroxybenzyl)-1,3,5-triazine-2,4,6-(1H,3H,5H)-trione ; 1,1,3-tris(2'-méthyl-4'-hydroxy-5'-*t*-butylphényl)butane ;

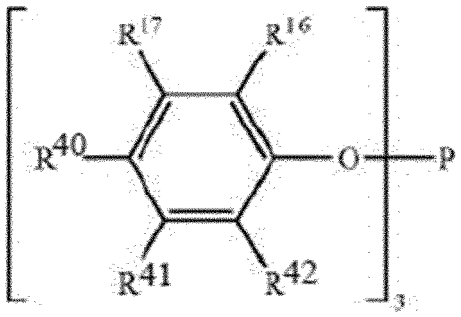
bis[3-(3-*t*-butyl-4-hydroxy-5-méthylphényl)propionate] de triéthylèneglycol ; 4,4'-thiobis(2-*t*-butyl-5-méthylphénol) ; bis[3-(3-*t*-butyl-4-hydroxy-5-méthylphényl)propionate] de 2,2'-thiodiéthylène ; 3-(3'-*t*-butyl-4'-hydroxy-5'-méthylphényl)propionate d'octadécyle ; tétrakisméthylène(3-*t*-butyl-4-hydroxy-5-méthylhydrocinnamate)méthane ; *N,N'*-hexaméthylènebis[3-(3-*t*-butyl-4-hydroxy-5-méthylphényl)propionamide] ; thiodipropionate de di(4-tert-butyl-3-hydroxy-2,6-diméthylbenzyle) ; et 3,5-di-(tert)-butyl-4-hydroxyhydrocinnamate d'octadécyle ; et les mélanges de ceux-ci.

7. Composition de stabilisant contre la chaleur et la lumière UV selon l'une quelconque des revendications précédentes, dans laquelle le composé phosphite est un composé phosphite d'arylalkyle encombré répondant à la formule (V) :



Formule (V)

dans laquelle R^1, R^2, R^3, R^4, R^5, R^6, R^7, R^8, R^9 et R^{10} dans la formule (V) sont chacun individuellement choisis parmi hydrogène, alkyle en C_1-C_{12}, cycloalkyle en C_3-C_{12}, alkylcycloalkyle en C_4-C_{12}, aryle en C_6-C_{10} et alkylaryle en C_7-C_{12}, dans laquelle R^1 et R^5 comprennent ensemble au moins 5 atomes de carbone et au moins l'un de R^1 et R^5 comprend un atome de carbone tertiaire, dans laquelle R^6 et R^{10} comprennent ensemble au moins 5 atomes de carbone et au moins l'un de R^6 et R^{10} comprend un atome de carbone tertiaire ; de préférence choisi dans le groupe constitué de bis(2,6-di-t-butyl-4-méthylphényl)pentaérythritol-diphosphite, bis(2,4-dicumylphényl)pentaérythritol-diphosphite, bis(2,4-di-t-butylphényl)pentaérythritol-diphosphite et bis(2,4,6-tri-t-butylphényl)pentaérythritol-diphosphite ; et des mélanges de ceux-ci ;
ou
un trisarylphosphite répondant à la formule (VI) :



Formule (VI)

dans laquelle R^{16}, R^{17}, R^{40}, R^{41} et R^{42} dans la formule (VI) sont chacun individuellement choisis parmi hydrogène, alkyle en C_1-C_{20}, cycloalkyle en C_3-C_{20}, alkylcycloalkyle en C_4-C_{20}, aryle en C_6-C_{10} et alkylaryle en C_7-C_{20} ; de préférence choisi dans le groupe constitué de tris(2,4-di-t-butylphényl)phosphite, tris(4-nonylphényl)phosphite et triphénylphosphite ; et des mélanges de ceux-ci ;
ou des mélanges de ceux-ci.

8. Composition de stabilisant contre la chaleur et la lumière UV selon l'une quelconque des revendications précédentes, dans laquelle le composé thioester est choisi dans le groupe constitué de thiodipropionate de dilauryle, thiodipropionate de distéaryle, tétrakis(3-dodécylthiopropionate) de pentaérythritol, thiodisuccinate de tétraalkylthioéthyle, 2,12-dihydroxy-4,10-dithia-7-oxatridécaméthylènebis[3-(dodécylthio)propionate], esters de polyalcanol d'acides alkylthioalcanoïques et 3,3'-thiodipropionates de dialkyle ; et des mélanges de ceux-ci.

9. Composition de stabilisant contre la chaleur et la lumière UV selon l'une quelconque des revendications précédentes,

dans laquelle :

le composé ortho-hydroxy-tris-aryl-s-triazine est le 2-[4,6-bis(2,4-diméthylphényl)-1,3,5-triazin-2-yl]-5-(octyloxy)phénol ;
le composé photostabilisant de type amine encombrée est un mélange d'acides gras et d'esters de 2,2,6,6-tétraméthyl-4-pipéridinyle insaturés en C_{12}-C_{21}, C_{18} ;
le composé hydroxybenzoate encombré est l'ester d'hexadécyle de l'acide 3,5-di-tert-butyl-4-hydroxybenzoïque ;
le fixateur d'acide est choisi dans le groupe constitué d'oxyde de magnésium, oxyde d'aluminium, hydroxyde de magnésium, hydroxyde d'aluminium, carbonates de ceux-ci et mélanges de ceux-ci ;
le composé phosphite est le bis(2,4-dicumylphényl)pentaérythritol-diphosphite ;
le composé antioxydant de type phénol encombré est la 1,3,5-tris(4-tert-butyl-3-hydroxy-2,6-diméthylbenzyl)-1,3,5-triazine-2,4,6-(1H,3H,5H)-trione ; et
le thioester est le tétrakis-3-dodécylthiopropionate) de pentaérythritol ou le thiodipropionate de distéaryle.

10. Composition de stabilisant contre la chaleur et la lumière UV selon l'une quelconque des revendications précédentes, dans laquelle :

le composé ortho-hydroxy-tris-aryl-s-triazine est présent en une quantité allant de 1 % en poids à 10 % en poids sur la base d'un % en poids total de la composition de stabilisant contre la chaleur et la lumière UV ;
le composé photostabilisant de type amine encombrée est présent en une quantité allant de 20 % en poids à 50 % en poids sur la base du % en poids total de la composition de stabilisant contre la chaleur et la lumière UV ;
le composé hydroxybenzoate encombré est présent en une quantité allant de 20 % en poids à 50 % en poids sur la base du % en poids total de la composition de stabilisant contre la chaleur et la lumière UV ;
le fixateur d'acide est présent en une quantité allant de 1 % en poids à 10 % en poids sur la base du % en poids total de la composition de stabilisant contre la chaleur et la lumière UV ;
le composé phosphite est présent en une quantité allant de 5 % en poids à 40 % en poids sur la base du % en poids total de la composition de stabilisant contre la chaleur et la lumière UV ; et
le composé antioxydant de type phénol encombré est présent en une quantité allant de 1 % en poids à 10 % en poids sur la base du % en poids total de la composition de stabilisant contre la chaleur et la lumière UV.

11. Composition de stabilisant contre la chaleur et la lumière UV selon l'une quelconque des revendications 1-9, dans laquelle

le composé ortho-hydroxy-tris-aryl-s-triazine est présent en une quantité allant de 1 % en poids à 10 % en poids sur la base d'un % en poids total de la composition de stabilisant contre la chaleur et la lumière UV ;
le composé photostabilisant de type amine encombrée est présent en une quantité allant de 20 % en poids à 50 % en poids sur la base du % en poids total de la composition de stabilisant contre la chaleur et la lumière UV ;
le composé hydroxybenzoate encombré est présent en une quantité allant de 20 % en poids à 50 % en poids sur la base du % en poids total de la composition de stabilisant contre la chaleur et la lumière UV ;
le fixateur d'acide est présent en une quantité allant de 1 % en poids à 10 % en poids sur la base du % en poids total de la composition de stabilisant contre la chaleur et la lumière UV ;
le composé phosphite est présent en une quantité allant de 5 % en poids à 25 % en poids sur la base du % en poids total de la composition de stabilisant contre la chaleur et la lumière UV ;
le composé antioxydant de type phénol encombré est présent en une quantité allant de 1 % en poids à 10 % en poids sur la base du % en poids total de la composition de stabilisant contre la chaleur et la lumière UV ; et
le composé thioester est présent en une quantité allant de 1 % en poids à 15 % en poids sur la base du % en poids total de la composition de stabilisant contre la chaleur et la lumière UV.

12. Composition comprenant :

une composition de stabilisant contre la chaleur et la lumière UV selon l'une quelconque des revendications 1 à 11 ; et
un matériau à stabiliser ; de préférence choisi dans le groupe constitué de : polyoléfines, polyesters, polyéthers, polycétones, polyamides, caoutchoucs naturels et synthétiques, polyuréthanes, polystyrènes, polystyrènes à haute résistance au choc, polyacrylates, polyméthacrylates, polyacétals, polyacrylonitriles, polybutadiènes, polystyrènes, acrylonitrile-butadiène-styrène, styrène-acrylonitrile, acrylate-styrène-acrylonitrile, acétate-butyrate cellulosique, polymères cellulosiques, polyimides, polyamideimides, polyétherimides, polyphénylsulfures,

polyphénylоxydepolysulfones, polyéthersulfones, polychlorures de vinyle, polycarbonates, polycétones, polycétones aliphatiques, oléfines thermoplastiques, polyacrylates et polyesters réticulés par aminorésine, polyesters et polyacrylates réticulés par polyisocyanate, résines phénol/formaldéhyde, urée/formaldéhyde et mélamine/formaldéhyde, résines alkyde siccatives et non siccatives, résines alkydes, résines polyester, résines acrylate réticulées avec des résines mélamine, résines urée, isocyanates, isocyanurates, carbamates et résines époxy, résines époxy réticulées dérivées de composés glycidyle aliphatiques, cycloaliphatiques, hétérocycliques et aromatiques, qui sont réticulés avec des anhydrides ou des amines, polysiloxanes, polymères formés par addition de Michael, amines, amines bloquées avec des composés insaturés et méthylène activés, cétimines avec des composés insaturés et méthylène activés, polycétimines en combinaison avec des résines acryliques-polyacétoacétate insaturées, polycétimines en combinaison avec des résines acryliques insaturées, compositions durcissables par rayonnement, résines époxymélamine, colorants organiques, produits cosmétiques, formulations de papier à base de cellulose, papier pour film photographique, fibres, cires, encres et mélanges de ceux-ci ; plus préférablement choisi dans le groupe constitué d'oléfines thermoplastiques, acrylonitrile-butadiène-styrène, polyesters, polychlorure de vinyle, polyamides, polyuréthanes ou homo- et copolymères de propylène, isobutylène, butène, méthylpentène, hexène, heptène, octène, isoprène, butadiène, hexadiène, dicyclopentadiène, éthylidène cyclopentène et norbornène ; et le plus préférablement le matériau à stabiliser est le polypropylène ou le polyéthylène ;
de préférence dans laquelle la composition est un mélange maître et la composition de stabilisant contre la chaleur et la lumière UV est présente en une quantité allant d'environ 10 % en poids à environ 80 % en poids, de préférence en une quantité allant d'environ 30 % en poids à environ 60 % en poids et plus préférablement en une quantité comprise entre environ 40 % en poids et environ 50 % en poids, sur la base d'un poids total de la composition de mélange maître, et le matériau à stabiliser est présent en une quantité allant d'environ 20 % en poids à environ 90 % en poids, de préférence en une quantité allant d'environ 40 % en poids à environ 70 % en poids et plus préférablement en une quantité comprise entre environ 50 % en poids et environ 60 % en poids, sur la base du poids total de la composition de mélange maître.

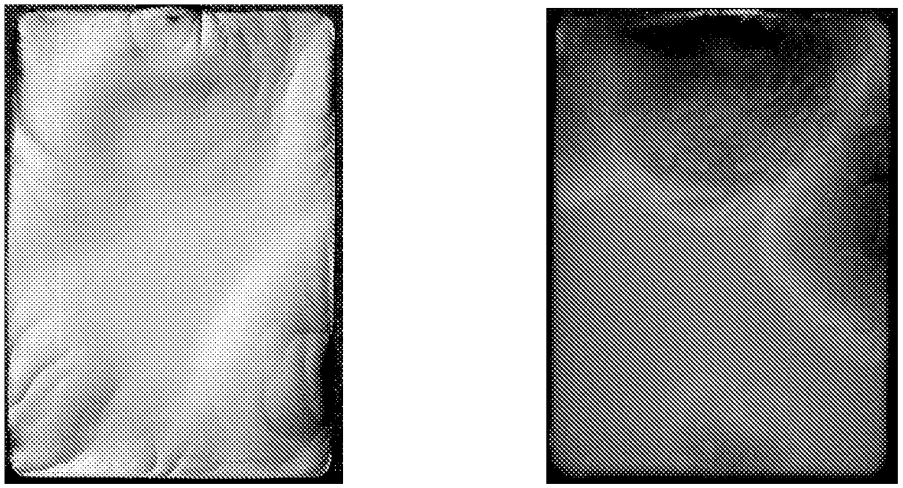
13. Composition selon la revendication 12, dans laquelle le matériau à stabiliser est utilisé dans la construction ou rénovation de bâtiments et est de préférence choisi parmi un bardage en vinyle, une moulure de bardage en vinyle, un volet, un évent de pignon, un avant-toit, une planche de rive, une sous-face, un moulage, un bardeau de toiture, une sous-couche de toiture, une membrane de toiture, un système de lattage, une rallonge de lattage, une bande d'étanchéité, un receveur de douche, une aération de faîtage, un bloc de protection contre les intempéries, un toit à quatre pans, une contremarche d'avant-toit, une bande de raccordement, un coin de faîtage, une moulure de rive, une géomembrane, un matériau de terrasse composite, un garde-corps ou un châssis de fenêtre.

14. Composition selon l'une ou l'autre de la revendication 12 ou 13, dans laquelle la composition de stabilisant contre la chaleur et la lumière UV est présente en une quantité allant de 0,01 % en poids à 5 % en poids sur la base d'un poids total de la composition stabilisée ;

de préférence dans laquelle la composition de stabilisant contre la chaleur et la lumière UV est présente en une quantité allant de 0,05 % en poids à 2 % en poids sur la base d'un poids total de la composition stabilisée ; plus préférablement dans laquelle une quantité du composé ortho-hydroxy-tris-aryl-s-triazine va d'environ 0,002 % en poids à environ 0,50 % en poids, une quantité du composé photostabilisant de type amine encombrée va d'environ 0,01 % en poids à environ 1,20 % en poids, une quantité du composé hydroxybenzoate encombré va d'environ 0,01 % en poids à environ 1,20 % en poids, une quantité du fixateur d'acide va d'environ 0,001 % en poids à environ 0,50 % en poids, une quantité du composé antioxydant de type phénol encombré va d'environ 0,001 % en poids à environ 0,50 % en poids et une quantité du composé phosphite va d'environ 0,005 % en poids à environ 1,00 % en poids, sur la base du poids total de la composition stabilisée ;
le plus préférablement dans laquelle la quantité du composé ortho-hydroxy-tris-aryl-s-triazine va d'environ 0,004 % en poids à environ 0,20 % en poids, la quantité du composé photostabilisant de type amine encombrée va d'environ 0,02 % en poids à environ 0,80 % en poids, la quantité du composé hydroxybenzoate encombré va d'environ 0,02 % en poids à environ 0,80 % en poids, la quantité du fixateur d'acide va d'environ 0,003 % en poids à environ 0,25 % en poids, la quantité du composé antioxydant de type phénol encombré va d'environ 0,002 % en poids à environ 0,25 % en poids et la quantité de la composition de phosphite va d'environ 0,01 % en poids à environ 0,80 % en poids, sur la base d'un poids total de la composition stabilisée ;
et le plus préférablement en particulier dans laquelle la composition de stabilisant contre la chaleur et la lumière UV comprend en outre un composé thioester, dans laquelle une quantité du composé thioester va d'environ 0,001 % en poids à environ 0,80 % en poids, de préférence d'environ 0,003 % en poids à environ 0,4 % en poids, sur la base d'un poids total de la composition stabilisée.

15. Procédé permettant de parvenir à une stabilité contre la dégradation par la chaleur et la lumière UV d'un matériau choisi dans le groupe constitué de polyoléfines, polyesters, polyéthers, polycétones, polyamides, caoutchoucs naturels et synthétiques, polyuréthanes, polystyrènes, polystyrènes à haute résistance au choc, polyacrylates, polyméthacrylates, polyacétals, polyacrylonitriles, polybutadiènes, polystyrènes, acrylonitrile-butadiène-styrène, styrène-acrylonitrile, acrylate-styrène-acrylonitrile, acétate-butyrate cellulosique, polymères cellulosiques, polyimides, polyamideimides, polyétherimides, polyphénylsulfures, polyphényloxydepolysulfones, polyéthersulfones, polychlorures de vinyle, polycarbonates, polycétones, polycétones aliphatiques, oléfines thermoplastiques, polyacrylates et polyesters réticulés par aminorésine, polyesters et polyacrylates réticulés par polyisocyanate, résines phénol/formaldéhyde, urée/formaldéhyde et mélamine/formaldéhyde, résines alkyde siccatives et non siccatives, résines alkydes, résines polyester, résines acrylate réticulées avec des résines mélamine, résines urée, isocyanates, isocyanurates, carbamates et résines époxy, résines époxy réticulées dérivées de composés glycidyle aliphatiques, cycloaliphatiques, hétérocycliques et aromatiques, qui sont réticulés avec des anhydrides ou des amines, polysiloxanes, polymères formés par addition de Michael, amines, amines bloquées avec des composés insaturés et méthylène activés, cétimines avec des composés insaturés et méthylène activés, polycétimines en combinaison avec des résines acryliques-polyacétoacétate insaturées, polycétimines en combinaison avec des résines acryliques insaturées, compositions durcissables par rayonnement, résines époxymélamine, colorants organiques, produits cosmétiques, formulations de papier à base de cellulose, papier pour film photographique, fibres, cires, encres et mélanges de ceux-ci, le procédé comprenant l'ajout d'une quantité stabilisante d'une composition de stabilisant selon l'une quelconque des revendications 1-11 au matériau.

FIG. 1



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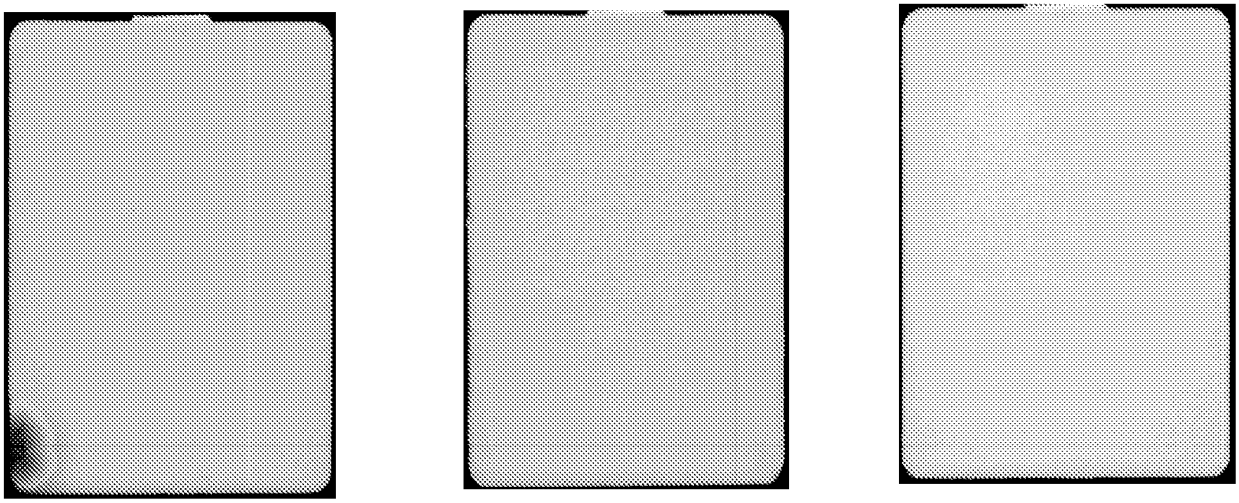

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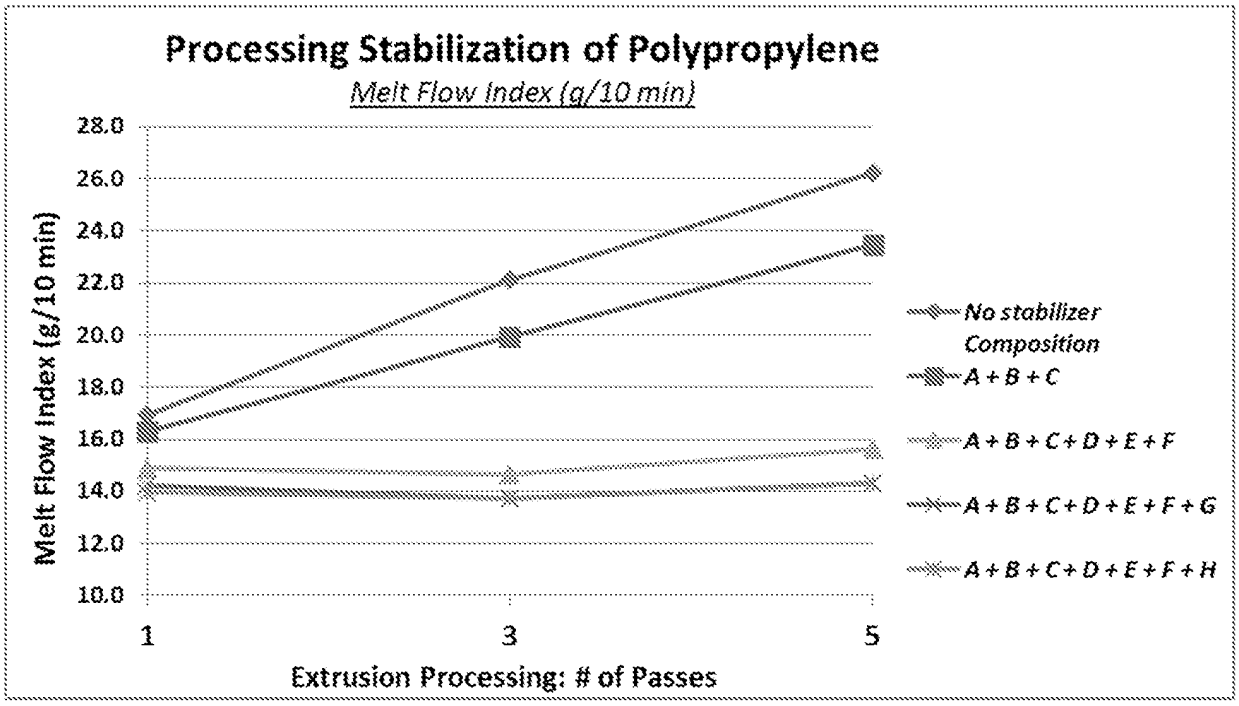
Processing Stabilization of Polypropylene
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Melt Flow Index (g/10 min)
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26.0
24.0
22.0
20.0
18.0
16.0
14.0
12.0
10.0
1
3
5
Extrusion Processing: # of Passes
No stabilizer Composition
A + B + C
A + B + C + D + E + F
A + B + C + D + E + F + G
A + B + C + D + E + F + H

REFERENCES CITED IN THE DESCRIPTION

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