Additive mixtures

Field of the invention

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

Background of the invention

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

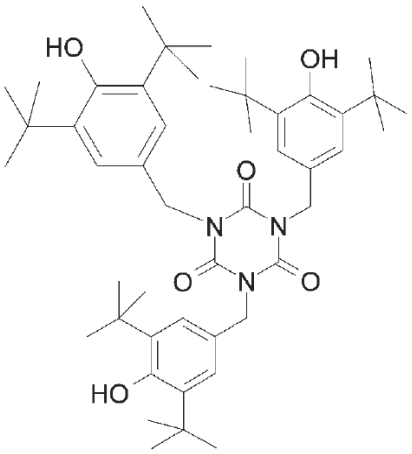
Hence, retaining the properties such as stability of the polymer when exposed to the UV light and reducing the tendency of a polymer to bloom is highly desirable.

Thus, an object of the present invention is to provide additive mixture that stabilizes an organic material which is susceptible to oxidative, thermal or light-induced degradation. Another object of the present invention is to provide an additive mixture, which when used in organic material, provides a surface that shows no stickiness to the organic material articles and that shows no blooming/exudation from the organic material articles.

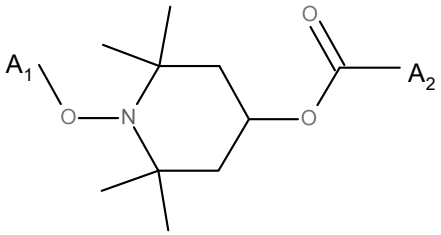
Summary

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

Thus, the present disclosure is directed to an additive mixture comprising a compound of formula (1) and a compound of formula (2)



(1),



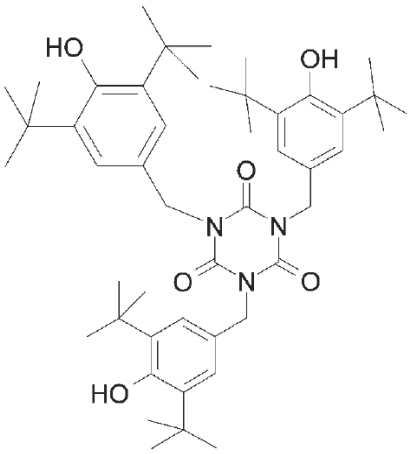
(2),

wherein

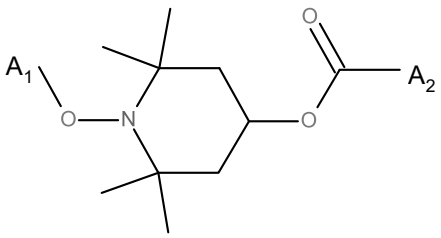
A_1 is linear or branched, substituted or unsubstituted C_1 to C_{20} alkyl, and

A_2 is linear or branched, substituted or unsubstituted C_1 to C_{30} alkyl.

In another aspect, the present disclosure is directed to an additive mixture comprising a compound of formula (1) and a compound of formula (2)



(1),



(2),

wherein

A_1 is linear or branched, substituted or unsubstituted C_1 to C_{20} alkyl, and

A_2 is linear or branched, substituted or unsubstituted C_1 to C_{30} alkyl; and

at least one compound other than compounds (1) and (2) selected from the group of hindered amine light stabilizers.

In another aspect, the present disclosure is directed to a composition comprising

a) an organic material which is susceptible to oxidative, thermal or light-induced degradation; and

b) an additive mixture as defined above.

In another aspect, the present disclosure is directed to an automotive interior or exterior material made of a composition as defined above.

In another example, the present disclosure is directed to an automotive interior or exterior material made of a composition comprising an organic material and an additive mixture as defined above.

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

In another aspect, the present disclosure is directed to the use of the additive mixture defined above as light stabilizer for organic material susceptible to light-induced degradation.

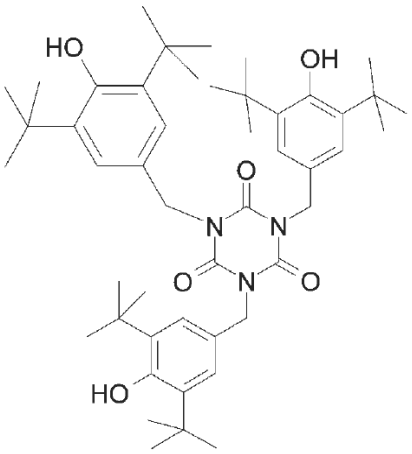
In still another example, the present disclosure is directed to the use of the additive mixture as light stabilizer for organic material susceptible to light-induced degradation.

Detailed Description of the Invention

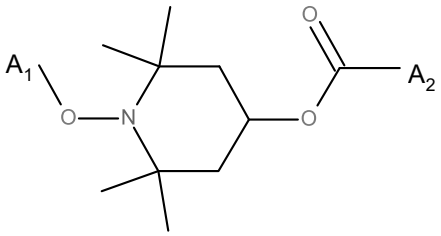
Before the present compositions and formulations of the invention are described, it is to be under-stood that this invention is not limited to particular compositions and formulations described, since such compositions and formulation may, of course, vary. It is also to be understood that the terminology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

Claims

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



(1),



(2),

wherein

A_1 is linear or branched, substituted or unsubstituted C_1 to C_{20} alkyl, and

A_2 is linear or branched, substituted or unsubstituted C_1 to C_{30} alkyl; and

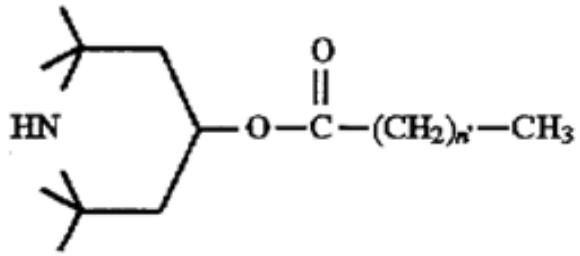
at least one compound other than compounds (1) and (2) selected from the group of hindered amine light stabilizers.

2. The additive mixture according to claim 1, wherein A_1 is linear or branched, hydroxyl-substituted C_1-C_{20} alkyl, and A_2 is linear or branched, unsubstituted C_1 to C_{30} alkyl.

3. The additive mixture according to claim 1 or 2, wherein A_1 is 2-hydroxy-2-methylpropyl, and A_2 is C_{15}-C_{17} alkyl.

4. The additive mixture according to one or more of claims 1 to 3, wherein the weight ratio of the compound of formula (1) to compound of formula (2) is in the range of from 5:95 to 95:5.

5. The additive mixture according to one or more of claims 1 to 4, further comprising an additive, other than additives as defined in claim 1, selected from a hydroxyphenyl triazine UV absorber, a compound of formula (C-I-8)



(C-I-8),

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

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

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

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

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

9. A composition comprising

a) an organic material which is susceptible to oxidative, thermal or light-induced degradation; and

b) an additive mixture as defined in one or more of claims 1 to 8.

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

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

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

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

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

15. The composition according to one or more of claims 9 to 14, wherein the anti-scratch agent is selected from the group consisting of an unsaturated or saturated fatty acid amide, a poly(organo)siloxane, and mixtures thereof.

16. An automotive interior or exterior material made of a composition according to any of claims 9 to 15.

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

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