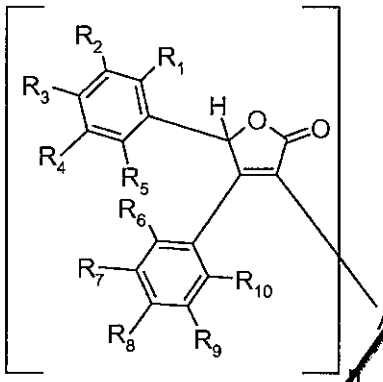
Claims

1. A composition, which comprises

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

b) a compound of formula I



(I),

wherein

when n is 1

A is -C(=O)-OR'$_1$, -C(=O)-N(R'$_2$)(R'$_3$), -CN, phenyl, which is unsubstituted or substituted by one or more C_1-C_8-alkyl, C_1-C_4-alkoxy, C_5-C_7-cycloalkyl or halogen, -H or -SO_2-phenyl;

when n is 2

A is -C(=O)-O-Z_1-O-C(=O)-, -C(=O)-N(R"$_1$)-Z_2-N(R"$_2$)-C(=O)- or piperazine-N,N'-biscarbonyl;

when n is 3

A is C_3-C_{12}-alkane-tri-(oxycarbonyl), 3-ethyl-3-azapentane-1,5,2'-tri-(oxycarbonyl), 1,4,7-triazaheptane-1,4,7-tricarbonyl, 1,4,8-triazaoctane-1,4,8-tricarbonyl or 1,5,9-triazanonane-1,5,9-tricarbonyl;

when n is 4

A is C_4-C_{16}-alkane-tetra-(oxycarbonyl), 1,4,7,10-tetraazadecane-1,4,7,10-tetracarbonyl, 1,4,8,11-tetraazaundecane-1,4,8,11-tetracarbonyl or 1,5,8,12-tetraazadodecane-1,5,8,12-tetracarbonyl;

n is 1, 2, 3 or 4;

R_1, R_2, R_3, R_4, R_5, R_6, R_7, R_8, R_9 and R_{10} are independently from each other H, C_1-C_8-alkyl, C_4-C_8-cycloalkyl, phenyl, C_1-C_4-alkoxy or halogen;

R'$_1$ is H, C_1-C_{22}-alkyl, C_2-C_{18}-alkenyl, C_3-C_{12}-alkine-yl, C_4-C_8-cycloalkyl, which is unsubstituted or substituted by one to three C_1-C_4-alkyl, C_4-C_8-cycloalkyl-C_1-C_4-alkyl, bicyclic or tricyclic C_5-C_{20}-alkyl, C_6-C_{14}-aryl-C_1-C_4-alkyl, C_2-C_{12}-alkyl, which is substituted by one or more hydroxyl groups, C_4-C_{12}-alkyl, which is interrupted by one or more oxygen atoms, C_4-C_{18}-alkyl, which is interrupted by one sulfur atom, 2,2,6,6-tetramethylpiperidine-4-yl, 1-(C_1-C_8-alkyl)-2,2,6,6-tetramethylpiperidine-4-yl or 1-(C_1-C_8-alkoxy)-2,2,6,6-tetramethylpiperidine-4-yl;

R'_2 and R'_3 are independently from each other H, C_1-C_{22}-alkyl, C_2-C_{18}-alkenyl, C_4-C_8-cycloalkyl, which is unsubstituted or substituted by one to three C_1-C_4-alkyl, C_6-C_{10}-aryl, C_4-C_8-cycloalkyl-C_1-C_4-alkyl, C_6-C_{14}-aryl-C_1-C_4-alkyl, C_2-C_8-alkyl, which is substituted by one hydroxyl group, 2,2,6,6-tetramethylpiperidine-4-yl, 1-(C_1-C_8-alkyl)-2,2,6,6-tetramethylpiperidine-4-yl or 1-(C_1-C_8-alkoxy)-2,2,6,6-tetramethylpiperidine-4-yl, or R'_2 and R'_3 form together with the nitrogen atom to which they are attached a 5-, 6- or 7-membered saturated heterocycle;

R''_1 and R''_2 are independently from each other H, C_1-C_{22}-alkyl, C_2-C_{18}-alkenyl, C_4-C_8-cycloalkyl, which is unsubstituted or substituted by one to three C_1-C_4-alkyl, C_4-C_8-cycloalkyl-C_1-C_4-alkyl, C_6-C_{14}-aryl-C_1-C_4-alkyl;

Z_1 is C_2-C_{12}-alkylene, C_4-C_8-cycloalkylene, C_4-C_8-cycloalkane-bis-(C_1-C_4-alkylene), C_6-C_{14}-arene-bis-(C_1-C_4-alkylene), C_3-C_6-alkylene, which is substituted by one or more hydroxyl groups, C_4-C_{12}-alkylene, which is interrupted by one or more oxygen atoms, hexahydro-furo[3,2-b]furane-3,6-diyl, C_4-C_8-alkylene, which is interrupted by a sulfur atom, 3-(C_1-C_8-alkyl)-3-azapentane-1,5-diyl, 4-(C_1-C_8-alkyl)-4-azaheptane-1,7-diyl or 1-ethyl-2,2,6,6-tetramethylpiperidine-4,2'-diyl; and

Z_2 is C_2-C_{12}-alkylene, C_4-C_8-cycloalkylene, C_6-C_{14}-arylene, C_4-C_8-cycloalkane-bis(C_1-C_4-alkylene), C_6-C_{14}-arene-bis-(C_1-C_4-alkylene), C_4-C_{12}-alkylene, which is interrupted by one or more oxygen atoms, 3-(C_1-C_8-alkyl)-3-azapentane-1,5-diyl or 4-(C_1-C_8-alkyl)-4-azaheptane-1,7-diyl.

2. A composition according to claim 1, wherein at formula I

when n is 1

A is -C(=O)-OR'_1, -C(=O)-N(R'_2)(R'_3), -CN, phenyl, which is unsubstituted or substituted by one to three C_1-C_8-alkyl or C_1-C_4-alkoxy, -H or -SO_2-phenyl;

when n is 2

A is -C(=O)-O-Z_1-O-C(=O)-, -C(=O)-N(R''_1)-Z_2-N(R''_2)-C(=O)- or piperazine-N,N'-biscarbonyl;

when n is 3

A is propane-1,2,3-tri-(oxycarbonyl), 2-methyl-propane-1,2,3-tri-(oxycarbonyl), 2-methyl-butane-1,2,1'-tri-(oxycarbonyl), 2,2-dimethyl-butane-1,1',1''-tri-(oxycarbonyl), 2,2-dimethyl-pentane-1,1',1''-tri-(oxycarbonyl), 3-ethyl-3-azapentane-1,5,2'-tri-(oxycarbonyl);

when n is 4

A is 2,2-dimethyl-propane-1,3,1',1''-tetra-(oxycarbonyl);

n is 1, 2, 3 or 4;

R_1, R_2, R_3, R_4, R_5, R_6, R_7, R_8, R_9 and R_{10} are independently from each other H, C_1-C_8-alkyl, phenyl or C_1-C_4-alkoxy with the proviso that at least R_1 or R_5 is H and at least R_6 or R_{10} is H;

R'_1 is H, C_1-C_{22}-alkyl, C_2-C_{18}-alkenyl, C_5-C_7-cycloalkyl, which is unsubstituted or substituted by one C_1-C_4-alkyl, C_5-C_7-cycloalkyl-C_1-C_4-alkyl, C_6-C_{10}-aryl-C_1-C_4-alkyl, C_4-C_{12}-alkyl, which is interrupted by one or more oxygen atoms, 2,2,6,6-tetramethylpiperidine-

4-yl, 1-(C_1-C_6-alkyl)-2,2,6,6-tetramethylpiperidine-4-yl or 1-(C_1-C_6-alkoxy)-2,2,6,6-tetramethylpiperidine-4-yl;
R'$_2$ and R'$_3$ are independently from each other H, C_1-C_{22}-alkyl, C_2-C_{18}-alkenyl, C_5-C_7-cycloalkyl, which is unsubstituted or substituted by one C_1-C_4-alkyl, C_6-C_{10}-aryl, C_5-C_7-cycloalkyl-C_1-C_4-alkyl, C_6-C_{10}-aryl-C_1-C_4-alkyl, 2,2,6,6-tetramethylpiperidine-4-yl, 1-(C_1-C_6-alkyl)-2,2,6,6-tetramethylpiperidine-4-yl or 1-(C_1-C_6-alkoxy)-2,2,6,6-tetramethylpiperidine-4-yl, or R'$_2$ and R'$_3$ form together with the nitrogen atom to which they are attached a pyrrolidine, a piperidine or a morpholine;
R"$_1$ and R"$_2$ independently from each other H, C_1-C_{22}-alkyl, C_2-C_{18}-alkenyl, C_5-C_7-cycloalkyl, which is unsubstituted or substituted by one C_1-C_4-alkyl, C_5-C_7-cycloalkyl-C_1-C_4-alkyl, C_6-C_{10}-aryl-C_1-C_4-alkyl;
Z_1 is C_2-C_{12}-alkylene, C_5-C_7-cycloalkylene, C_5-C_7-cycloalkane-bis-(C_1-C_4-alkylene), C_6-C_{10}-arene-bis-(C_1-C_4-alkylene), C_3-C_6-alkylene, which is substituted by one or more hydroxyl groups, C_4-C_{12}-alkylene, which is interrupted by one or more oxygen atoms, C_4-C_8-alkylene, which is interrupted by a sulfur atom, 3-(C_1-C_4-alkyl)-3-azapentane-1,5-diyl, 4-(C_1-C_4-alkyl)-4-azaheptane-1,7-diyl or 1-ethyl-2,2,6,6-tetramethylpiperidine-4,2'-diyl; and
Z_2 is C_2-C_{12}-alkylene, C_5-C_7-cycloalkylene, C_6-C_{14}-arylene, C_5-C_7-cycloalkane-bis(C_1-C_4-alkylene), C_6-C_{10}-arene-bis-(C_1-C_4-alkylene), C_4-C_{12}-alkylene, which is interrupted by one or more oxygen atoms, 3-(C_1-C_4-alkyl)-3-azapentane-1,5-diyl or 4-(C_1-C_4-alkyl)-4-azaheptane-1,7-diyl.

3. A composition according to claims 1 or 2, wherein at formula I
when n is 1
A is -C(=O)-OR'$_1$, -C(=O)-N(R'$_2$)(R'$_3$), -CN, phenyl, -H or -SO_2-phenyl;
when n is 2
A is -C(=O)-O-Z_1-O-C(=O)-;
n is 1 or 2;
R_1, R_2, R_4, R_5, R_6, R_7, R_9 and R_{10} are H;
R_3 and R_8 are independently from each other H or C_1-C_4-alkoxy;
R'$_1$ is H, C_1-C_{12}-alkyl, C_5-C_7-cycloalkyl, which is unsubstituted, phenyl-C_1-C_4-alkyl, 1-(C_1-C_6-alkyl)-2,2,6,6-tetramethylpiperidine-4-yl or 1-(C_1-C_6-alkoxy)-2,2,6,6-tetramethylpiperidine-4-yl;
R'$_2$ and R'$_3$ are independently from each other H, C_1-C_{12}-alkyl, C_5-C_7-cycloalkyl, which is unsubstituted, C_6-C_{10}-aryl, phenyl-C_1-C_4-alkyl, 1-(C_1-C_6-alkyl)-2,2,6,6-tetramethylpiperidine-4-yl or 1-(C_1-C_6-alkoxy)-2,2,6,6-tetramethylpiperidine-4-yl, or R'$_2$ and R'$_3$ form together with the nitrogen atom to which they are attached a pyrrolidine, a piperidine or a morpholine; and
Z_1 is C_5-C_7-cycloalkylene.

4. A composition according to anyone of claims 1 to 3, wherein the organic material is selected from the group consisting of a polymer, a wax, a mineral oil and a fat.

5. A composition according to anyone of claims 1 to 4, wherein the organic material is a polymer, which is semi-synthetic or synthetic.

6. A composition according to claim 5, wherein component a) is a polyolefin, a polyether polyol or a polyurethane.

7. A composition according to anyone of claims 1 to 6, wherein component b) is contained in an amount of 0.0005% to 10% based on the weight of component a).

8. A composition according to anyone of claims 1 to 7, which comprises as component c) a further additive.

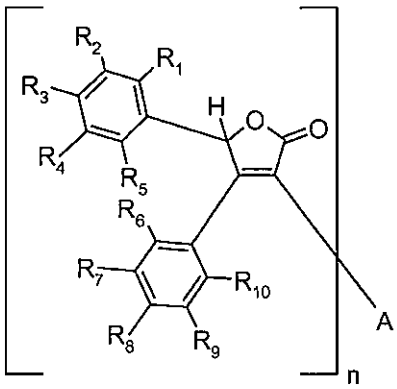
9. A composition according to claim 8, which comprises as component c) an additive selected from the group consisting of a phosphite or phosphonite, an acid scavenger, a phenolic antioxidant and an aminic antioxidant.

10. A composition according to claims 8 or 9, wherein the weight ratio of component b) to component c) is from 4 : 1 to 1 : 20.

11. A composition according to anyone of claims 8 to 10, which comprises as component d) a second further additive selected from the group consisting of a phosphite or phosphonite, an acid scavenger, a phenolic antioxidant or an aminic antioxidant.

12. A process for protection of an organic material susceptible to oxidative, thermal or light-induced degradation, which comprises the step of incorporation into or application onto an organic material as defined in claim 1 a compound of formula I as defined in claim 1.

13. A compound of formula I



(I),

wherein

when n is 1

A is -C(=O)-OR'$_1$, -C(=O)-N(R'$_2$)(R'$_3$) or -SO$_2$-phenyl;

when n is 2
A is -C(=O)-O-Z_1-O-C(=O)-, -C(=O)-N(R''_1)-Z_2-N(R''_2)-C(=O)- or piperazine-N,N'-biscarbonyl;
when n is 3
A is C_3-C_{12}-alkane-tri-(oxycarbonyl), 3-ethyl-3-azapentane-1,5,2'-tri-(oxycarbonyl), 1,4,7-triazaheptane-1,4,7-tricarbonyl, 1,4,8-triazaoctane-1,4,8-tricarbonyl or 1,5,9-triazanonane-1,5,9-tricarbonyl;
when n is 4
A is C_4-C_{16}-alkane-tetra-(oxycarbonyl), 1,4,7,10-tetraazadecane-1,4,7,10-tetracarbonyl, 1,4,8,11-tetraazaundecane-1,4,8,11-tetracarbonyl or 1,5,8,12-tetraazadodecane-1,5,8,12-tetracarbonyl;
n is 1, 2, 3 or 4;
R_1, R_2, R_3, R_4, R_5, R_6, R_7, R_8, R_9 and R_{10} are independently from each other H, C_1-C_8-alkyl, C_4-C_8-cycloalkyl, phenyl, C_1-C_4-alkoxy or halogen;
R'_1 is H, C_1-C_{22}-alkyl, C_2-C_{18}-alkenyl, C_3-C_{12}-alkine-yl, C_4-C_8-cycloalkyl, which is unsubstituted or substituted by one to three C_1-C_4-alkyl, C_4-C_8-cycloalkyl-C_1-C_4-alkyl, bicyclic or tricyclic C_5-C_{20}-alkyl, C_6-C_{14}-aryl-C_1-C_4-alkyl, C_2-C_{18}-alkyl, which is substituted by one or more hydroxyl groups, C_4-C_{12}-alkyl, which is interrupted by one or more oxygen atoms, C_4-C_{18}-alkyl, which is interrupted by one sulfur atom, 2,2,6,6-tetramethylpiperidine-4-yl, 1-(C_1-C_8-alkyl)-2,2,6,6-tetramethylpiperidine-4-yl or 1-(C_1-C_8-alkoxy)-2,2,6,6-tetramethylpiperidin-4-yl;
R'_2 and R'_3 are independently from each other H, C_1-C_{22}-alkyl, C_2-C_{18}-alkenyl, C_4-C_8-cycloalkyl, which is unsubstituted or substituted by one to three C_1-C_4-alkyl, C_6-C_{10}-aryl, C_4-C_8-cycloalkyl-C_1-C_4-alkyl, C_6-C_{14}-aryl-C_1-C_4-alkyl, C_2-C_6-alkyl, which is substituted by a hydroxyl group, 2,2,6,6-tetramethylpiperidine-4-yl, 1-(C_1-C_8-alkyl)-2,2,6,6-tetramethylpiperidine-4-yl or 1-(C_1-C_8-alkoxy)-2,2,6,6-tetramethylpiperidine-4-yl, or R'_2 and R'_3 form together with the nitrogen atom to which they are attached a 5-, 6- or 7-membered saturated heterocycle;
R''_1 and R''_2 are independently from each other H, C_1-C_{22}-alkyl, C_2-C_{18}-alkenyl, C_4-C_8-cycloalkyl, which is unsubstituted or substituted by one to three C_1-C_4-alkyl, C_4-C_8-cycloalkyl-C_1-C_4-alkyl, C_6-C_{14}-aryl-C_1-C_4-alkyl;
Z_1 is C_2-C_{12}-alkylene, C_4-C_8-cycloalkylene, C_4-C_8-cycloalkane-bis-(C_1-C_4-alkylene), C_6-C_{14}-arene-bis-(C_1-C_4-alkylene), C_3-C_6-alkylene, which is substituted by one or more hydroxyl groups, C_4-C_{12}-alkylene, which is interrupted by one or more oxygen atoms, hexahydrofuro[3,2-b]furane-3,6-diyl, C_4-C_8-alkylene, which is interrupted by a sulfur atom, 3-(C_1-C_8-alkyl)-3-azapentane-1,5-diyl, 4-(C_1-C_8-alkyl)-4-azaheptane-1,7-diyl or 1-ethyl-2,2,6,6-tetramethylpiperidine-4,2'-diyl; and
Z_2 is C_2-C_{12}-alkylene, C_4-C_8-cycloalkylene, C_6-C_{14}-arylene, C_4-C_8-cycloalkane-bis-(C_1-C_4-alkylene), C_6-C_{14}-arene-bis-(C_1-C_4-alkylene), C_4-C_{12}-alkylene, which is interrupted by one or more oxygen atoms, 3-(C_1-C_8-alkyl)-3-azapentane-1,5-diyl or 4-(C_1-C_8-alkyl)-4-azaheptane-1,7-diyl.

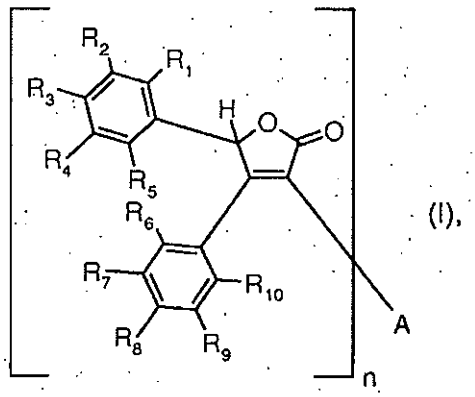
14. A compound of formula I according to claim 13, wherein
when n is 1
A is -C(=O)-OR'$_1$ or -C(=O)-N(R'$_2$)(R'$_3$);
when n is 2
A is -C(=O)-O-Z_1-O-C(=O)-, -C(=O)-N(R"$_1$)-Z_2-N(R"$_2$)-C(=O)- or piperazine-N,N'-biscarbonyl;
when n is 3
A is C_3-C_{12}-alkane-tri-(oxycarbonyl);
when n is 4
A is C_4-C_{16}-alkane-tetra-(oxycarbonyl);
n is 1, 2, 3 or 4;
R_1, R_2, R_3, R_4, R_5, R_6, R_7, R_8, R_9 and R_{10} are independently from each other H, C_1-C_8-alkyl, C_4-C_8-cycloalkyl, phenyl, C_1-C_4-alkoxy or halogen;
R'$_1$ is H, C_1-C_{22}-alkyl, C_2-C_{18}-alkenyl, C_3-C_{12}-alkine-yl, C_4-C_8-cycloalkyl, which is unsubstituted or substituted by one to three C_1-C_4-alkyl, C_4-C_8-cycloalkyl-C_1-C_4-alkyl, bicyclic or tricyclic C_5-C_{20}-alkyl, C_6-C_{14}-aryl-C_1-C_4-alkyl, C_2-C_{12}-alkyl, which is substituted by one or more hydroxyl groups, C_4-C_{12}-alkyl, which is interrupted by one or more oxygen atoms, C_4-C_{18}-alkyl, which is interrupted by one sulfur atom, 2,2,6,6-tetramethylpiperidine-4-yl, 1-(C_1-C_8-alkyl)-2,2,6,6-tetramethylpiperidin-4-yl or 1-(C_1-C_8-alkoxy)-2,2,6,6-tetramethylpiperidine-4-yl;
R'$_2$ and R'$_3$ are independently from each other H, C_1-C_{22}-alkyl, C_2-C_{18}-alkenyl, C_4-C_8-cycloalkyl, which is unsubstituted or substituted by one to three C_1-C_4-alkyl, C_6-C_{10}-aryl, C_4-C_8-cycloalkyl-C_1-C_4-alkyl, C_6-C_{14}-aryl-C_1-C_4-alkyl, C_2-C_6-alkyl, which is substituted by a hydroxyl group, 2,2,6,6-tetramethylpiperidine-4-yl, 1-(C_1-C_8-alkyl)-2,2,6,6-tetramethylpiperidine-4-yl or 1-(C_1-C_8-alkoxy)-2,2,6,6-tetramethylpiperidine-4-yl, or R'$_2$ and R'$_3$ form together with the nitrogen atom to which they are attached a 5-, 6- or 7-membered saturated heterocycle;
R"$_1$ and R"$_2$ are independently from each other H, C_1-C_{22}-alkyl, C_2-C_{18}-alkenyl, C_4-C_8-cycloalkyl, which is unsubstituted or substituted by one to three C_1-C_4-alkyl, C_4-C_8-cycloalkyl-C_1-C_4-alkyl, C_6-C_{14}-aryl-C_1-C_4-alkyl;
Z_1 is C_2-C_{12}-alkylene, C_4-C_8-cycloalkylene, C_4-C_8-cycloalkane-bis-(C_1-C_4-alkylene), C_6-C_{14}-arene-bis-(C_1-C_4-alkylene), C_3-C_6-alkylene, which is substituted by one or more hydroxyl groups, C_4-C_{12}-alkylene, which is interrupted by one or more oxygen atoms, hexahydro-furo[3,2-b]furane-3,6-diyl, C_4-C_8-alkylene, which is interrupted by a sulfur atom, 3-(C_1-C_8-alkyl)-3-azapentane-1,5-diyl, 4-(C_1-C_8-alkyl)-4-azaheptane-1,7-diyl or 1-ethyl-2,2,6,6-tetramethylpiperidine-4,2'-diyl; and
Z_2 is C_2-C_{12}-alkylene, C_4-C_8-cycloalkylene, C_6-C_{14}-arylene, C_4-C_8-cycloalkane-bis-(C_1-C_4-alkylene), C_6-C_{14}-arene-bis-(C_1-C_4-alkylene), C_4-C_{12}-alkylene, which is interrupted by one or more oxygen atoms, 3-(C_1-C_8-alkyl)-3-azapentane-1,5-diyl or 4-(C_1-C_8-alkyl)-4-azaheptane-1,7-diyl.

15. Use of a compound of formula I as defined in claim 1 for stabilizing an organic material susceptible to oxidative, thermal or light-induced degradation against degradation by oxidation, heat or light.

Claims

1. A composition, which comprises

a) an organic material susceptible to oxidative, thermal or light-induced degradation; and
b) a compound of formula I



(I),

wherein
when n is 1
A is -C(=O)-OR'$_1$ -C(=O)-N(R'$_2$)(R'$_3$), -CN, phenyl, which is unsubstituted or substituted by one or more C_1-C_8-alkyl, C_1-C_4-alkoxy, C_5-C_7-cycloalkyl or halogen, -H or -SO_2-phenyl;
when n is 2
A is -C(=O)-O-Z_1-O-C(=O)-, -C(=O)-N(R"$_1$)-Z_2-N(R"$_2$)-C(=O)- or piperazine-N,N'-biscarbonyl;
when n is 3
A is C_3-C_{12}-alkane-tri-(oxycarbonyl), 3-ethyl-3-azapentane-1,5,2'-tri-(oxycarbonyl), 1,4,7-triazaheptane-1,4,7-tricarbonyl, 1,4,8-triazaoctane-1,4,8-tricarbonyl or 1,5,9-triazanonane-1,5,9-tricarbonyl;
when n is 4
A is C_4-C_{16}-alkane-tetra-(oxycarbonyl), 1,4,7,10-tetraazadecane-1,4,7,10-tetracarbonyl, 1,4,8,11-tetraazaundecane-1,4,8,11-tetracarbonyl or 1,5,8,12-tetraazadodecane-1,5,8,12-tetracarbonyl;
n is 1, 2, 3 or 4;
R_1, R_2, R_3, R_4, R_5, R_6, R_7, R_8, R_9 and R_{10} are independently from each other H, C_1-C_8-alkyl, C_4-C_8-cycloalkyl, phenyl, C_1-C_4-alkoxy or halogen;
R'$_1$ is H, C_1-C_{22}-alkyl, C_2-C_{18}-alkenyl, C_3-C_{12}-alkine-yl, C_4-C_8-cycloalkyl, which is unsubstituted or substituted by one to three C_1-C_4-alkyl, C_4-C_8-cycloalkyl-C_1-C_4-alkyl, bicyclic or tricyclic C_5-C_{20}-alkyl, C_6-C_{14}-aryl-C_1-C_4-alkyl, C_2-C_{12}-alkyl, which is substituted by one or more hydroxyl groups, C_4-C_{12}-alkyl, which is interrupted by one or more oxygen atoms, C_4-C_{18}-alkyl, which is interrupted by one sulfur atom, 2,2,6,6-tetramethylpiperidine-4-yl, 1-(C_1-C_8-alkyl)-2,2,6,6-tetramethylpiperidine-4-yl or 1-(C_1-C_8-alkoxy)-2,2,6,6-tetramethylpiperidine-4-yl;
R'$_2$ and R'$_3$ are independently from each other H, C_1-C_{22}-alkyl, C_2-C_{18}-alkenyl, C_4-C_8-cycloalkyl, which is unsubstituted or substituted by one to three C_1-C_4-alkyl, C_6-C_{10}-aryl, C_4-C_8-cycloalkyl-C_1-C_4-alkyl, C_6-C_{14}-aryl-C_1-C_4-alkyl, C_2-C_8-alkyl, which is substituted by one hydroxyl group, 2,2,6,6-tetramethylpiperidine-4-yl,

1-(C_1-C_8-alkyl)-2,2,6,6-tetramethylpiperidine-4-yl or 1-(C_1-C_8-alkoxy)-2,2,6,6-tetramethylpiperidine-4-yl, or R'_2 and R'_3 form together with the nitrogen atom to which they are attached a 5-, 6- or 7-membered saturated heterocycle;

R''_1 and R''_2 are independently from each other H, C_1-C_{22}-alkyl, C_2-C_{18}-alkenyl, C_4-C_8-cycloalkyl, which is unsubstituted or substituted by one to three C_1-C_4-alkyl, C_4-C_8-cycloalkyl-C_1-C_4-alkyl, C_6-C_{14}-aryl-C_1-C_4-alkyl;

Z_1 is C_2-C_{12}-alkylene, C_4-C_8-cycloalkylene, C_4-C_8-cycloalkane-bis-(C_1-C_4-alkylene), C_6-C_{14}-arene-bis-(C_1-C_4-alkylene), C_3-C_6-alkylene, which is substituted by one or more hydroxyl groups, C_4-C_{12}-alkylene, which is interrupted by one or more oxygen atoms, hexahydro-furo[3,2-b]furane-3,6-diyl, C_4-C_8-alkylene, which is interrupted by a sulfur atom, 3-(C_1-C_8-alkyl)-3-azapentane-1,5-diyl, 4-(C_1-C_8-alkyl)-4-azaheptane-1,7-diyl or 1-ethyl-2,2,6,6-tetramethylpiperidine-4,2'-diyl; and

Z_2 is C_2-C_{12}-alkylene, C_4-C_8-cycloalkylene, C_6-C_{14}-arylene, C_4-C_8-cycloalkane-bis(C_1-C_4-alkylene), C_6-C_{14}-arene-bis-(C_1-C_4-alkylene), C_4-C_{12}-alkylene, which is interrupted by one or more oxygen atoms, 3-(C_1-C_8-alkyl)-3-azapentane-1,5-diyl or 4-(C_1-C_8-alkyl)-4-azaheptane-1,7-diyl.

2. A composition according to claim 1, wherein at formula I

when n is 1

A is -C(=O)-OR'_1, -C(=O)-N(R'_2)(R'_3), -CN, phenyl, which is unsubstituted or substituted by one to three C_1-C_8-alkyl or C_1-C_4-alkoxy, -H or -SO_2-phenyl;

when n is 2

A is -C(=O)-O-Z_1-O-C(=O)-, -C(=O)-N(R''_1)-Z_2-N(R''_2)-C(=O)- or piperazine-N,N'-biscarbonyl;

when n is 3

A is propane-1,2,3-tri-(oxycarbonyl), 2-methyl-propane-1,2,3-tri-(oxycarbonyl), 2-methyl-butane-1,2,1'-tri-(oxycarbonyl), 2,2-dimethy)-butane-1,1',1''-tri-(oxycarbonyl), 2,2-dimethyl-pentane-1,1',1''-tri-(oxycarbonyl), 3-ethyl-3-azapentane-1,5,2'-tri-(oxycarbonyl);

when n is 4

A is 2,2-dimethyl-propane-1,3,1',1''-tetra-(oxycarbonyl);

n is 1, 2, 3 or 4;

R_1, R_2, R_3, R_4, R_5, R_6, R_7, R_8, R_9 and R_{10} are independently from each other H, C_1-C_8-alkyl, phenyl or C_1-C_4-alkoxy with the proviso that at least R_1 or R_5 is H and at least R_8 or R_{10} is H;

R'_1 is H, C_1-C_{22}-alkyl, C_2-C_{18}-alkenyl, C_5-C_7-cycloalkyl, which is unsubstituted or substituted by one C_1-C_4-alkyl, C_5-C_7-cycloalkyl-C_1-C_4-alkyl, C_6-C_{10}-aryl-C_1-C_4-alkyl, C_4-C_{12}-alkyl, which is interrupted by one or more oxygen atoms, 2,2,6,6-tetramethylpiperidine-4-yl, 1-(C_1-C_6-alkyl)-2,2,6,6-tetramethylpiperidine-4-yl or 1-(C_1-C_6-alkoxy)-2,2,6,6-tetramethylpiperidine-4-yl;

R'_2 and R'_3 are independently from each other H, C_1-C_{22}-alkyl, C_2-C_{18}-alkenyl, C_5-C_7-cycloalkyl, which is unsubstituted or substituted by one C_1-C_4-alkyl, C_6-C_{10}-aryl, C_5-C_7-cycloalkyl-C_1-C_4-alkyl, C_6-C_{10}-aryl-C_1-C_4-alkyl, 2,2,6,6-tetramethylpiperidine-4-yl, 1-(C_1-C_6-alkyl)-2,2,6,6-tetramethylpiperidine-4-yl or 1-(C_1-C_6-alkoxy)-2,2,6,6-tetramethylpiperidine-4-yl, or R'_2 and R'_3 form together with the nitrogen atom to which they are attached a pyrrolidine, a piperidine or a morpholine;

R''_1 and R''_2 independently from each other H, C_1-C_{22}-alkyl, C_2-C_{18}-alkenyl, C_5-C_7-cycloalkyl, which is unsubstituted or substituted by one C_1-C_4-alkyl, C_5-C_7-cycloalkyl-C_1-C_4-alkyl, C_6-C_{10}-aryl-C_1-C_4-alkyl;

Z_1 is C_2-C_{12}-alkylene, C_5-C_7-cycloalkylene, C_5-C_7-cycloalkane-bis-(C_1-C_4-alkylene), C_6-C_{10}-arene-bis-(C_1-C_4-alkylene), C_3-C_6-alkylene, which is substituted by one or more hydroxyl groups, C_4-C_{12}-alkylene, which is interrupted by one or more oxygen atoms, C_4-C_8-alkylene, which is interrupted by a sulfur atom, 3-(C_1-C_4-alkyl)-3-azapentane-1,5-diyl, 4-(C_1-C_4-alkyl)-4-azaheptane-1,7-diyl or 1-ethyl-2,2,6,6-tetramethylpiperidine-4,2'-diyl; and Z_2 is C_2-C_{12}-alkylene, C_5-C_7-cycloalkylene, C_6-C_{14}-arylene, C_5-C_7-cycloalkane-bis(C_1-C_4-alkylene), C_6-C_{10}-arene-bis-(C_1-C_4-alkylene), C_4-C_{12}-alkylene, which is interrupted by one or more oxygen atoms, 3-(C_1-C_4-alkyl)-3-azapentane-1,5-diyl or 4-(C_1-C_4-alkyl)-4-azaheptane-1,7-diyl.

3. A composition according to claims 1 or 2, wherein at formula I

when n is 1

A is -C(=O)-OR'_1, -C(=O)-N(R'_2)(R'_3), -CN, phenyl, -H or -SO_2-phenyl;

when n is 2

A is -C(=O)-O-Z_1-O-C(=O)-;

n is 1 or 2;

R_1, R_2, R_4, R_5, R_6, R_7, R_9 and R_{10} are H;

R_3 and R_8 are independently from each other H or C_1-C_4-alkoxy;

R'_1 is H, C_1-C_{12}-alkyl, C_5-C_7-cycloalkyl, which is unsubstituted, phenyl-C_1-C_4-alkyl, 1-(C_1-C_6-alkyl)-2,2,6,6-tetramethylpiperidine-4-yl or 1-(C_1-C_6-alkoxy)-2,2,6,6-tetramethylpiperidine-4-yl; R'_2 and R'_3 are independently from each

other H, C_1-C_{12}-alkyl, C_5-C_7-cycloalkyl, which is unsubstituted, C_6-C_{10}-aryl, phenyl-C_1-C_4-alkyl, 1-(C_1-C_5-alkyl)-2,2,6,6-tetramethylpiperidine-4-yl or 1-(C_1-C_6-alkoxy)-2,2,6,6-tetramethylpiperidine-4-yl, or R'_2 and R'_3 form together with the nitrogen atom to which they are attached a pyrrolidine, a piperidine or a morpholine; and
Z_1 is C_5-C_7-cycloalkylene.

4. A composition according to anyone of claims 1 to 3, wherein the organic material is selected from the group consisting of a polymer, a wax, a mineral oil and a fat.

5. A composition according to anyone of claims 1 to 4, wherein the organic material is a polymer, which is semi-synthetic or synthetic.

6. A composition according to claim 5, wherein component a) is a polyolefin, a polyether polyol or a polyurethane.

7. A composition according to anyone of claims 1 to 6, wherein component b) is contained in an amount of 0.0005% to 10% based on the weight of component a).

8. A composition according to anyone of claims 1 to 7, which comprises as component c) a further additive.

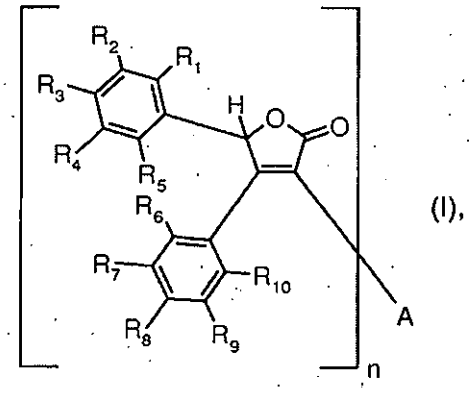
9. A composition according to claim 8, which comprises as component c) an additive selected from the group consisting of a phosphite or phosphonite, an acid scavenger, a phenolic antioxidant and an amihic antioxidant.

10. A composition according to claims 8 or 9, wherein the weight ratio of component b) to component c) is from 4 : 1 to 1 : 20.

11. A composition according to anyone of claims 8 to 10, which comprises as component d) a second further additive selected from the group consisting of a phosphite or phosphonite, an acid scavenger, a phenolic antioxidant or an aminic antioxidant.

12. A process for protection of an organic material susceptible to oxidative, thermal or light-induced degradation, which comprises the step of incorporation into or application onto an organic material as defined in claim 1 a compound of formula I as defined in claim 1.

13. A compound of formula I



(I),

wherein
when n is 1
A is -C(=O)-OR'_1, -C(=O)-$N(R'_2)(R'_3)$ or -SO_2-phenyl;
when n is 2
A is -C(=O)-O-Z_1-O-C(=O)-, -C(=O)-$N(R''_1)$-Z_2-$N(R''_2)$-C(=O)- or piperazine-N,N'-biscarbonyl;
when n is 3
A is C_3-C_{12}-alkane-tri-(oxycarbonyl), 3-ethyl-3-azapentane-1,5,2,-tri-(oxycarbonyl), 1,4,7-triazaheptane-1,4,7-tricarbonyl, 1,4,8-triazaoctane-1,4,8-tricarbonyl or 1,5,9-triazanonane-1,5,9-tricarbonyl;
when n is 4

A is C_4-C_{16}-alkane-tetra-(oxycarbonyl), 1,4,7,10-tetraazadecane-1,4,7,10-tetracarbonyl, 1,4,8,11-tetraazaundecane-1,4,8,11-tetracarbonyl or 1,5,8,12-tetraazadodecane-1,5,8,12-tetracarbonyl;
n is 1, 2, .3 or 4;
R_1, R_2, R_3, R_4, R_5, R_6, R_7, R_8, R_9 and R_{10} are independently from each other H, C_1-C_8-alkyl, C_4-C_8-cycloalkyl, phenyl, C_1-C_4-alkoxy or halogen;
R'_1 is H, C_1-C_{22}-alkyl, C_2-C_{18}-alkenyl, C_3-C_{12}-alkine-yl, C_4-C_8-cycloalkyl, which is unsubstituted or substituted by one to three C_1-C_4-alkyl, C_4-C_8-cycloalkyl-C_1-C_4-alkyl, bicyclic or tricyclic C_5-C_{20}-alkyl, C_6-C_{14}-aryl-C_1-C_4-alkyl, C_2-C_{12}-alkyl, which is substituted by one or more hydroxyl groups, C_4-C_{12}-alkyl, which is interrupted by one or more oxygen atoms, C_4-C_{18}-alkyl, which is interrupted by one sulfur atom, 2,2,6,6-tetramethylpiperidine-4-yl, 1-(C_1-C_8-alkyl)-2,2,6,6-tetramethylpiperidine-4-yl or 1-(C_1-C_8-alkoxy)-2,2,6,6-tetramethylpiperidin-4-yl; R'_2 and R'_3 are independently from each other H, C_1-C_{22}-alkyl, C_2-C_{18}-alkenyl, C_4-C_8-cycloalkyl, which is unsubstituted or substituted by one to three C_1-C_4-alkyl, C_6-C_{10}-aryl, C_4-C_8-cycloalkyl-C_1-C_4-alkyl, C_6-C_{14}-aryl-C_1-C_4-alkyl, C_2-C_6-alkyl, which is substituted by a hydroxyl group, 2,2,6,6-tetramethylpiperidine-4-yl, 1-(C_1-C_8-alkyl)-2,2,6,6-tetramethylpiperidine-4-yl or 1-(C_1-C_8-alkoxy)-2,2,6,6-tetramethylpiperidine-4-yl, or R'_2 and R'_3 form together with the nitrogen atom to which they are attached a 5-, 6- or 7-membered saturated heterocycle;
R''_1 and R''_2 are independently from each other H, C_1-C_{22}-alkyl, C_2-C_{18}-alkenyl, C_4-C_8-cycloalkyl, which is unsubstituted or substituted by one to three C_1-C_4-alkyl, C_4-C_8-cycloalkyl-C_1-C_4-alkyl, C_6-C_{14}-aryl-C_1-C_4-alkyl; Z_1 is C_2-C_{12}-alkylene, C_4-C_8-cycloalkylene, C_4-C_8-cycloalkane-bis-(C_1-C_4-alkylene), C_6-C_{14}-arene-bis-(C_1-C_4-alkylene), C_3-C_6-alkylene, which is substituted by one or more hydroxyl groups, C_4-C_{12}-alkylene, which is interrupted by one or more oxygen atoms, hexahydro-furo[3,2-b]furane-3,6-diyl, C_4-C_8-alkylene, which is interrupted by a sulfur atom, 3-(C_1-C_8-alkyl)-3-azapentane-1,5-diyl, 4-(C_1-C_8-alkyl)-4-azaheptane-1,7-diyl or 1-ethyl-2,2,6,6-tetramethylpiperidine-4,2'-diyl; and
Z_2 is C_2-C_{12}-alkylene, C_4-C_8-cycloalkylene, C_6-C_{14}-arylene, C_4-C_8-cycloalkane-bis-(C_1-C_4-alkylene), C_6-C_{14}-arene-bis-(C_1-C_4-alkylene), C_4-C_{12}-alkylene, which is interrupted by one or more oxygen atoms, 3-(C_1-C_8-alkyl)-3-azapentane-1,5-diyl or 4-(C_1-C_8-alkyl)-4-azaheptane-1,7-diyl.

14. A compound of formula I according to claims 13, wherein
when n is 1
A is -C(=O)-OR'_1 or -C(=O)-N(R'_2)(R'_3);
when n is 2
A is -C(=O)-O-Z_1-O-C(=O)-, -C(=O)-N(R''_1)-Z_2-N(R''_2)-C(=O)- or piperazine-N,N'-biscarbonyl;
when n is 3
A is C_3-C_{12}-alkane-tri-(oxycarbonyl);
when n is 4
A is C_4-C_{16}alkane-tetra-(oxycarbonyl);
n is 1, 2, 3 or 4;
R_1, R_2, R_3, R_4, R_5, R_6, R_7, R_8, R_9 and R_{10} are independently from each other H, C_1-C_8-alkyl, C_4-C_8-cycloalkyl, phenyl, C_1-C_4-alkoxy or halogen;
R'_1 is H, C_1-C_{22}-alkyl, C_2-C_{18}-alkenyl, C_3-C_{12}-alkine-yl, C_4-C_8-cycloalkyl, which is unsubstituted or substituted by one to three C_1-C_4-alkyl, C_4-C_8-cycloalkyl-C_1-C_4-alkyl, bicyclic or tricyclic C_5-C_{20}-alkyl, C_6-C_{14}-aryl-C_1-C_4-alkyl, C_2-C_{12}-alkyl, which is substituted by one or more hydroxyl groups, C_4-C_{12}-alkyl, which is interrupted by one or more oxygen atoms, C_4-C_{18}-alkyl, which is interrupted by one sulfur atom, 2,2,6,6-tetramethylpiperidine-4-yl, 1-(C_1-C_8-alkyl)-2,2,6,6-tetramethylpiperidin-4-yl or 1-(C_1-C_8-alkoxy)-2,2,6,6-tetrarriethylpiperidine-4-yl;
R'_2 and R'_3 are independently from each other H, C_1-C_{22}-alkyl, C_2-C_{18}-alkenyl, C_4-C_8-cycloalkyl, which is unsubstituted or substituted by one to three C_1-C_4-alkyl, C_6-C_{10}-aryl, C_4-C_8-cycloalkyl-C_1-C_4-alkyl, C_6-C_{14}-aryl-C_1-C_4-alkyl, C_2-C_6-alkyl, which is substituted by a hydroxyl group, 2,2,6,6-tetramethylpiperidine-4-yl, 1-(C_1-C_8-alkyl)-2,2,6,6-tetramethylpiperidine-4-yl or 1-(C_1-C_8-alkoxy)-2,2,6,6-tetramethylpiperidine-4-yl, or R'_2 and R'_3 form together with the nitrogen atom to which they are attached a 5-, 6- or 7-membered saturated heterocycle;
R''_1 and R''_2 are independently from each other H, C_1-C_{22}-alkyl, C_2-C_{18}-alkenyl, C_4-C_8-cycloalkyl, which is unsubstituted or substituted by one to three C_1-C_4-alkyl, C_4-C_8-cycloalkyl-C_1-C_4-alkyl, C_6-C_{14}-aryl-C_1-C_4-alkyl;
Z_1 is C_2-C_{12}-alkylene, C_4-C_8-cycloalkylene, C_4-C_8-cycloalkane-bis-(C_1-C_4-alkylene), C_6-C_{14}-arene-bis-(C_1-C_4-alkylene), C_3-C_6-alkylene, which is substituted by one or more hydroxyl groups, C_4-C_{12}-alkylene, which is interrupted by one or more oxygen atoms, hexahydro-furo[3,2-b]furane-3,6-diyl, C_4-C_8-alkylene, which is interrupted by a sulfur atom, 3-(C_1-C_8-alkyl)-3-azapentane-1,5-diyl, 4-(C_1-C_8-alkyl)-4-azaheptane-1,7-diyl or 1-ethy)-2,2,6,6-tetramethylpiperidine-4,2'-diyl; and
Z2 is C_2-C_{12}-alkylene, C_4-C_8-cycloalkylene, C_6-C_{14}-arylene, C_4-C_8-cycloalkane-bis-(C_1-C_4-alkylene), C_6-C_{14}-arene-bis-(C_1-C_4-alkylene), C_4-C_{12}-alkylene, which is interrupted by one or more oxygen atoms, 3-(C_1-C_8-alkyl)-3-azapentane-1,5-diyl or 4-(C_1-C_8-alkyl)-4-azaheptane-1,7-diyl.

15. Use of a compound of formula I as defined in claim 1 for stabilizing an organic material susceptible to oxidative, thermal or light-induced degradation against degradation by oxidation, heat or light.

16. An additive composition, which comprises

    b) a compound of formula I as defined in claim 1, and
    c) a further additive selected from the group consisting of a phosphite or phosphonite, an acid scavenger, a phenolic antioxidant or an aminic antioxidant.

17. An additive composition according to claim 16, wherein the weight ratio of component b) to component c) is from 10 : 1 to 1 : 30.

18. An additive composition according to claims 16 or 17, which comprises as component d) a second further additive.

19. An additive composition according to claim 18, wherein the second further additive is selected from a group consisting of a phosphite or phosphonite, an acid scavenger, a phenolic antioxidant or an aminic antioxidant.

20. An additive composition according to claims 18 or 19, wherein the weight ratio of component b) to component c) is from 10 : 1 to 30 : 1 and the weight ratio of component b) to component d) is form 10 : 1 to 1 : 30.