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(54) **Title:** ANTI TERMITE CABLE SHEATHING COMPRISING AN ALIPHATIC POLYAMIDE X.Y WITH X+Y>18, AN UV ABSORBER AND/OR UV STABILIZER, AND AN ANTIOXIDANT

(57) **Abstract:** The present invention relates to the use of a composition comprising: a) at least one aliphatic polyamide having at least two units corresponding to the following general formula: X.Y in which: X.Y represents a unit obtained by polycondensation of: - a diamine containing X carbon atoms and, - a dicarboxylic acid containing Y carbon atoms, and such that the sum of X+Y is strictly superior to 18, b) at least one UV absorber and eventually at least one UV stabilizer, c) at least one antioxidant, with preferably a weight ratio of antioxidant over light stabilizer being less than or equal to 0.7, to manufacture a mono or multilayer cable sheathing resistant to termite damage. The present invention also relates to a cable sheathing made of a composition according to the invention, a process to manufacture a cable sheathing according to the invention, and the use of a cable sheathing according to the invention in an electric or optical fiber cable.

Anti termite cable sheathing comprising an aliphatic polyamide X.Y with $X+Y>18$, an UV absorber and/or UV stabilizer, and an antioxidant

Technical Field

5 The technical field of the present invention relates to cable sheathings, in particular electric and optical fiber cable sheathing, displaying, among others, excellent termite resistant properties.

10 The invention relates to the use of a composition comprising at least one particular aliphatic polyamide, at least one UV absorber and/or UV stabilizer, and at least one antioxidant, to manufacture a mono or multilayer cable sheathing resistant to termite damage, in particular for electric and optical fiber cables. The cable according to the invention display besides at least an additional property as disclosed further below.

15 In particular, the invention relates to a composition comprising at least one particular aliphatic polyamide, at least one UV absorber and/or UV stabilizer, and at least one antioxidant, with a weight ratio of the total amount of antioxidant over the total amount of UV protective agent being less than or equal to 0.7.

20 The invention also relates to a mono or multilayer cable sheathing constituted of at least one layer of a composition according to the invention; a process to manufacture a cable sheathing from said composition according to the invention; and the use of a mono or multilayer sheathing according to the invention to prevent and/or
25 protect a cable, in particular an electric cable (such as power cable, copper cable) and/or optical fiber cable, from damages of termites and eventually damages from light, heat, wind, water air, humidity, soils, oil, grease, jelly, other insects, and/or bending.

Background Art

30 It is known different ways to protect cable from termite attacks.

 First, cable sheathing and soils were impregnated with insecticide or repellent. However, the difficulty with loading chemical is to practically load insecticide or repellent enough to deter termites

from further attacks. On the other side, putting chemicals in the soils may harm non-target organisms and are dangerous to handle.

Second, cable sheathing layer materials have been chosen to be used as anti termite barrier layers, such as for example metal or hard plastics.

In AU2011253718, it was found that polyethylene terephthalate (PET) was useful as anti termite barrier tape to protect cable from termite attacks. However, this material is improper to be extruded onto the core of a cable due to its high melting temperature (260°C) and low melt viscosity, and thus, requires thermoplastic polymer termite barrier manufacturers who usually use tube extrusions process to make additional investment to implementing new installations to produce cable sheathings.

On the market, it has been known for years to use PA12 or PA11 based grades to make anti termite cable sheathings. However, these materials are very expensive and had to face recently production shortage.

Contents of Invention

Therefore, there is now a need to find new cable sheathing compositions which can be extruded into tubes, are environment friendly, non toxic to human health, and which lead to cable sheathing displaying a broad range of properties and at least antitermite properties. In particular, it is searched a composition which can be used to manufacture antitermite cable sheathing which displays one or several properties to face outdoor conditions especially in tropical and subtropical regions where live most of the termite. For example, mention may be made of light and water resistance after long term exposition, low moisture uptake, mechanical resistance, chemical resistance, resistance to other insects attacks, bending resistance....

When cables are exposed to external environment in particular wind, sun and water (rain, humidity), such as outdoor and overhead cables, cable sheathings shall resist at least to high exposure to sunlight (ultraviolet rays) and/or rain over long term periods. Water should not penetrate underneath the sheathing as it will cause damage to the optical fibers and perturbate the transmitted signal or cause

shortcircuit to electric cable. Therefore, it is searched a cable sheathing resistant to UV ageing, resistant to hydrolysis and/or having a low moisture uptake.

5 When cables are buried, cable sheathings are exposed to various type of soils more or less acid, different types of chemicals during the installation (oils, grease, jelly...) and to surrounding fauna rejects such as formic acid. Therefore, cable sheathings should present preferably chemical resistance.

10 Moreover, soils may be humid or exposed to floods. Therefore, it is searched a cable sheathing that are also preferably resistant to hydrolysis and have low moisture uptake.

15 Moreover, it is searched a cable sheathing that display sufficient mechanical strength and heat resistance so that it will not be damaged and will not melt under regular use (indoor or outdoor use) of the electric or optical fiber cables.

It is also searched cable sheathing that is preferably dimension stable, meaning its dimension should not vary over time. This enables to avoid looseness of the sheathing, water penetration in the underneath layers, surface defects or wrinkles.

20 It is also preferred cable sheathing which outer surface is smooth and glossy. Indeed without being limited to the theory, it is thought that any defect surface is a potential point of attack by termites. Therefore, a glossy surface might contribute to the resistance to termite attacks.

25 To get such aspect, the cable sheathing should be at least resistant to blistering. Blistering may occur for example when the material is moisture sensitive in particular when the material has high moisture uptake.

30 Surprisingly, it has now been found that by using a composition comprising at least one particular aliphatic polyamide, at least one UV absorber and/or UV stabilizer, and at least one, it was possible to get an antitermite cable sheathing, in particular for electric and optical fiber cables, possessing one or several of the above mentioned properties, and preferably several of the above mentioned
35 properties.

Summary of the invention

In order to resolve prior art disadvantage, the present invention relates to a composition comprising:

- 5 a) at least one aliphatic polyamide having at least two units corresponding to the following general formula:



in which:

X.Y represents a unit obtained, preferably directly, by polycondensation of:

- 10 - a diamine containing X carbon atoms and,
- a dicarboxylic acid containing Y carbon atoms,
and such that the sum of X+Y is strictly superior to 18,
(hereafter PA X.Y)

- 15 b) at least one UV absorber and/or UV stabilizer,
c) at least one antioxidant,
wherein the weight ratio of the total amount of antioxidant(s) over the total amount of UV absorber(s) and UV stabilizer(s) (when present) being less than or equal to 0.7, and preferably less than or equal to 0.4, with a weight ratio greater than zero.

20 Another object of the invention is the use of a composition comprising:

- a) at least one aliphatic polyamide having at least two units corresponding to the following general formula:



25 in which:

X.Y represents a unit obtained, preferably directly, by polycondensation of:

- a diamine containing X carbon atoms and,
- a dicarboxylic acid containing Y carbon atoms,
30 and such that the sum of X+Y is strictly superior to 18,

- b) at least one UV absorber and/or UV stabilizer,
c) at least one antioxidant,

to manufacture a mono or multilayer cable sheathing resistant to termite damage.

35

In particular, it was observed that the mono or multilayer cable sheathing according to the invention presents from good to excellent results as regards:

- termite resistance,
- 5 - thermal ageing resistance,
- ultraviolet (UV) ageing resistance,
- processability (extrusion or coextrusion),
- moisture uptake,
- gloss, and
- 10 - chemical resistance (against lewis acid such as formic acid).
- colour fastness
- cold bend performance in particular, when used as outer layer or overlayer of a cable.

Indeed, it was observed that after heat ageing at 100°C for 120
15 hours in an air circulating oven, the cable sheathing according to the invention present preferably over 80% retention of elongation at break.

After 1200 hours UV exposure (radiance level of 0.5W/m², 1nm bandpass at 340nm, optical filter: cut-on 295nm, black panel temperature of 63°C, relative humidity (RH) = 50%, no water spray),
20 the cable sheathing according to the invention present preferably over 85% even over 90% retention of elongation at break (over 90% for coloured cable sheathing).

The composition according to the invention is in particular easy to process, (easy to extrude) and lead to dimension stable
25 extruded products.

The cable sheathing according to the invention have preferably a low moisture uptake after immersion in water or exposure to saturated humidity at 23°C over one and up to two weeks at (less than 2.5%), and are resistant to hydrolysis (ISO 62).

30 It has preferably a smoothy and glossy outer surface. Gloss can be measured by detecting the intensity of the reflected light from an incident beam at a given incidence angle on the tested material surface (ASTM D 2457).

Preferably the antitermite cable sheathing is resistant to chemicals such as formic acid, as characterized by AS1049-2008.2 appendix M.

5 When composition of the invention comprises a colorant or pigment, colorfastness may be characterized by AS1049-2008.2.

The cable sheathing according to the invention is preferably flexible enough to resist to bending as characterized by AS1049-2008 appendix J, Indeed, it has been observed that the cable sheathing of the invention do not present any crackings after being bent around a
10 mandrel for 4 hours at -15°C. The invention also relates to a process to manufacture a cable sheathing according to the invention by extrusion or coextrusion.

The invention also relates to the use of a cable sheathing according to the invention or manufactured according to a process of the invention to prevent and/or protect the cable, in particular power
15 cable, copper cable and optical fiber cable, from damages due to termites and eventually/or light, heat, wind, water air, humidity, soils, oil, grease, jelly, other insects and/or kinking.

Other characteristics, aspects, subjects and advantages of the present invention will emerge even more clearly on reading the
20 description and the examples that follow.

Specific Mode for Carrying out the Invention

The composition according to the invention comprises at least one PA X.Y as defined above.

25 The diamine used for the polycondensation of PA X.Y may be chosen from linear or branched aliphatic diamine.

As linear and aliphatic diamine used for the polycondensation of PA X.Y, mention may be made of those, saturated or unsaturated, corresponding to the formula $H_2N-(CH_2)_X-NH_2$, in which X has the same meaning as above
30 mentioned. Such linear and aliphatic diamine may be chosen from hexanediamine (X=6), heptanediamine (X=7), octanediamine (X=8), nonanediamine (X=9), decanediamine (X=10), undecanediamine (X=11), dodecanediamine (X=12), tridecanediamine (X=13), tetradecanediamine (X=14), hexadecanediamine (X=16), octadecanediamine (X=18), octadecenediamine (X=18), eicosanediamine (X=20),
35 docosanediamine (X=22) and the diamines obtained from fatty acids.

As branched and aliphatic diamine used for the polycondensation of PA X.Y, mention may be made of those chosen from linear and aliphatic diamines, such as those defined above, comprising one or several alkyl group (in particular methyl or ethyl) pendant to the main chain of the diamine. Such branched and aliphatic diamine
5 may be saturated or unsaturated. By way of example, it may be chosen from 2-methyl-1,5-pentanediamine (X=6), 2,2,4-trimethyl-1,6-hexanediamine (X=9), 2,4,4-trimethyl-1,6-hexanediamine (X=9), 2-methyl-1,8-octanediamine (X=9). Preferably, the branched and aliphatic diamine has from 6 to 12 carbon atoms in its main chain.

10 The dicarboxylic acid used for the polycondensation of PA X.Y may be chosen from linear or branched aliphatic dicarboxylic acid.

The linear and aliphatic dicarboxylic acid used for the polycondensation of PA X.Y may be saturated or unsaturated. By way of example, mention may be made of adipic acid (Y=6), heptanedioic acid (Y=7), octanedioic acid (Y=8), azelaic acid
15 (Y=9), sebacic acid (Y=10), undecanedioic acid (Y=11), dodecanedioic acid (Y=12), brassylic acid (Y=13), tetradecanedioic acid (Y=14), pentadecanedioic acid (Y=15), hexadecanedioic acid (Y=16), octadecanedioic acid (Y=18), octadecenedioic acid (Y=18), eicosanedioic acid (Y=20), docosanedioic acid (Y=22) and fatty acid dimers containing 36 carbon atoms.

20 The fatty acid dimers mentioned above are dimerized fatty acids obtained by oligomerization or polymerization of unsaturated monobasic fatty acids bearing a long hydrocarbon-based chain (such as linoleic acid (C₁₈) and oleic acid (C₁₈)), as described especially in document EP 0 471 566.

25 The branched and aliphatic dicarboxylic acid used for the polycondensation of PA X.Y, may be saturated or unsaturated.

The diamine and/or dicarboxylic acid used to form the polyamide used according to the invention from a biobased raw material as characterized in ASTM D6866. By way of example,
30 mention may be made of 1,10-decanediamine, linear and aliphatic diamines and diacides as above-mentioned.

Advantageously, the polyamide used in the composition according to the invention does not result from recycling of prior-used polyamides. In other terms, the polyamide is directly obtained from

the polycondensation of:

- a diamine containing X carbon atoms and,
- a dicarboxylic acid containing Y carbon atoms,

5 and such that the sum of X+Y is strictly superior to 18, preferably superior or equal to 20, and more preferably inferior or equal to 36.

The diamine and dicarboxylic acid used to form the polyamide used in the composition according to the invention are chosen so as to satisfy the condition that the sum of X+Y is strictly greater than 18, and preferably greater or equal to 20, and more preferably inferior or
10 equal to 36.

Preferably, X is chosen from 6 to 12 and/or Y is chosen from 10 to 18.

Preferably, the polyamide used in the composition of the invention is a homopolymer.

Preferably, the polyamide used in the composition of the
15 invention may be chosen from among PA6.14, PA 6.18, PA10.10, PA10.12, PA10.14, PA12.12 and mixture thereof, in particular from PA10.10, PA10.12, PA12.12 and mixture thereof, and more preferably the polyamide is PA10.10, PA10.12 or PA12.12.

Advantageously, the polyamide used according to the invention
20 presents a melting point of less than 210°C, preferably from 180°C to 205°C.

Preferably, the mole proportions of diamine, and of dicarboxylic acid used to form the polyamide used according to the invention, are stoichiometric.

25 The polyamide used according to the invention have a flexibility of less than or equal to 2000 MPa, preferably ranging from 1000 to 1800MPa (measured according to AS1049.2-2008, appendix J)

Preferably, the polyamide is used in the composition of the invention in an amount such that the complement to 100% of the
30 composition being constituted by said polyamide, said amount being of at least 50wt%, more preferably at least 60wt% of the total weight of the composition.

The composition according to the invention comprises at least one UV absorber and eventually at least one UV stabilizer.

The UV absorber used according to the invention provides UV protection through effective absorption or reflection of incident UV rays.

5 The UV stabilizer used according to the invention functions as scavenger of harmful molecules that may attack and degrade the plastic material used in the composition of the invention.

10 In a first embodiment of the invention, the UV absorber is chosen from among black colored UV absorbers (hereafter referred as L1). The term black colored UV absorber includes UV absorber displaying a black color or capable to color the composition of the invention in black when present in effective amount (for example in an amount of less than or equal to 0,1% by weight (wt%)). In particular, these black colored UV absorbers absorb any incident rays of light of any wavelength (including UV rays), leading thus to a black colored component.

15 Preferably, the black colored UV absorber (L1) that is used in the composition according to the invention may be chosen from among mineral black colored UV absorbers such as black pigments such as carbon black, iron oxide black, manganese black (MnO₂), cobalt black (Co₂O₃), antimony black, and mixture thereof. More preferably, carbon black is used.

20 Carbon black may be available under the brand Vulcan® P sold by Cabot Corporation.

25 Advantageously, the average particle size of the mineral black colored UV absorber is less than 25 nm. Average particle size may be determined in accordance with ASTM D3849.

Advantageously, the mineral black colored UV absorber may be homogeneously dispersed in the polyamide matrix of the composition, in accordance with standard ISO 18553.

30 Preferably, the mineral black colored UV absorber is present in the composition in an amount of at least 2%wt relative to the total weight of the composition, and preferably from 2 to 3wt% relative to the total weight of the composition.

35 Its content may be determined in accordance with AS/NZS 1660.2.4: 1998 Standards.

In this first embodiment, the composition comprises as antioxidant at least one metallic antioxidant.

The composition may also comprise at least one heat stabilizer.

5 Advantageously, the metallic antioxidant plays the role of a heat stabilizer. This enables to get cable sheathing with better thermal ageing resistance.

10 As example of metallic antioxidants and/or heat stabilizers which may be used in accordance with the invention, mention may be made of mineral copper based antioxidants and heat stabilizers, and more preferably copper salts and complexes such as potassium and copper halogen blends (KI/CuI) with stearate based or wax binder lubricant.

15 Such metallic antioxidants and heat stabilizers may be available under the brand BRUGGOLEN® H3336 sold by BRÜGGEMANN CHEMICAL, or POLYAD® PB 201 IODIDE STAB sold by POLYAD SERVICES.

20 The total amount of metallic antioxidant(s) and heat stabilizer that may be present in the composition of the invention ranges preferably from 0.1wt% to 2wt% relative to the total weight of the composition.

25 When the metallic antioxidant plays the role of a heat stabilizer, an vice versa, the total amount of metallic antioxidant(s) and heat stabilizer(s) that may be present in the composition ranges preferably from 0.05wt% to 1wt% relative to the total weight of the composition.

30 In a second embodiment of the invention, the UV absorber is chosen from organic and/or mineral UV absorbers (L2). These UV absorbers are different from those of first embodiment. In particular, the UV absorber used according to second embodiment is not black colored.

35 As example of organic or mineral UV absorbers (L2) that may be used in the composition of the invention, mention may be made of benzophenone UV absorbers; benzotriazole UV absorbers such as 2-(2H-benzotriazol-2-yl)-4,6-bis(1-methyl-1-phenylethyl)phenol

(Tinuvin® 234), N-(2-ethoxyphenyl)-N'-(2-ethylphenyl)-ethanediamide (TINUVIN® 312) and 2-(2'-hydroxy-3',5'-di-tert-butylphenyl)benzotriazole (TINUVIN® 320); and TiO₂ eventually coated by rutile. More preferably, it may be chosen from benzotriazole UV absorbers.

The UV absorber (L2) may be present in the composition according to the invention in an amount ranging from 0.1 to 1.5wt% and preferably from 0.2 to 0.5wt% relative to the total weight of the composition.

In this second embodiment, the composition according to the invention does not comprise component that may give a black color to the composition. In particular, the composition does not comprise black colorant and black pigment such as the above mentioned black colored UV absorber (L1).

The composition according to the invention may comprise at least one colorant or pigment, different from black colorant or black pigment. Said colorant and pigment enable to color the composition in the desired colored

By way of example, said colorant or pigment may be chosen from colorant or pigment giving a blue, green, yellow, red or white colour to the composition or cable sheathing according to the invention, under visible light. Preferably, the composition according to the invention does not comprise metallic salts or complex such as copper and potassium halogen salts or complex. Indeed, those metallic salts and complexes may interfere and darken the color given by the non black colorant or pigment.

When present (i.e. when the composition comprises more than 0wt% relative to the total weight of the composition), the colorant or pigment is preferably chosen in an effective amount to visibly colour the composition, for example ranging from 1 to 10wt% relative to the total weight of the composition. For example, the amount of the colorant or pigment may vary up to 4wt%, up to 6wt% or up to 8wt%, relative to the total weight of the composition.

In this second embodiment, preferably the composition according to the invention is a halogen free composition.

The composition according to the invention may comprise at least one UV stabilizer, preferably chosen from among hindered amine light stabilizers (HALS).

5 In the composition according to the first embodiment, UV stabilizer may not be used.

When present in the composition of the invention, HALS may be chosen from among amine derivatives of 2,2,6,6-tetramethylpiperidine; amino ether derivatives of 2,2,6,6-tetramethylpiperidine (hereafter HALS amine and HALS aminoether
10 respectively); and mixture thereof.

Mention may be made of 2,2,6,6-tetramethyl-4-piperidone; 2,2,6,6-tetramethyl-4-piperidinol; bis-(1,2,2,6,6-pentamethylpiperidyl)-(3',5'-ditert-butyl-4'-hydroxybenzyl)butylmalonate; di-(2,2,6,6-tetramethyl-4-piperidyl)sebacate (TINUVIN® 770); oligomer of N-(2-hydroxyethyl)-2,2,6,6-tetramethyl-4-piperidinol and succinic acid
15 (TINUVIN® 622); oligomer of cyanuric acid and N,N-di(2,2,6,6-tetramethyl-4-piperidyl)-hexamethylenediamine; bis-(2,2,6,6-tetramethyl-4-piperidyl)sebacate (TINUVIN® 123); bis-(1,2,2,6,6-pentamethyl-4-piperidyl)sebacate (TINUVIN® 765); ; tetrakis-(2,2,6,6-tetramethyl-4-piperidyl)-1,2,3,4-butane tetracarboxylate; N,N'-bis-(2,2,6,6-tetramethyl-4-piperidyl)-hexane-1, 6-diamine (CHIMASORB® T5); N-butyl-2,2,6,6-tetramethyl-4-piperidinamine; 2,2'-[(2,2,6,6-tetramethyl-piperidinyl)-imino]-bis-[ethanol]; polyK6-morpholine-S-triazine-2,4-diyl) (2,2,6,6-tetramethyl-4-piperidinyl)-
25 iminohexamethylene-(2,2,6,6-tetramethyl-4-piperidyl)-imino)(Cyasorb UV 3346); 5-(2,2,6,6-tetramethyl-4-piperidinyl)-2-cyclo-undecyl-oxazole) (HOSTAVIN® N20); 1,1'-(1,2-ethane-di-yl)-bis-(3,3',5,5'-tetramethyl-piperazinone); 8-acetyl-3-dothecyl-7,7,9,9-tetramethyl-1,3,8-triazaspiro(4,5)decane-2, 4-dione;
30 polymethylpropyl-3-oxy-[4(2,2,6,6-tetramethyl)-piperidinyl]siloxane (UVASIL® 299); 1,2,3,4-butane-tetracarboxylic acid-1,2,3-tris(1,2,2,6,6-pentamethyl-4-piperidyl)-4-tridecylester; copolymer of alpha-methylstyrene-N-(2,2,6,6-tetramethyl-4-piperidinyl) maleimide and
35 stearyl maleimide; 1,2,3,4-butanetetracarboxylic acid, polymer with

beta,beta,beta',beta'-tetramethyl-2,4,8,10-tetraoxaspiro[5,5]undecane-
 3,9-diethanol,1,2,2,6,6-pentamethyl-4-piperidinyl ester (MARK®
 LA63); 2,4,8,10-tetraoxaspiro[5,5]undecane-3,9-
 diethanol,beta,beta,beta',beta'-tetramethyl-polymer with 1,2,3,4-
 5 butanetetracarboxylic acid,2,2,6,6-tetramethyl-4-piperidinyl ester
 (MARK® LA68); D-glucitol, 1,3,2,4-bis-O-(2,2,6,6-tetramethyl-4-
 piperidinylidene)-(HALS 7); oligomer of 7-oxa-3,20-
 diazadispiro[5,1,11,2]-heneicosan-21-one-2,2,4,4-tetramethyl-20-
 (oxiranylmethyl) (HOSTAVIN® N30); propanedioic acid, [(4-
 10 methoxyphenyl)methylene]-bis-(1,2,2,6,6-pentamethyl-4-
 piperidinyl)ester (SANDUVOR® PR 31); formamide,N,N'-1,6-
 hexanediylbis [N-(2,2,6,6-tetramethyl-4-piperidinyl (UVINUL®
 4050H); 1,3,5-triazine-2,4,6-triamine,N,N''-[1,2-ethanediylbis[[[4,6-
 bis[butyl(1,2,2,6,6-pentamethyl-4-piperidinyl)amino]-1,3,5-triazine-2-
 15 yl]imino]-3,1-propanediyl]]-bis[N',N''-dibutyl-N',N''-bis(1,2,2,6,6-
 pentamethyl-4-piperidinyl) (CHIMASSORB® 119); poly[[6-[(1,1,3,3-
 tetramethylbutyl)amino]-1,3,5-triazine-2,4-diyl][(2,2,6,6-tetramethyl-
 4-piperidinyl)-imino]-1,6-hexanediyl[(2,2,6,6-tetramethyl-4-
 piperidinyl)imino]] (CHIMASSORB® 944); 1,6-hexanediamine, N,N-
 20 bis(2,2,6,6-tetramethyl-4-piperidinyl)-, polymer with 2,4,6-trichloro-
 1,3,5-triazine, reaction products with N-butyl-1-butanamine and N-
 butyl-2,2,6,6-tetramethyl-4-piperidinamine (CHIMASSORB® 2020) ;
 1,5-dioxaspiro(5,5)undecane 3,3-dicarboxylic acid, bis(2,2,6,6-
 tetramethyl-4-piperidinyl)ester (CYASORB® UV-500); 1,5-
 25 dioxaspiro(5,5)undecane 3,3-dicarboxylic acid, bis(1,2,2,6,6-
 pentamethyl-4-piperidinyl)ester (CYASORB® UV-516); N-2,2,6,6-
 tetramethyl-4-piperidinyl-N-amino-oxamide; 4-acryloyloxy-1,2,2,6,6-
 pentamethyl-4-piperidine. 1, 5, 8, 12-tetrakis[2', 4'-bis(1'',2'',2'',6'',6''-
 pentamethyl-4''-piperidinyl(butyl)amino)-1',3',5'-triazine-6'-yl]-
 30 1,5,8,12-tetraazadodecane; HALS PB-41 (CLARIANT ® S.A.); N,N'-
 bis(2,2,6,6-tetramethyl-4-piperidinyl)-1,3-benzenedicarboxamide
 (NYLOSTAB® SEED); 3-dodecyl-1-(2,2,6,6-tetramethyl-4-piperidyl)-
 pyrrolidin-2,5-dione; 1,3-Propanediamine, N,N'' -1,2-ethanediylbis-,
 polymer with 2,4,6-trichloro-1,3,5-triazine, reaction products
 35 with N-butyl-2,2,6,6-tetramethyl-4-piperidinamine (UVASORB®

HA88); 1,1'-(1,2-ethane-di-yl)-bis-(3,3',5,5'-tetra-methyl-piperazinone) (GOOD-RITE® 3034); 1,1'1''-(1,3,5-triazine-2,4,6-triyltris((cyclohexylimino)-2,1-ethanediyl)tris-(3,3,5,5-tetramethylpiperazinone) (GOOD-RITE® 3150) and; 1,1',1''-(1,3,5-triazine-2,4,6-triyltris((cyclohexylimino)-2,1-ethanediyl)tris-(3,3,4,5,5-tetramethylpiperazinone) (GOOD-RITE® 3159); 1,3,5-Triazine-2,4,6-triamine, N2,N2'-1,2-ethanediylbis[N2-[3-[[4,6-bis[butyl(1,2,2,6,6-pentamethyl-4-piperidiny]amino]-1,3,5-triazin-2-yl]amino]propyl]-N4,N6-dibutyl-N4,N6-bis(1,2,2,6,6-pentamethyl-4-piperidiny]- (SONGLIGHT® 1190).

Preferably, the HALS that may be used in the composition of the invention is chosen from HALS amines and mixture thereof. By way of example mention may be made of poly[[6-[(1,1,3,3-tetramethylbutyl)amino]-1,3,5-triazine-2,4-diyl][(2,2,6,6-tetramethyl-4-piperidiny]imino)-1,6-hexanediyl[(2,2,6,6-tetramethyl-4-piperidiny]imino))] (CHIMASSORB® 944); 1,3,5-triazine-2,4,6-triamine,N,N''-[1,2-ethanediylbis[[[4,6-bis[butyl(1,2,2,6,6-pentamethyl-4-piperldiny]amino)-1,3,5-triazine-2-yl]imino]-3,1-propanediyl]]-bis[N',N''-dibutyl-N',N''-bis(1,2,2,6,6-pentamethyl-4-piperidiny] (CHIMASSORB® 119); 1,6-hexanediamine, N,N'-bis(2,2,6,6-tetramethyl-4-piperidiny]-polymer with 2,4,6-trichloro-1,3,5-triazine, reaction products with N-butyl-1-butanamine and N-butyl-2,2,6,6-tetramethyl-4-piperidinamine (CHIMASSORB® 2020); N,N'-bis(2,2,6,6-tetramethyl-4-piperidiny]-1,3-benzenedicarboxamide (NYLOSTAB® SEED).

More preferably, the HALS amine used in the composition of the invention is poly[[6-[(1,1,3,3-tetramethylbutyl)amino]-1,3,5-triazine-2,4-diyl][(2,2,6,6-tetramethyl-4-piperidiny]imino)-1,6-hexanediyl[(2,2,6,6-tetramethyl-4-piperidiny]imino))] (CHIMASSORB® 944).

Preferably, when present in the composition according to the invention, the UV stabilizer is present in an amount ranging from 0.1 to 1wt% and preferably from 0.2 to 0.5wt% relative to the total weight of the composition.

The composition according to the invention comprises at least one antioxidant, and preferably at least two or at least three antioxidants.

5 In the first embodiment of the invention, the composition comprises at least two antioxidants, at least one being organic (A1) and advantageously at least one being metallic (MA1) as defined above.

10 The organic antioxidant (A1) is different from said at least metallic antioxidant (MA1) and is preferably chosen from organic antioxidant.

As organic antioxidant (A1) that may be used in the composition according to the invention, mention may be made of sterically hindered phenolic antioxidants; aromatic secondary amines; and mixture thereof. Preferred organic antioxidant (A1) is chosen from
15 among sterically hindered phenolic antioxidants.

By way of example of sterically hindered phenolic antioxidant, mention may be made of N,N'-hexane-1,6-diylbis(3-(3,5-di-tert-butyl-4-hydroxyphenyl)propionamide)) (IRGANOX® 1098); ethylene-bis(oxyethylene)-bis[(3-tert-butyl-4-hydroxy-5-methylphenyl)propionate]
20 (IRGANOX® 245); pentaerythritol tetrakis(3-(3,5-di-tert-butyl-4-hydroxyphenyl)propionate) (IRGANOX® 1010); 6,6'-di-tert-butyl-4,4'-butylidenedi-m-cresol (LOWINOX® 44B25); 3,9-Bis[1,1-dimethyl-2-[β -(3-tert-butyl-4-hydroxy-5-methylphenyl)propionyloxy]ethyl]2,4,8,10-tetraoxaspiro[5,5]-
25 undecane (ADK STAB® AO - 80). By way of example of aromatic secondary amines that may be used in the composition of the invention, mention may be made of such as 4,4'-bis(alpha,alpha-dimethylbenzyl)diphenylamine) (NAUGARD® 445); 4-{[4,6-bis(octylsulfanyl)-1,3,5-triazin-2-yl]amino}-2,6-di-tert-butylphenol,
30 (IRGANOX® 565); 1-N,4-N-di(phenyl)benzene-1,4-diamine (FLEXAMINE® G); benzenamine,N-phenyl-, reaction products with 2,4,4-trimethylpentene (IRGANOX® 5057).

According to the second embodiment of the invention, the composition comprises at least one organic antioxidant (A1).

Said organic antioxidant (A1) may be chosen from among those defined above. Preferred organic antioxidant (A1) is chosen from among sterically hindered phenolic antioxidants.

The composition according to the invention may comprises at least one antioxidant (A2) as secondary antioxidant, said antioxidant (A2) being different from antioxidant (A1) and preferably chosen from among organic antioxidant. Organic antioxidant (A2) may be chosen from among organophosphites, organophosphonites and/or thio antioxidants. Preferred organic antioxidant (A2) is chosen from among organophosphites and organophosphonites. As organophosphite or organophosphinite that may be used in the composition of the invention, mention may be made of 4,4'-biphenylenediphosphonous acid tetrakis(2,4-di-tert-butylphenyl) ester (HOSTANOX® P-EPQ), phosphorous acid triphenyl ester (IRGAFOS® TPP), tris(4-nonylphenyloxy)phosphine (IRGAFOS® TNPP), tris(2,4-ditert-butylphenyl)phosphite (IRGAFOS® 168), tetrakis(2,4-di-tert-butylphenyl)[1,1-biphenyl]-4,4-glybisphosphate (IRGAFOS® P-EPQ), di-phenyl isodecyl phosphite (IRGAFOS® DDPP), , bis(2,4-ditert-butylphenyl)pentaerythritol diphosphite (IRGAFOS® 126), bis(2,6-di-tert-butyl-4-methylphenyl)pentaerythritol diphosphite (ADK STAB® PEP-36), bis(2,4-dicumylphenyl)pentaerythritol diphosphite (DOVERPHOS® S-9228 sold by DOVER), 2,2'2''-nitrilo[triethyl-tris[3,3',5,5'-tetra-tert-butyl-1,1'-biphenyl-2,2'-diyl]] phosphite (IRGAFOS® 12), 2,2'-methylenebis(4,6-di-tert-butylphenyl)octyl phosphite (ADK STAB® HP 10), phenol,2-(1,1-dimethylethyl)-6-methyl-4-[3-[[2,4,8,10-tetrakis(1,1-dimethylethyl)dibenzo[d,f][1,3,2]dioxaphosphin-6-yl]oxy]propyl]- (SUMILIZER® GP sold by SUMIMOTO), calcium bis[3,5-di(tert-butyl)-4-hydroxybenzyl(ethoxy) phosphinate] (IRGANOX® 1425).

As thio antioxidants that may be used in the composition of the invention, mention may be made of propanoic acid,3-(dodecylthio)-,1,1'-[2,2-bis[[3-(dodecylthio)-1-oxopropoxy]methyl]-1,3-propanediyl] ester (ADK STAB® AO 412S), propanoic acid,3,3'-thiobis-, 1,1'-didodecyl ester (IRGANOX® PS 800), propanoic acid,3,3'-thiobis-, 1,1'-dioctadecyl ester (HOSTANOX® SE 4), distearyl disulfide

(HOSTANOX® SE 10), ADK STAB® AO-23 (CAS-Number 66534-05-2, 71982-66-6), 2-methyl-4,6-bis(octylsulfanylmethyl)phenol (IRGANOX® 1520), phenol,2,4-bis[(dodecylthio)methyl]-6-methyl (IRGANOX® 1726), Benzenepropanoic acid,3,5-bis(1,1-dimethylethyl)-4-hydroxy-, 1,1'-(thiodi-2,1-ethanediyl) ester (IRGANOX® 1035), 4,4'-thiobis[2-(1,1-dimethylethyl)-5-methyl-phenol (IRGANOX® 415), 2,2'-thiobis[6-(1,1-dimethylethyl)-4-methyl-phenol (IRGANOX® 1081), 2-methyl-4,6-bis[(octylthio)methyl]-phenol (IRGANOX® 1520).

10 Preferably, the composition according to the invention comprises a mixture of antioxidant (A1) and antioxidant (A2), and more preferably a mixture of sterically hindered phenolic antioxidant(s) and organophosphite(s) and/or organophosphinite(s).

15 The organic antioxidant (A1) that may be used in the composition of the invention may be present in an amount ranging from 0.05 to 0.4wt% relative to the total weight of the composition.

20 Preferably, in the composition according to first embodiment of the invention, the organic antioxidant (A1) is present in an amount ranging from 0.1 to 0.3wt% relative to the total weight of the composition. Preferably, when present, the antioxidant (A2) is present in the composition according to the invention in an amount ranging from 0.1 to 1 wt% and preferably from 0.3 to 0.5wt% relative to the total weight of the composition.

25 Preferably, in the composition according to the second embodiment of the invention, the antioxidant (A1) is present in an amount ranging from 0.1 to 0.2wt% relative to the total weight of the composition. Preferably, when present, the antioxidant (A2) is present in the composition according to the invention in an amount ranging from 0.05 to 0.4 wt% relative to the total weight of the composition, and preferably from 0.1 to 0.5wt% relative to the total weight of the composition. Preferably, the weight amount of the antioxidant(s) (MA1, A1, A2), UV absorber(s) and UV stabilizer(s) are chosen independently from each other in the range amount as defined above, provided that the weight ratio of the total amount of antioxidant(s) over the total amount of UV absorber(s) and UV stabilizer(s) is less

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than or equal to 0.7, and more preferably less than or equal to 0.4, said weight ratio being different from zero.

The composition according to the invention advantageously does not produce smoke during (co)extrusion process.

5 The composition according to the invention may comprise at least one additive chosen from among plasticizers and impact modifiers.

10 As examples of plasticizers, mention may be made of benzene sulphonamide derivatives, such as N-butyl benzene sulphonamide (BBSA), ethyl toluene sulphonamide or N-cyclohexyl toluene sulphonamide; esters of hydroxybenzoic acids, such as 2-ethylhexyl-para-hydroxybenzoate and 2-decylhexyl-para-hydroxybenzoate; esters or ethers of tetrahydrofurfuryl alcohol, such as oligoethyleneoxytetrahydrofurfuryl alcohol; and esters of citric acid or
15 hydroxymalonic acid, such as oligoethyleneoxy malonate. Mention may also be made of decylhexyl-para-hydroxybenzoate and ethylhexyl-para-hydroxybenzoate. One particularly preferred plasticizer is N-butyl benzene sulphonamide (BBSA).

20 As examples of impact modifiers, mention may be made of polyolefins, crosslinked polyolefins, Ethylene Propylene Rubber (EPR) elastomer, Ethylene Propylene Diene Monomer (EPDM) elastomer, Styrene-Butadiene-Styrene (SBS) and Styrene-Ethylene-Butadiene-Styrene (SEBS) elastomers, it being possible for these elastomers to be grafted in order to facilitate their compatibilization with polyamides,
25 copolymers containing polyamide blocks and polyether blocks. These copolymers containing polyamide blocks and polyether blocks are known per se – they are also known by the name PEBA (polyether-block-amide). Mention may also be made of acrylic elastomers, for example those of the Nitrile Butadiene Rubber (NBR) type,
30 Hydrogenated Nitrile Butadiene Rubber (HNBR) type and Carboxylated Nitrile Butadiene Rubber (X-NBR) type.

The additive may be present in the composition according to the invention in an amount up to 35wt% and more preferably up to 15wt% relative to the total weight of the composition.

The nature and quantity of additives that may be present in the composition should be chosen such as not to impair the advantageous properties of the composition of the invention.

5 In a particularly preferred first embodiment of the invention, the composition consists of:

- a') at least one PA X.Y,
 - b') at least one black colored UV absorber preferably being carbon black,
 - c') at least one organic antioxidant (A1), preferably chosen from
 - 10 among sterically hindered benzophenol,
 - d') optionally at least one UV stabilizer,
 - e') optionally at least another organic antioxidant (A2), preferably chosen from among organophosphite and organophosphinite,
 - f') optionally at least one metallic antioxidant or heat stabilizer
 - 15 (MA2), preferably chosen from among copper based antioxidant or heat stabilizer,
 - g') optionally at least one plasticizer,
 - h') optionally at least one impact modifier.
- preferably the weight ratio of the total amount of antioxidant(s) over
- 20 the total amount of UV absorber(s) and UV stabilizer(s) being less than or equal to 0.7, more preferably less than or equal to 0.4 and is different from zero.

The ingredients a') to h') are as defined above.

In particular, the composition of the invention consists of:

- 25 a') the complement to 100% of at least of PA X.Y,
- b') from 2 to 3wt% of carbon black,
- c') from 0.05 to 0.4wt%, preferably from 0.1 to 0.3wt%, of at least one organic antioxidant (A1),
- d') from 0.1 to 1 wt%, preferably from 0.3 to 0.5wt% of at least
- 30 another organic antioxidant (A2),
- e') from 0.05 to 1wt% of at least one metallic antioxidant or heat stabilizer (MA2),
- f') from 0 to 35wt% of at least one additive chosen from among plasticizer and impact modifier, preferably from 0 to 15% of
- 35 plasticizer,

preferably the weight ratio of the total amount of antioxidant over the total amount of light stabilizer being less than or equal to 0.7, and more preferably 0.4, zero being excluded.

5 In another particularly preferred second embodiment of the invention, the composition consists of:

- a") at least one PA X.Y,
- b") at least one UV absorber, preferably chosen from among benzotriazole UV absorber,
- 10 c") at least one UV stabilizer chosen from HALS, preferably HALS amine,
- d") at least one organic antioxidant (A1), preferably chosen from among sterically hindered benzophenol,
- e") optionally at least one organic antioxidant (A2), preferably chosen from organophosphite and organophosphinite,
- 15 f") optionally at least one pigment or colorant being different from black colorant or black pigment,
- g") optionally at least one plasticizer,
- h") optionally at least one impact modifier.

20 preferably the weight ratio of the total amount of antioxidant over the total amount of light stabilizer being less than or equal to 0.7, more preferably less than or equal to 0.4, zero being excluded.

The ingredients a") to h") are as defined above.

25 The ingredients a") to e") and g") to h") shall be chosen so that they are not likely to modify the colour given to the composition by ingredient f") if present.

In particular, the composition of the invention may consist of;

- a") the complement to 100% of at least of PA X.Y,
- b") from 0 to 1wt%, preferably from 0.1 to 1wt%, more preferably from 0.2 to 0.5wt%, of at least one UV absorber,
- 30 c'') from 0.1 to 1.5wt%, preferably from 0.2 to 0.5wt%, of at least one UV stabilizer L1 chosen from HALS,
- d") from 0.05 to 0.4wt%, preferably from 0.1 to 0.2wt%, of at least one organic antioxidant (A1),
- e") from 0.05 to 0.4 wt%, preferably from 0.1 to 0.5wt% of at least
- 35 another antioxidant (A2),

f") from 0 to 4wt%, or from 0 to 6wt% or from 0 to 8wt% of at least one pigment or colorant being different from black colorant or black pigment, preferably the quantity of said pigment or colorant being more than zero,

5 g") from 0 to 35wt% of at least one additive chosen from among plasticizer and impact modifier, preferably from 0 to 15% of plasticizer,

preferably the weight ratio of the total amount of antioxidants over the total amount of UV absorber(s) and UV stabilizer(s) being less than or
10 equal to 0.7, preferably less than or equal to 0.4, zero being excluded.

Advantageously, the composition according to the invention does not contain any polyhydric alcohol or polyhydroxy polymer, having in particular a number average molecular weight (Mn) of less than 2000 as determined for polymeric materials with gel permeation
15 chromatography (GPC). As example of polyhydric alcohol or polyhydroxy polymer, mention may be made of polyols such as pentaerythritol, dipentaerythritol, tripentaerythritol, ditrimethylolpropane, and saccharides. The terms polyhydric alcohol and polyhydroxy polymer used in the present application do not cover
20 sterically hindered phenol antioxidants.

When the composition according to the invention does not contain such polyhydric alcohols or polyhydroxy polymers, it leads to cable sheathing displaying surprisingly lower moisture uptake and/or better water resistance.

25 The invention also relates to a cable sheathing comprising at least one layer constituted of any one of the compositions according to the invention.

Advantageously, the cable sheathing of the invention comprises as outer layer a layer constituted of a composition according to the
30 invention.

When the cable sheathing is a monolayer structure, the term outer layer means the monolayer sheathing and the outer surface of said sheathing is in contact with the outdoor environment (soil, air, sunlight, water, termites and other insects, chemicals such as oil,
35 grease, jelly...).

When the cable sheathing is a multilayer structure, the outer layer means the layer having its external surface in contact with the outdoor environment.

5 The other layer constituting the multilayer cable sheathing of the invention may be chosen from among the conventionally used layers.

10 In particular, the cable sheathing according to the invention may form a composite layer with a polyolefine layer, such as polyethylene layer, positioned underneath a monolayer cable sheathing according to the invention (PAX.Y rich monolayer, i.e. $\geq 50\text{wt}\%$ of PA X.Y relative to the total weight of the layer composition).

The resulting composite layer is part of the invention and can be manufactured by conventional coextrusion methods.

15 For example, the multilayer cable sheathing according to the invention may comprise from inner to outwards:

- at least an insulation layer, made of the same or different dielectric material(s) over the conductor wire,
- optionally at least one intermediate layer chosen from among thermoplastic polymer based layer and polyolefine based layer,
- 20 - at least an outer layer constituted from a monolayer sheathing or composite layer according to the invention.

25 The term inner layer referring to the layer whose inner surface is in contact with the conductor wire, in particular the electric wire or optical fiber.

Another object of the invention is a process to manufacture a mono or multilayer cable sheathing according to the invention, such as defined above.

30 Conventional extrusion and coextrusion techniques may be performed. For example, a mono or multilayer cable sheathing according to the invention may be manufactured by performing at least the following steps:

- i) melt blending the different ingredients of the (or each) layer composition(s), and

ii) extruding (or coextruding) the mixture(s) preferably at an extruder barrel temperature of the ranging from 180°C to 280°C.

Preferably, the process according to the invention comprise only one melt blending step or one extrusion (or coextrusion) step: the polymer is directly extruded without forming pellets prior to extrusion (or coextrusion) of the cable sheathing.

As example of extruder that may be used, mention may be made of JSW Model: TEX30XSST-45.5BW-5V available by RC Group.

The composition according to the invention may be extruded into mono or multilayer films or tubes.

The thickness of the monolayer cable sheathing according to the invention may be chosen as those conventionality used for cable sheathing, in particular electric or optical fiber cable sheathing.

The present invention also relates to a Cable comprising :

a) a conductive Core element having a diameter from 0.008 mm to 12 mm,

b) at least one insulating layer having a thickness from 0.5 mm to 9 mm around the conductive Core element,

c) at least one sheath layer or composite layer according to the invention having a thickness from 0.20 mm to 1.2 mm around the insulating layer,

wherein at least one of said sheath layer being the cable outer sheath.

In an advantageous embodiment, the cable defined above is an optical fiber having a diameter from 0.008 mm to 0.1 mm.

In an advantageous embodiment, the cable defined above is an conductive cable having a diameter from 0.08 mm to 12 mm, in particular a copper conductive cable.

The present invention further relates to the use of a cable sheathing according to the invention or manufactured according to the process of the invention to prevent and/or protect cable, in particular power cable, copper cable and optical fiber cable, from damages of termites and eventually light, heat, wind, water, humidity, soils, oil, grease, jelly, other insects and/or kinking.

Indeed, it has been observed that the cable sheathing according to the invention is resistant enough against the damage by the Australian subterranean termite “*Mastotermes darwiniensis*”, which are known as one of the most destructive termite species in the world. Therefore, the cable sheathing according to the invention or manufactured according to the process of the invention, may be advantageously used as outer layer or overlayer of a cable, such as electric cable or optical fiber cable, to protect the overall cable.

TINUVIN®, CHIMASSORB®, IRGANOX® and IRGAFOS® materials are available from BASF; CYASORB® materials are available from CYTEC TECHNOLOGY CORP;

UVASIL® materials are available from GREAT LAKES CHEMICAL CORP;

SADUVOR®, HOSTAVIN®, NYLOSTAB® and HOSTANOX® materials are available from CLARIANT;

UVINUL® materials are available from BASE;

UVASORB® materials are available from PARTECIPAZIONI INDUSTRIALI;

GOOD-RITE® materials are available from B.F.GOODRICH CO;

MARK® materials are available from ASAHI DENKA CO;

SONGLIGHT® materials are available from SONGWON

LOWINOX®, NAUGARD® and FLEXAMINE® materials are available from CHEMTURA.

ADK STAB® materials are available from PALMAROLE

Other aims and advantages of the present invention will emerge on reading the following examples, which are given as a guide and without any limitation.

EXAMPLES:

The following compositions have been prepared by melt blending the different ingredients and then extruded into films or tubes depending on the test purpose. Extrusion was performed at a screw speed of 40 round per minute (rpm) with a barrel temperature varying from 180°C to 245°C in the extruder. Suitable die is used to get either a film or a tube.

The quantities in the table below are given in percent by weight relative to the total weight of the composition.

Composition according to the invention	I	II	III	IV
PA10.10	q.s. 100	-	-	-
PA10.12	-	q.s. 100	-	q.s. 100
PA12.12	-	-	q.s. 100	-
Carbon black	-	-		2
Color Masterbatch green	-	-	6	-
Color Masterbatch blue	3	5	-	-
ADK Stab PEP-36	0.2	0.1	0.3	-
Lowinox 44B25	0.2	0.1	0.4	-
Tinuvin 234	0.4	0.2	0.5	-
Chimassorb 944LB	0.6	0.5	1.5	-
Irganox 1098	-	-	-	0.3
Irgafos 168	-	-	-	0.2
Bruggolen H3336	-	-	-	0.3
Weight ratio (antioxidants) / (UV absorbers + UV stabilizer)	0.4	0.3	0.35	0.4

q.s. 100: quantity sufficient to get 100% relative to the total weight of the composition

- 5 Comparative compositions V, VI, VII corresponding to compositions I, II, III wherein PAX.Y have been replaced by PA 6.6, PA6.10, PA 6.12 (which correspond to PAX.Y wherein the sum of X+Y is less than or equal to 18) were also prepared and extruded into films or tubes using the same process. Extruder JSW Model:
- 10 TEX30XSST-45.5BW-5V has been used to prepare the films and tubes from the above mentioned compositions (Co-rotation, screw type: segment, screw LSP-2, Screw diameter: 32 mm, Screw speed 59.5-595rpm, L/D ration: 45.5 (base diameter 30mm)).

- 15 Both samples according to the invention and comparative samples have been submitted to two set of tests:

First set of test: properties required by AS1049-2008 for anti-termite cable sheathing

Termite resistance: The compositions were extruded into tubes which were cut into 100mm length and were evaluated in the bioassay. The samples tubes were exposed to Australian subterranean termite species. The ends of each tube samples were capped with brass dome nuts. A single piece of timber was placed adjacent to each test specimen to both provide food source for termites and encourage them to contact and explore the surface of the plastic samples. The duration of the bioassay was 12 weeks.

Thermal resistance: The compositions were extruded into 150 μ m thick film. ASTM type IV dumbbells were die-cut along the flow in this extruded film. The test was performed in accordance with AS1049.2-2008 (heat ageing at 100°C for 120 hours in an air circulating oven, 80% retention of elongation at break required according to the AS1049 standard).

UV resistance: The compositions were extruded into 150 μ m thick film. ASTM type IV dumbbells were die-cut along the flow in this extruded film. The test was performed in accordance with AS1049.2-2008 (1200 hours UV exposure (radiance level of 0.5W/m², 1nm bandpass at 340nm, optical filter: cut-on 295nm, black panel temperature of 63°C, relative humidity (RH) = 50%, no water spray)).

Results: The results are as follows:

	V	VI	VII	I	II	III
Termite resistance	Fail	Fail	Fail	Pass (+)	Pass (++)	Pass (++)
Thermal Resistance (retention at break > 80% required)	Borderline	Borderline	Borderline	Pass (+)	Pass (++)	Pass (++)
UV resistance (retention at break > 85% required)	Fail (<85%)	Fail (<85%)	Fail (<85%)	85~90%	87~92%	89~94%

Termite resistance: It was observed that the tube samples constituted by compositions I, II, III according to the invention including PAX.Y with X+Y>18 exhibit a superior resistance to the attack of termites.

Particularly, tube samples constituted by compositions II, III including PAX.Y with $X+Y>20$ shows the best results. No nibbling nor attack marks have been observed whereas, the comparative compositions V, VI, VII including PAX.Y with $X+Y$ less than or equal to 18 showed clear signs of attacks.

Thermal resistance: Despite their high melting point, compositions V, VI, VII including PAX.Y with $X+Y$ less than or equal to 18 lead to extruded samples exhibiting a lower heat ageing resistance than compositions I, II, III according to the invention including PAX.Y with $X+Y>18$ over time. Particularly, samples issued from compositions II, III PAX.Y with $X+Y>20$ show the best results.

UV resistance: The plastic sheath should remain highly flexible and not degraded after long outdoor exposures during cables installation. Therefore, AS1049 standard imposes to retain 85% of elongation at break after an intense UV exposure. Compositions including PAX.Y with $X+Y>18$ have been formulated to meet this stringent criterion. Particularly, compositions including PAX.Y with $X+Y>20$ lead to the best results. Samples from compositions including PAX.Y with $X+Y$ of less than or equal to 18 failed this test.

Second set of tests: Other physical properties

This second set of physical properties enables to check the quality and efficiency of the sheath of the cable sheathing according to the invention.

Moisture uptake and Blistering resistance: The samples have been kept in a 50%RH (relative humidity) oven at 23°C for two weeks. Retention of tensile properties were assessed according to ISO 527 test.

Chemical resistance: The samples have been immersed in an aqueous solution of 5.8wt% of formic acid at 40°C for one week. Retention of tensile properties was assessed according to ISO 527 test.

Properties	V	VI	VII	I	II	III
Processability into tube	Medium	Medium	Medium	Good	Good	Good
Moisture uptake	8.0%	3.3%	3.0%	2.1%	2.1%	1.4%
Blistering Resistance	Bad	Bad	Bad	Medium	Good	Good

Chemical Resistance	Medium	Medium	Medium	Medium	Good	Good
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5 **Processability:** It has been observed that the samples extruded from compositions I, II and III according to the invention are easier to extrude into tubes compared to other comparative samples. Moreover, the tubes extruded by using the compositions I, II, III of the invention are glossy without defects on the surface.

Moisture uptake and Blistering resistance: It has been observed that the samples extruded from compositions I, II and III according to the invention exhibit far lower moisture retention and no blistering defects on surface compared to other comparative samples.

10 **Chemical resistance:** It has been observed that the samples extruded from compositions I, II and III according to the invention exhibit better resistance to formic acid compared to other comparative samples, as they retain better their mechanical properties.

CLAIMS

1. Use of a composition comprising:

a) at least one aliphatic polyamide having at least two units corresponding to the following general formula:



5 in which:

X.Y represents a unit obtained by polycondensation of:

- a diamine containing X carbon atoms and,

- a dicarboxylic acid containing Y carbon atoms,

and such that the sum of X+Y is strictly superior to 18,

10 b) at least one UV absorber and eventually at least one UV stabilizer,

c) at least one antioxidant ,

to manufacture a mono or multilayer cable sheathing resistant to termite damage.

2. Composition comprising:

15 a) at least one aliphatic polyamide having at least two units corresponding to the following general formula:



in which:

X.Y represents a unit obtained by polycondensation of:

20 - a diamine containing X carbon atoms and,

- a dicarboxylic acid containing Y carbon atoms,

and such that the sum of X+Y is strictly superior to 18,

b) at least one UV absorber and eventually at least one UV stabilizer

c) at least one antioxidant,

25 with a weight ratio of the total amount of antioxidant(s) over the total amount of UV absorber(s) and UV stabilizer(s) is less than or equal to 0.7.

3. Composition according to Claim 2, wherein said composition does not contain any polyhydric alcohol or polyhydroxy polymer, said
30 polyhydric alcohol or polyhydroxy polymer being different from sterically hindered phenols.

4. Composition according to any one of Claims 2 to 3, wherein X is chosen from 6 to 12, Y is chosen from 10 to 18, and/or the sum of X+Y is superior or equal to 20.

5. Composition according to Claim 4, wherein the polyamide is chosen from among PA6.14, PA 6.18, PA10.10, PA10.12, PA10.14, PA12.12 and mixture thereof.

6. Composition according to any one of Claims 2 to 5, wherein the at least one UV absorber is chosen from among black colored UV absorbers (L1).

10. 7. Composition according to Claim 6, wherein the composition comprises at least one metallic antioxidant or heat stabilizer.

8. Composition according to Claim 7, wherein the composition comprises at least one colorant or pigment, said colorant or pigment being different from black colorant and black pigment.

15. 9. Composition according to any one of Claims 7 to 8, wherein the composition comprises at least one UV stabilizer chosen from among Hindered Amine Light Stabilizers (HALS) amine and HALS amine ether.

20. 10. Composition according to Claim 2 or 9, wherein the composition comprises at least one UV absorber chosen from among organic and/or mineral UV absorbers (L2) chosen from among benzophenone UV absorbers, benzotriazole UV absorbers and TiO₂ eventually coated with rutile, said UV absorber.

25. 11. Composition according to any one of Claims 2 to 10, wherein the at least one antioxidant is chosen from among sterically hindered phenolic antioxidants and aromatic secondary amines, and preferably sterically hindered phenolic antioxidants.

30. 12. Composition according to any one of Claims 2 to 11, where the composition comprises at least one antioxidant being chosen from among organophosphites, organophosphonites and/or thio antioxidants.

13. Composition according to any one of Claims 2 to 12, wherein the composition comprises at least one additive chosen from among plasticizers and impact modifiers.

35. 14. Cable sheathing comprising at least one layer comprising a composition as defined in any one of Claims 2 to 13.

15. Cable sheathing as defined in Claim 14, wherein it comprises as outer layer or overlayer a layer constituted of a composition as defined in any one of Claims 2 to 13.

5 16. Process to manufacture a cable sheathing as defined in Claim 14 or 15, by performing at least the following steps:

i) melt blending the different ingredients of the (or each) layer composition(s), and

ii) extruding (or coextruding) the mixture(s) at an extruder barrel temperature of the ranging from 180°C to 280°C.

10 17. Process according to Claim 16, wherein it comprises only one melt blending step or one extrusion (or coextrusion).

15 18. Use of a cable sheathing as defined in any one of Claims 14 to 15 or as manufactured in Claim 16 to 17, to prevent and/or protect cable, in particular electric cable or optical fiber cable, from damages of termites and eventually light, heat, wind, water, humidity, soils, oil, grease, jelly, other insects and/or kinking.