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Carpet backing layer composition.

(57)

The present invention relates to a carpet backing layer composition, comprising: 100 parts by weight of a polyolefin or a blend of polyolefins and optionally a blend of oils, wax and tackifiers, the each polyolefin or polyolefin blend comprising at least 50% by weight of (co)polymerized C3 - C8 alfa-olefins, between 100 and 900 parts by weight of one or more inorganic filler(s) characterized by a volume median particle diameter (D50) comprised between 10 and 1000 µm, the backing layer composition having a Young modulus at 23°C comprised between 10 MPa and 70 MPa. The invention further relates to a carpet comprising a carpet backing layer obtained from the carpet backing layer composition and a method for the preparation of the carpet.

CARPET BACKING LAYER COMPOSITION

Field of the Invention

[0001] The present invention relates to a composition for carpet backing, in particular to a composition comprising a polyolefin and a filler. The present invention also relates to a carpet comprising the carpet backing composition and to a method for making the carpet comprising the carpet backing composition.

Background of the Invention

[0002] Most conventional carpets comprise a primary backing layer with fiber tufts in the form of cut or uncut loops extending upwardly from the primary backing layer and a secondary backing layer at the backside of the primary backing layer.

[0003] US2004/0052952 discloses a process for tuft and filament binding to an unfinished carpet, which comprises applying a coating composition which comprises from 50% to 100% by weight of one or more substantially amorphous poly-alpha-olefins as a melt to the backside of the unfinished carpet in a coating weight amount of from 20 to 1,500 g/m² to bind the tuft and filament to the unfinished carpet, wherein the melt viscosity of the coating composition at 190°C is from 200 mPas to 20,000 mPas.

[0004] The poly-alpha-olefin comprises polymerized monomer units of from 0% to 100% by weight of one or more alpha-olefins having 4 to 10 carbon atoms, from 0% to 100% by weight of propene and from 0% to 20% by weight of ethene.

[0005] The coating composition further comprises one or more of from 0% to 5% by weight of a crystalline polyolefin, from 0% to 35% by weight of fillers or pigments, and from 0% to 15% by weight of a wax.

[0006] US 2008/0280093 discloses a carpet comprising:

- a primary backing material;
- a plurality of fibers attached to the primary backing material; and
- an adhesive composition, wherein the adhesive composition comprises at least one homogenously branched ethylene polymer characterized as having a short chain branching distribution index of greater than or equal to 50%, and a filler in an amount comprised between 1 and 75 weight percent of the composition,

wherein the adhesive composition has substantially penetrated and substantially consolidated the fibers.

Preferably the ethylene polymers are substantially amorphous or totally amorphous. Representative examples of fillers include, but are not limited limestone (primarily
5 CaCO_3), marble, quartz, silica, and barite (primarily BaSO_4). Suitable particle sizes range from about 1 to about 50 μm .

[0007] JPH05132870 discloses a resin composition for backing tile carpets, obtained by blending:

- 100 parts by weight resin component composed of (A) 50-90 % by weight
10 amorphous polyolefin and (B) 10-50 % by weight tackifier (e.g. natural rosin or a modified rosin) with (C) 0-30 parts by weight of crystalline polypropylene and
- 25-900 parts by weight filler containing magnesium carbonate.

The particle size of MgCO_3 filler is between 1 and 500 μm , preferably between 10 and 300 μm . The polyolefin can be a random copolymer of ethylene and propylene, wherein
15 the ethylene content is between 0 and 30% by weight.

[0008] US 2014/0017439 describes carpets comprising:

- a primary backing layer having a face side and a back side;
- a plurality of fibers attached to the primary backing layer; and
- a second layer attached to the back side of the primary backing layer, comprising
20 at least one propylene-based elastomer, with limited crystallinity, comprising at least about 60% by weight propylene-derived units and about 5 to about 25% by weight ethylene-derived units.

The backing layers may include up to 80% by weight, based on the total weight of the layer, of organic and/or inorganic fillers. Suitable fillers are calcium carbonate,
25 aluminum trihydrate, talc, among others.

[0009] US 7,741,397 discloses a polymer composition comprising an ethylene/alpha-olefin interpolpolymer and a filler. The ethylene/alpha-olefin interpolpolymer is a block copolymer having a certain amount of crystallinity, and the filler, with a particle size preferably comprised between 3.2 and 8 μm , is present in the polymer

composition in an amount comprised between 30 and 95%. The polymer composition can be used in automotive flooring applications.

US 2010/0285246 discloses a polyolefin for floor coverings, wherein the polyolefin contains not more than 20% by weight of ethylene, either 70-100% by weight or not more than 20% by weight of propylene and/or either 70-100% by weight or not more than 20% by weight of 1-butene or of another linear 1-olefin, with the sum of the proportions being 100% by weight, and the triad distribution for propene triads determined by ¹³C-NMR has an isotactic proportion of 75-98% by weight, an atactic proportion of less than 20% by weight and a syndiotactic proportion of not more than 20% by weight and/or the triad distribution for 1-butene triads determined by ¹³C-NMR has an isotactic proportion of 10-98% by weight, an atactic proportion of 1-85% by weight and a syndiotactic proportion of not more than 20% by weight. The polyolefin may be mixed with not more than 80% by weight of inorganic and/or organic, based on a hot melt formulation comprising polyolefin and filler.

[0010] WO2015/100073 discloses a carpet comprising:

- (a) a primary backing layer;
- (b) a plurality of fibers attached to the primary backing layer; and
- (c) a second layer attached to the back side of the primary backing layer, wherein at least one of the primary backing layer and the second layer comprises a polymer blend comprising:
 - (i) a first propylene-based polymer, wherein the first propylene-based polymer is a homopolymer of propylene or a copolymer of propylene and ethylene or a C4 to C10 alpha-olefin; and
 - (ii) a second propylene-based polymer, wherein the second propylene-based polymer is a homopolymer of propylene or a copolymer of propylene and ethylene or a C4 to C10 alpha-olefin; wherein the second propylene-based polymer is different than the first propylene-based polymer;

wherein the polymer blend has a melt viscosity, measured at 190°C, according to ASTM D-3236, of about 500 to about 25,000 cP. Any one of the layers can comprise a filler and/or additive. The filler may be present at up to about 80% by weight, based on the total weight of the layer. The polymer blend may have a heat of fusion comprised

between 5 J/g and less than 90 J/g and a crystallization temperature of greater than 0°C and less than 110°C,

[0011] US 2016/0102429 discloses a carpet backing composition comprising:

- (a) 10 to 50% by weight of a first polymer component, the first polymer component comprising an elastomeric polymer;
- (b) 50 to 90% by weight of a filler; and
- (c) 0.1 to 5% by weight of a compatibilizer, the compatibilizer providing free radical source to bond the first polymer component and the filler.

The filler comprises fly ash, ground glass, calcium carbonate, talc, clay, or combinations thereof. The first polymer component is a propylene-based copolymer having:

- 75 to 95 % by weight propylene-derived units and about 5 to 25% by weight units derived from at least one of ethylene or a C4 to C12 alpha-olefin;
- a heat of fusion, as determined by DSC, of about 75 J/g or less;
- a percent crystallinity of 2 to 65.

The composition may further comprise a second polymer component. The second polymer component can be a homo-polymer, such as a functionalized/modified homo-polymer, a copolymer, such as a functionalized/modified copolymer, an oligomer, a hydrocarbon tackifying resin, such as a functionalized/modified hydrocarbon tackifying resin, or any combinations thereof.

[0012] Carpets, during their use, are subject to atmospheric fluctuations such as changes in ambient temperature and humidity, which endanger their dimensional stability. To remedy to the dimensional instability and to prevent curling, a flexible backing is indispensable; yet it is generally known that the flexibility of the polymer(s), forming the backing layer, is negatively influenced by the addition of filler and additives. The yield strength of a combination of polyolefin, filler, oil, wax and/or tackifier is inferior to the yield strength of the polyolefin as such. Fillers are added to the formulation both for economical and performance reasons e.g. fire resistance.

The negative effect of filler on the flexibility of a polyolefin/filler blend, depends on the particle size of said filler and is proportional to it. Otherwise, low particle size fillers

negatively influence processing of the blend since they give rise to local overheating of the polyolefin causing degradation of the polymer resulting, dependent on the polymer composition, in either an increase in viscosity due to peroxide-initiated crosslinking or a loss in physical properties of the backing layer due to chain scission.

5 In particular, polymers containing high levels (more than 50% in weight) of ethene are subject to a viscosity increase during high temperature processing due to crosslinking degradation, causing poor processing performances especially for high filled compounds. Contrary, polymers containing high level of C3 to C8 monomers have no tendency to crosslink during hot processing. In addition, high amounts of low particle
10 size filler negatively influence the adhesion of the backing layer to the unfinished carpet.

Aims of the invention.

[0013] In one aspect, the present invention aims at providing a carpet backing layer that does not present the drawbacks of the prior art carpet backing layers. In a further
15 aspect, it is an aim of the present invention to provide a carpet backing layer allowing the production of carpets showing a dimensional stability independent of atmospheric conditions, the carpet backing layer being applicable by a trouble-free process. An aim of a further aspect of the invention is to provide a method for the production of carpets, comprising the carpet backing layer as well as the carpet itself.

Summary of the Invention

[0014] According to a first aspect, the present invention relates to a carpet backing layer composition comprising:

- between at least 10% by weight and 50% by weight or less, preferably 40% by weight or less, more preferably 30% by weight or less, most preferably 20% by
25 weight or less of a semi-crystalline polyolefin or of a blend of two or more semi-crystalline polyolefin(s) said polyolefin or blend of two or more polyolefins being characterized in that the weight percentage of (co)polymerized C2 olefin is less than 50 and that the weight percentage of C3 – C8 alpha olefins is 50 or more; and
- between up to 90% by weight and 50% by weight or more, preferably 60% by
30 weight or more, more preferably 70% by weight or more, most preferably 80% by weight or more of one or more inorganic filler(s) characterized by a volume

median particle diameter (D50) comprised between up to 1000 μm and at least 10 μm , preferably more than 20 μm , more preferably more than 50 μm and most preferably more than 100 μm , or even more than 200 μm as obtained from laser light scattering measurements according to ISO 13320;

- 5 the backing layer composition being characterized by a Young modulus measured after melting and conditioning for 48 hours at 23°C, according to ASTM D 882, comprised between 10 and 70 MPa, preferably between 15 and 70 MPa, more preferably between 20 and 50 MPa.

[0015] Preferred embodiments of the present invention have one or more of the
10 following features:

- the polyolefin or blend of polyolefins has a Shore A hardness, according to ASTM D 2240 of at least 70, preferably of at least 75, more preferably at least 80, most preferably of at least 85 or even at least 90;
- the C3 – C8 alpha-olefin(s) of the one or more polyolefin(s) are selected from the
15 group consisting of the isomers of C3 to C8 alpha-olefins and combinations thereof;
- the C3 – C8 alpha-olefin of the one or more polyolefin(s) is propene, 1-butene, 1-octene or a combination thereof;
- the polyolefin is selected from the group consisting of polypropylene, poly-1-
20 butene, propene-ethene copolymer, propene-1-butene copolymer, 1-butene-ethene copolymer, propene-1-butene-ethene copolymer and 1-octene-ethene copolymer;
- the polyolefin or blend of polyolefins is characterized by a Young modulus at 23°C, according to ASTM D 882, of more than 10 MPa, preferably of more than
25 20 MPa, more preferably of more than 30 MPa, most preferably of more than 50 MPa;
- the inorganic filler is selected from the group consisting of talc, mica, calcium carbonate, magnesium carbonate, dolomite, barite (barium sulfate), bauxite, magnesium hydroxide, aluminium hydroxide, kaolin, silica, glass, and any
30 combination thereof;

- the carpet backing layer composition comprises one or more processing additives selected from the group consisting of waxes, oils and tackifiers;
- the carpet backing layer composition comprises:
 - o between at least 10% by weight and 50% by weight or less, preferably 40%
5 by weight or less, more preferably 30% by weight or less, most preferably 20% by weight or less of ingredient composition (mixture or blend) I, preferably of ingredient composition II, more preferably of ingredient composition II, most preferably of ingredient composition IV; and
 - o between up to 90% by weight and 50% by weight or more, preferably 60%
10 by weight or more, more preferably 70% by weight or more, most preferably 80% by weight or more of one or more inorganic filler(s) characterized by a volume median particle diameter (D50) comprised between up to 1000 µm and at least 10 µm, preferably more than 20 µm, more preferably more than 50 µm and most preferably more than 100 µm, or even more than 200 µm
15 as obtained from laser light scattering measurements according to ISO 13320.;

wherein:

- I. comprises 20% by weight or more of one or more polyolefin(s) and 80% by weight or less of one or more wax(es), oil(s) and/or tackifier(s);
- 20 II. comprises 25% by weight or more of one or more polyolefin(s) and 75% by weight or less of one or more wax(es), oil(s) and/or tackifier(s);
- III. comprises 35% by weight or more of one or more polyolefin(s) and 65% by weight or less of one or more wax(es), oil(s) and/or tackifier(s);
- IV. comprises 45% by weight or more of one or more polyolefin(s) and
25 55% by weight or less of one or more wax(es), oil(s) and/or tackifier(s);
- the carpet backing layer composition comprises:
 - o between at least 10% by weight and 50% by weight or less, preferably 40%
by weight or less, more preferably 30% by weight or less, most preferably 20% by weight or less of ingredient composition V, preferably of ingredient
30 composition VI, more preferably of ingredient composition VII; and

- between up to 90% by weight and 50% by weight or more, preferably 60% by weight or more, more preferably 70% by weight or more, most preferably 80% by weight or more of one or more inorganic filler(s) characterized by a volume median particle diameter (D50) comprised between up to 1000 μm and at least 10 μm , preferably more than 20 μm , more preferably more than 50 μm and most preferably more than 100 μm , or even more than 200 μm as obtained from laser light scattering measurements according to ISO 13320;

wherein:

- V. comprises 55% by weight or more of one or more polyolefin(s) and 45% by weight or less of one or more wax(es), oil(s) and/or tackifier(s);
 - VI. comprises 65% by weight or more of one or more polyolefin(s) and 35% by weight or less of one or more wax(es), oil(s) and/or tackifier(s);
 - VII. comprises 80% by weight or more of one or more polyolefin(s) and 20% by weight or less of one or more wax(es), oil(s) and/or tackifier(s);
- the carpet backing layer composition has a melt viscosity at 160°C in a rotational viscometer, according to ISO 11443, of from 10 Pas to 5000 Pas, preferably from 20 Pas to 2500 Pas, more preferably from 50 to 500 Pas.

[0016] In a further aspect, the present invention relates to a carpet comprising a carpet backing layer comprising the carpet backing layer composition of the present invention.

[0017] Preferred characteristics of the carpet according to the present invention comprise:

- the backing layer has a surface density comprised between 1600 and 4000 g/m^2 , preferably between 1700 and 3500 g/m^2 , more preferably between 1800 and 3000 g/m^2 , most preferably between 1900 and 2500 g/m^2 and
- the backing layer thickness is comprised between 0.4 and 4.0 mm, preferably between 0.5 and 3.5 mm, more preferably between 0.7 and 2.5 mm, most preferably between 0.8 and 2.0 mm.

[0018] The present invention further discloses a method of making a carpet comprising:

- a) extrusion coating the carpet backing layer composition of the present, on the back side of a primary backing material, said primary backing material having a face and a back side, a plurality of fibers attached to the primary backing material and extending from the face side and exposed at the back side and
- 5 b) cooling down the carpet layer composition and forming the carpet backing layer.

[0019] Preferred embodiments of the method of making a carpet further disclose:

- the extrusion coating is performed at a temperature comprised between 130 and 170°C, preferably between 140 and 160°C.
- an additional step comprises subjecting the extrusion coated carpet backing layer composition of step a) to a subsequent heat treatment at a temperature comprised between 130 and 170°C, preferably between 140 and 160°C for a time period comprised between 1 and 60 s, preferably between 5 and 30 s, more preferably between 10 and 20 s, before cooling down in step b).

Detailed description of the invention

15 [0020] According to an embodiment of the present invention there is provided a carpet backing layer for carpet tiles and carpet rolls, showing an outstanding dimensional stability, independent of the ambient conditions, said carpet backing layer being obtained from a semi-crystalline polyolefin or a blend of semi-crystalline polyolefins, one or more filler(s) and optionally of one or more compounds selected

20 from the group consisting of waxes, oils, tackifiers and combinations thereof.

[0021] The polyolefin(s) for being used in the carpet backing layer of the present invention are obtained from polymerizing one or more C2 to C8 olefin.

[0022] In the case where one polyolefin is used, that polyolefin comprises 50% by weight or more of (co)polymerized C3 to C8 alpha olefins.

25 [0023] In the case where a blend of polyolefins is used, one or more of the polyolefins may comprise less than 50% by weight of (co)polymerized C3 – C8 alpha-olefins, provided that the blend of polyolefins comprises 50% by weight or more of C3 – C8 alpha-olefins.

[0024] The (co)polymerized C3 to C8 alpha olefins are preferably selected from the

30 group consisting of propene, 1-butene, 1-pentene, 1-hexene, 1-heptene, and 1-octene.

[0025] Alpha-olefins selected from the group consisting of isopentene, 3,3-dimethyl-1-butene, 3,3-dimethyl-1-pentene, 3,4-dimethyl-1-pentene, 3-ethyl-1-pentene, 3-methyl-1-hexene, 4,4-dimethyl-1-pentene, 4-methyl-1-hexene, 5-methyl-1-hexene, , 3-methyl-1-heptene, 4-methyl-1-heptene, 5-methyl-1-heptene, 6-methyl-1-heptene, 3,3-dimethyl-1-hexene, 4,4-dimethyl-1-hexene, 5,5-dimethyl-1-hexene, 3,4-dimethyl-1-hexene, 3,5-dimethyl-1-hexene, 4,5-dimethyl-1-hexene, 3-ethyl-1-hexene, 4-ethyl-1-hexene, 5-ethyl-1-hexene, 3-methyl-4-ethyl-1-pentene, 3-ethyl-4-methyl-1-pentene and 3-methyl-3-ethyl-1-pentene are optionally used.

[0026] Preferably the C3 to C8 alpha-olefin is propene, 1-butene, 1-octene or a combination thereof.

[0027] Preferably the polyolefin is a polypropylene homopolymer or a propylene based copolymer.

[0028] Preferably the polyolefin is a polybutylene-1 homopolymer or a 1-butene based copolymer; more preferably the polyolefin is a 1-butene based copolymer.

[0029] The propylene-based copolymer comprises 50% by weight or more, preferably 60% by weight or more, more preferably 70% by weight or more, most preferably 80% by weight or more or even 90% by weight or more of propylene-derived units, based on the total weight of the propylene-based copolymer. Correspondingly, the units derived from at least one of ethylene or a C4 to C8 alpha-olefin may be present in an amount of less than 50% by weight, preferably of less than 40% by weight, more preferably of less than 30% by weight, most preferably of less than 20% by weight or even of less than 10% by weight based on the weight of the propylene-based copolymer.

[0030] The 1-butene-based copolymer comprises 50% by weight or more, preferably 60% by weight or more, more preferably 70% by weight or more, most preferably 80% by weight or more of 1-butene-derived units, based on the total weight of the 1-butene-based copolymer. Correspondingly, the units derived from at least one of ethylene, propylene or a C5 to C8 alpha-olefin may be present in an amount of less than 50% by weight, preferably of less than 40% by weight, more preferably of less than 30% by weight, most preferably of less than 20% by weight based on the weight of the 1-butene-based copolymer. Preferably the 1-butene-based copolymer comprises less than 85% by weight of polymerized 1-butene and 15% by weight or

more of polymerized propene and/or ethene, the weight percentage of ethene being under 50.

[0031] Preferably the polyolefin is selected from the group consisting of polypropylene, propene-ethene copolymer, propene-1-butene copolymer, 1-butene-ethene copolymer, propene-1-butene-ethene copolymer and 1-octene-ethene copolymer.

[0032] Preferably the polyolefin comprises less than 50% by weight of polymerized ethene.

[0033] When a blend of polyolefins is used, one or more of the polyolefins may comprise more than 50% by weight of (co)polymerized ethene, provided that the blend of polyolefins comprises less than 50% by weight of ethene.

[0034] The polyolefin or polyolefin blend is a semi-crystalline polyolefin or polyolefin blend characterized by:

- a heat of fusion (ΔH_f) of 75 J/g or less, preferably of 70 J/g or less, more preferably of 50 J/g or less, most preferably of 45 J/g or less, or even of 35 J/g or less and of more than 0.5 J/g, preferably of more than 1 J/g, more preferably of more than 5 J/g, most preferably of more than 10 J/g or even more than 20 J/g;
- a melting peak temperature comprised between 30 and 160°C, preferably between 40 and 150°C, more preferably between 50 and 140°C;

the heat of fusion (ΔH_f) and the melting peak temperature being determined by DSC according to ASTM D3418, with a heating gradient of 10°C/minute, The melting peak temperature is determined at the peak in the DSC curve. The heat of fusion and melting peak temperature are determined after a first fusion and crystallization step for avoiding irreproducible results and eliminating memory or history of the polymer.

[0035] The polyolefin further is preferably characterized by:

- a number average molecular weight (M_n) comprised between 2,500 and 250,000 g/mole, preferably between 10,000 and 250,000 g/mole, more preferably between 25,000 and 200,000 g/mole;
- a polydispersity (DP) comprised between 1.5 and 20, preferably between 1.5 and 15, more preferably between 1.5 and 5, most preferably between 1.8 to about 3, or even between 1.8 to about 2.5;

as determined by Gel Permeation Chromatography in 1,2,4-trichlorobenzene, against polystyrene standards.

[0036] Preferably the polyolefin or blend of polyolefin is further characterized by:

- a Young modulus at 23°C, according to ASTM D 882, of more than 10 MPa, preferably of more than 20 MPa, more preferably of more than 30 MPa most preferably of more than 50 MPa or even of more than 70 MPa;
- a Shore A hardness, according to ASTM D 2240, of at least 70, preferably of at least 75, more preferably of at least 80, most preferably of at least 85 or even of at least 90.

10 [0037] To the one or more polyolefin(s) is/are optionally blended:

- tackifiers comprising at least one hydrocarbon, wherein the hydrocarbon comprises an aliphatic hydrocarbon, a cycloaliphatic hydrocarbon, an aromatic modified aliphatic hydrocarbon, an aromatic and aliphatic hydrocarbon modified with at least one fatty acid ester or any combination thereof. Commercially available examples of the hydrocarbon tackifier include, e.g., Escorez™ (Escorez 1102 and 5600) (ExxonMobil Corp.), and Struktol™ TR016 (Struktol Company of America); and/or Regalite (Regalite 1090) from Eastmann Tackifiers could be hydrotreated or not;
- waxes selected from microcrystalline waxes, polyethylene waxes, Fischer-Tropsch waxes, paraffin waxes, polypropylene waxes or combinations thereof. Preferably microcrystalline waxes and/or polypropylene waxes may be used. Commercially available waxes include but are not limited to Sasolwax® C80 (Sasol) and A-C® 1660 (Honeywell); and/or Microcristalline Wax LMP, or Microcristalline Wax HMP from Shell; and/or MMP Wax from Alpha;
- oils, for example oils selected from vegetable and derivatized vegetable oils, hydrotreated heavy naphthenic petroleum oils, paraffinic oils or combinations thereof may be used. Commercially available examples of naphthenic oils are KN 4006 and KN 4008 (KunLun Lubricant Company of Petrochina) and LP 150 and LP 350 (Kukdong Oil and Chemicals) and/or Finavestan 360 B from Total and/or processing oil 6116 WOP from PetroCenter. Preferably, oils are based on paraffinic hydrotreated to minimize the smell of the compound.

[0038] To the one or more polyolefin(s) optionally comprising one or more oil(s) and/or one or more wax(es) and/or one or more tackifier(s) are added one or more fillers selected from the group consisting coal fly ash, carbonate salts such as magnesium carbonate, calcium carbonate and calcium-magnesium carbonate, barium sulfate, carbon black, metal oxides, inorganic material, natural material, alumina trihydrate, magnesium hydroxide, aluminum hydroxide, bauxite, talc, mica, barite, kaolin, silica, post-consumer glass, or post-industrial glass, synthetic and natural fiber, or any combination thereof. Preferably, the filler comprises talc, mica, calcium carbonate, barite, kaolin, silica, glass, or any combination thereof.

[0039] The one or more fillers are characterized by a volume median particle diameter (D50) comprised between up to 1000 μm and more than 10 μm , preferably more than 20 μm , more preferably more than 50 μm and most preferably more than 100 μm or even more than 200 μm as obtained from laser light scattering measurements according to ISO 13320.

[0040] The technique of laser diffraction is based on the principle that particles passing through a laser beam will scatter light at an angle that is directly related to their size: large particles scatter at low angles, whereas small particles scatter at high angles. The laser diffraction is accurately described by the Fraunhofer approximation and the Mie theory, with the assumption of spherical particle morphology.

[0041] Concentrated suspensions, comprising about 1.0 % by weight of filler particles, are prepared, using suitable wetting and/or dispersing agents. Suitable solvents are for example water or organic solvents such as for example ethanol, isopropanol, octane or methyl ethyl ketone. A sample presentation system ensures that the material under test passes through the laser beam as a homogeneous stream of particles in a known, reproducible state of dispersion.

[0042] Typically the particle size distribution is measured by laser light scattering using the particle size analyzer (HORIBA 920) from (Horiba Scientific) according to ISO 13320. Particle size measurements are performed on pure solvent, e.g. 150 ml of methyl ethyl ketone, to which a concentrated suspension of filler is added drop by drop until the concentration of filler is such that a transmission, as displayed by the particle size analyzer is comprised between 75 and 90%.

[0043] The carpet backing layer of the present invention thus comprises a composition comprising:

- between at least 10 % by weight and 50% by weight or less, preferably 40% by weight or less, more preferably 30% by weight or less of a semi-crystalline polyolefin or of a blend of two or more semi-crystalline polyolefin(s) characterized in that the polyolefin or blend of polyolefins has a weight percentage of (co)polymerized C3 – C8 alfa-olefins of 50 or more and in that the Shore A hardness, according to ASTM D 2240, of the one or more polyolefin(s) (blend) is at least 70, more preferably at least 80, most preferably at least 85; or even at least 90;
- between up to 90% by weight and 50% by weight or more, preferably 60% by weight or more, more preferably 70% by weight or more of one or more inorganic filler(s) characterized by a volume median particle diameter (D50) comprised between up to 1000 µm and more than 10 µm, preferably more than 20 µm, more preferably more than 50 µm and most preferably more than 100 µm, or even more than 200 µm as obtained from laser light scattering measurements according to ISO 13320;

the backing layer composition being characterized by a Young modulus at 23°C, according to ASTM D 882 , of more than 10 MPa, preferably of more than 15 MPa, more preferably of more than 20 MPa.

[0044] The backing layer is characterized by a Young modulus at 23°C comprised between 10 and 70 MPa, preferably between 15 and 70 MPa, more preferably between 20 and 50 MPa.

[0045] The carpet backing layer further may comprise one or more wax(es), oil(s) and/or tackifier(s), substituting 80% by weight or less, advantageously 75% by weight or less, advantageously 65% by weight or less, advantageously 55% by weight or less, advantageously 45% by weight or less, advantageously 35% by weight or less, advantageously 20% by weight or less, of the semi-crystalline polyolefin or of the blend of semi-crystalline polyolefins, the polyolefin part in the carpet backing formulation thus being transformed into:

- 20% by weight or more of one or more polyolefin(s) and 80% by weight or less of more or more wax(es), oil(s) and/or tackifier(s) (mixture or blend I);

- 25% by weight or more of one or more polyolefin(s) and 75% by weight or less of one or more wax(es), oil(s) and/or tackifier(s) (mixture or blend II);
- 35% by weight or more of one or more polyolefin(s) and 65% by weight or less of one or more wax(es), oil(s) and/or tackifier(s) (mixture or blend III)
- 5 - 45% by weight or more of one or more polyolefin(s) and 55% by weight or less of one or more wax(es), oil(s) and/or tackifier(s) (mixture or blend IV);
- 55% by weight or more of one or more polyolefin(s) and 45% by weight or less of one or more wax(es), oil(s) and/or tackifier(s) (mixture or blend V);
- 65% by weight or more of one or more polyolefin(s) and 35% by weight or less of
10 one or more wax(es), oil(s) and/or tackifier(s) (mixture or blend VI);
- 80% by weight or more of one or more polyolefin(s) and 20% by weight or less of one or more wax(es), oil(s) and/or tackifier(s) (mixture or blend VII).

[0046] For this particular case the carpet backing composition comprises a composition comprising:

- 15 - between at least 10% by weight and 50% by weight or less, preferably 40% by weight or less, more preferably 30% by weight or less of a mixture or blend I, II, III, IV, V, VI or VII;
- between up to 90% by weight and 50% by weight or more, preferably 60% by weight or more, more preferably 70% by weight or more of one or more inorganic
20 filler(s).

[0047] The inventors have found that:

- the weight percentage of (co)polymerized C3 – C8 alpha-olefin;
 - the Young modulus of the backing layer composition;
 - and the particle size of the filler(s);
- 25 are key for:
- getting the right yield strength of the carpet backing layer resulting in a carpet characterized by a satisfactory handling and dimensional stability;
 - limiting thermal degradation of the polyolefin(s) to a strict minimum;

- guaranteeing good adhesion of the backing layer composition to the unfinished carpet.

[0048] The composition according to the present invention can optionally contain one or more further additives, such as, antimicrobial, biocides, antioxidants, thermal stabilizers, flame retardants, or any combination thereof. Preferably, the composition includes at least a flame retardant, a thermal stabilizer or a combination thereof.

[0049] A stabilizer can for example be added to the composition to provide heat stability. The stabilizer can be used to minimize degradation caused by exposure to heat and oxygen, including conditions encountered in the manufacture of a product containing the composition of the present invention.

[0050] Particularly preferred stabilizers are for example sterically hindered phenolic antioxidants such as Irganox 1010 and Irganox 1076 (BASF) and stabilizers from the phosphonite or phosphite type such as Doverphos® S-9228 (Dover Chem. Corp) or Weston® TNPP (Addivant).

[0051] Flame retardants preferably are selected from halogenated and non-halogenated flame retardants, zinc borates, aluminium hydroxides, bromine oxides and zinc hydroxides. Liquid flame retardants can also be used for instance phosphate plasticizers.

[0052] The composition according to the present invention optionally comprises between 0.1% and 5% of the one or more further additives.

[0053] The compositions according to the present invention are characterized by:

- a melt viscosity at 160°C in a rotational viscometer, according to ISO 11443:2005, of from 10 Pas to 5000 Pas, preferably from 20 Pas to 2500 Pas, more preferably from 50 to 500 Pas;
- an open time of not more than 300 seconds, preferably not more than 200 seconds, more preferably not more than 150 seconds and most preferably not more than 120 seconds, with further preferred ranges being not more than 100 seconds, not more than 60 seconds, not more than 45 seconds, not more than 30 seconds, not more than 20 seconds, and in particular 1-30 seconds, wherein the open time stands for the period of time during which the composition is

processable i.e. does not solidify or partially solidify, so that a potential blockage and contamination of the application equipment is circumvented.

[0054] The composition according to the present invention preferably is compounded in a suitable heated mixer, for example in a twin screw or a single screw extruder, at an internal temperature comprised between 130 and 170°C, preferable
5 between 140 and 160°C. By internal temperature it is meant the real temperature of the melt and not the set temperatures of the equipment for preparing and processing of said melt.

[0055] The melt is applied, by extrusion coating, on the back side of a first backing
10 material, said first backing material having a face and a back side, a plurality of fibers attached to the first backing material and extending from the face of the first backing material and exposed at the back side of the first backing material.

[0056] The melt blended composition, standing at a temperature comprised between 130 and 170°C, preferable between 140 and 160°C, is applied in the form of
15 a thin film on the back side of the first backing material, forming the carpet backing layer upon cooling, with a layer thickness comprised between 0.4 and 4.0 mm, preferably between 0.6 and 3.0 mm, more preferably between 0.8 and 2.0 mm, corresponding to a surface density comprised between 1600 and 4000 g/m², preferably between 1700 and 3500 g/m², more preferably between 1800 and 3000 g/m², most
20 preferably between 1900 and 2500 g/m².

[0057] The extrusion coated carpet backing layer composition optionally is subjected to a subsequent heat treatment at a temperature comprised between 130 and 170°C, preferable between 140 and 160°C for a time period comprised between 1 and 60 s, preferable between 5 and 30 s, more preferably between 10 and 20 s, before
25 cooling down.

[0058] The carpets may be produced and applied as tiles or as roles.

[0059] The carpets thus obtained prove satisfactory dimensional stability to prevent curling upon varying atmospheric temperature and humidity conditions.

Examples 1-25

[0060] The following illustrative examples are merely meant to exemplify the present invention but are not destined to limit or otherwise define the scope of the present invention.

- 5 [0061] In tables 1 to 3 the influence of filler content, particle size of the filler and additive content on the Young modulus of the carpet backing layer composition is illustrated. The amounts of polyolefins, additives and fillers are given in parts per weight.

Example	Vestoplast 708 Shore A : 67	Vestoplast 408 Shore A: 94	Carbocia 310	Additives	% weight Filler	Young Modulus (Mpa)
1		100	100		50	70
2		80	100	20	50	20
3	100		200		67	9
4		65	300	35	75	35
5	65		400	35	80	7
6		65	400	35	80	55

Table 1.

- 10 [0062] In table 1 examples 3 and 5 are comparative because of the Young modulus of the backing layer composition.

Example	Vistamax 6502 Shore A : 71	Vistamax 8880 Shore A : 93	Licocene 1602 Shore A: 82	Carbocia 310	Additives	% weight Filler	Young Modulus (Mpa)
7	100			200		67	36
8			100	200		67	70
9	80			100	20	50	16
10		80		100	20	50	53

Table 2.

[0063] In:

- 15 - Examples 2, 9 and 10 the additive is LMP wax, a microcrystalline hydrogenated microwax derived from the residues of the vacuum distillation of crude oil from Shell;
- Examples 4 to 6 the 35 parts of additives comprise 20 parts of tackifier, 5 parts of mineral oil and 10 parts of LMP wax, wherein the tackifier is Escorez 1102 or
- 20 Escorez 5600 from ExxonMobil and the mineral oil is Processing oil 6116 WOP from PetroCenter.

Example	Vestoplast 408	Durcal 10	BL	Omyacarb 130 GU	Carbocia 310	Carbocia 1300	Young Modulus (MPa)
11	100	100					69

12	100	150					120
13	100		100				70
14	100			100			60
15	100				100		50
16	100				150		65
17	100					100	50
18	100					150	66

Table 3.

Example	Polyolefin 1 (parts)	Polyolefin 2 (parts)	Additives parts	Filler (parts)	% weight Filler	Young Modulus (MPa)
19	Vestoplast 508 (20)	Vestoplast 408 (45)	35	Carbocia 310 (400)	80	40
20	Vestoplast 508 (20)	Vestoplast 408 (45)	35	Carbocia 310 (565)	85	45
21	Licocene 2602 (20)	Licocene 3602 (20)	60	Carbocia 310 (450) Baryte (450)	90	60
22	Vestoplast 408 (32.5)	Vistamax 8880 (32.5)	35	Carbocia 310 (400)	80	60
23	Engage 8100 (60)	Vistamax 8880 (40)	-	Carbocia 310 (200)	67	45
24	Engage 8100 (12.5)	Vistamax 8880 (12.5)	75	Carbocia 310 (300)	75	30
25	Engage 8100 (10)	Vistamax 8880 (10)	80	Carbocia 310 (300)	75	40

Table 4

[0064] In:

- 5 - Examples 19, 20 and 22, the 35 parts of additives comprise 20 parts of tackifier, 5 parts of mineral oil and 10 parts of MMP wax from Alpha;
- Example 21, the 60 parts of additives comprise 40 parts of tackifier, 10 parts of oil and 10 parts of MMP wax;
- Example 24, the 75 parts of additives comprise 25 parts of tackifier, 25 parts of oil and 12.5 parts of HMP Microcrystalline wax from Shell and 12.5 parts of MMP wax from Alpha;
- 10 - Example 25, the 80 parts of additives comprise 25 parts of tackifier, 30 parts of oil and 25 parts of HMP Microcrystalline wax.

[0065] In tables 1 to 4:

- Carbocia 310 is calcium carbonate with a volume median particle diameter (D50) of 200 μm ;
- Durcal 10 is calcium carbonate with a volume median particle diameter (D50) of 10 μm ;
- BL is calcium carbonate with a volume median particle diameter (D50) of 30 μm ;
- Omyacarb 130 GU is calcium carbonate with a volume median particle diameter (D50) of 150 μm ;
- Carbocia 1300 is a calcium carbonate with a volume median particle diameter (D50) of 650 μm ;
- Barite is "Barytmehl 901" from Sachtleben or "Baryte Supreme" from J Allcock & Sons Ltd , both having a volume particle diameter (D50) at 12 μm
- Vestoplast 408 is a high 1-butene , propylene ethylene copolymer; having a Shore A at 94; a heat of fusion (ΔH_f) of 36 J/g, a melting peak temperature of 98°C and a Young Modulus of 70 MPa;
- Vestoplast 508 is a high 1-butene , propylene ethylene copolymer; having a Shore A at 74; a heat of fusion (ΔH_f) of 5 J/g, a melting peak temperature of 70°C and a Young Modulus of 18 MPa;
- Vestoplast 708 is a high 1-butene , propylene ethylene copolymer, having a Shore A at 67; a heat of fusion (ΔH_f) of 7 J/g, a melting peak temperature of 83°C and a Young Modulus of 9 MPa;
- Vistamaxx 8880 is a metallocene propylene ethylene copolymer having a Shore A at 93; a heat of fusion (ΔH_f) of 34 J/g, a melting peak temperature of 96°C and a Young Modulus of 70 MPa;
- Vistamax 6502 is a metallocene propylene ethylene copolymer, having a Shore A at 71; a heat of fusion (ΔH_f) of 30 J/g, a melting peak temperature of 50°C and a Young Modulus of 13 MPa;
- Licocene 1602 is a metallocene propylene ethylene copolymer having a Shore A at 82; a heat of fusion (ΔH_f) of 20 J/g, a melting peak temperature of 70°C and a Young Modulus of 20 MPa

- Licocene 2602 is a metallocene propylene ethylene copolymer, having a Shore A at 90; a heat of fusion (ΔH_f) of 23 J/g, a melting peak temperature of 85°C and a Young Modulus of 50 MPa;
- Licocene 3602 is a metallocene propylene ethylene copolymer, having a Shore A at 97; a heat of fusion (ΔH_f) of 55 J/g, a melting peak temperature of 100°C and a Young Modulus of 110 MPa;
- Engage 8100 is an ethylene-octene copolymer having a Shore A at 73; a heat of fusion (ΔH_f) of 10 J/g, a melting peak temperature of 50°C and a Young Modulus of 20 MPa;

10 wherein:

- the heat of fusion (ΔH_f) is determined by DSC, second fusion, according to ASTM D3418, wherein the polyolefin first is heated to 170°C, then is slowly cooled down at 10°C/min. to 0°C and subsequently is heated with a heating gradient of 10°C/minute;
- the Shore A hardness and the Young modulus are measured on the polyolefin or polyolefin blend, after melting and cooling to 23°C at 10°C/min. and conditioning for 48 hours at 23°C;
- the Young modulus of the completed compound is measured after melting to 170°C, cooling to 23°C and conditioning for 48 hours at 23°C.

20 [0066] In tables 1 and 2 the influence of the filler content, Shore A hardness of the polyolefin and additive addition is illustrated.

[0067] In table 3 the influence of filler content and particle size is illustrated (examples 11 to 18). Example 12 is represented by way of comparison.

25 [0068] In table 4 a blend of polyolefins at high filler concentration is illustrated in examples 19 to 22. In the same table, examples 23 to 25 illustrate a polyolefin blend wherein one of the polyolefins (Engage 8100) has a copolymerized ethene weight percentage which is 62. In a mixture with Vistamaxx 8880 having a copolymerized ethene weight percentage of 6, the polymer blends are characterized by:

- an ethene percentage of 40 and a Shore A hardness of 80 for example 23,

- an ethene percentage of 34 and a Shore A hardness of 85 for examples 24 and 25.

Further, examples 24 and 25 illustrate carpet backing compositions comprising high weight percentages of additives.

5 Example 26

[0069] The dimensional stability was evaluated in accordance with ISO 2551. Comparison is made between dimensions of carpet test tiles after conditioning at 20°C and 65% relative humidity and then after being sequentially subjected to varied water and heat conditions:

- 10 1) two hours in hot-air oven at 60°C; dimensions determined within 6.5 minutes after removal;
- 2) two hours in water at 20°C; dimensions determined within 5 minutes after removal;
- 15 3) 24 hours drying in circulated air oven at 60°C; dimensions determined within 6.5 minutes after removal;
- 4) 48 hours conditioning at 20°C and 65%.

[0070] Dimensional changes were calculated after each test condition and expressed as percentage change for straight stitch loop level test panels with a width of 185 mm and a length of 500 mm wherein:

- 20 - the weight of the tufted nylon yarns is 900 g/m² with a tuft density is 12 needles per inch; and,
- the backing layer has a density of 2200 g/ m² and a thickness of 1.5 mm;
- the thickness is an indicative value as the weight needed is required.

[0071] The carpet test tiles comprising a backing layer with a Young modulus, as
25 measured at 23°C, comprised between 10 and 70 MPa, show a dimensional change, expressed in percentage change, after each of the conditions 1) to 4) of less than 0.1 % measured in both the width and length direction.

[0072] The carpet test tiles comprising the backing layer with a Young modulus below 10 MPa, as in examples 3 and 5, which are comparative examples, show a

dimensional change after each of the conditions 1) to 4) of more than 0.2 % measured in both the width and length direction.

[0073] The carpet test tiles comprising the backing layer according to the invention prove to have sufficient stiffness for showing an outstanding dimensional stability under
5 varying temperature and/or humidity conditions.

[0074] The inventors have observed that for a backing layer with a Young modulus below 10 MPa, as in examples 3 and 5, given by way of comparison, the tiles are too soft and difficult to handle. On the contrary for a backing layer with a Young modulus above 70 MPa, such as in example 12, given by way of comparison, the tiles are too
10 stiff and become difficult to handle. Moreover tiles having high level of filler, for instance at 80%, and having a high Young modulus, for instance 100 MPa; have strong tendency to be broken during the installation.

[0075] Within the range comprised between 10 and 70 MPa, the tiles show satisfying flexibility for easy and correct handling while showing enough stiffness for
15 having tile characteristics.

Revendications

1. Une composition de couche de support de tapis comprenant:
 - entre au moins 10% en poids et 50% en poids ou moins, préférablement 40% en poids ou moins, plus préférablement 30% en poids ou moins, le plus préférablement 20% en poids ou moins d'une polyoléfine semi-cristalline ou d'un mélange d'au moins deux polyoléfines semi-cristallines ladite polyoléfine ou mélange de polyoléfines étant caractérisées en ce que le pourcentage massique d'oléfine C2 (co)polymérisée est de moins de 50 et en ce que le pourcentage massique d'alpha-oléfines (co)polymérisée C3 – C8 est de 50 ou plus; et
 - entre jusqu'à 90% en poids et 50% en poids ou plus, préférablement 60% en poids ou plus, plus préférablement 70% en poids ou plus, le plus préférablement 80% en poids ou plus d'un ou plusieurs matériau(x) de remplissage caractérisé(s) par un diamètre de particule médian basé sur le volume (D50) compris entre au plus 1000 µm et au moins 10 µm, préférablement plus que 20 µm, plus préférablement plus que 50 µm et le plus préférablement plus que 100 µm, ou encore plus que 200 µm tel qu'obtenu par mesures de diffusion d'une lumière laser selon ISO 13320; la composition de couche de support étant caractérisée par un module de Young mesuré après fusion et conditionnement pendant 48 heures à 23°C, selon ASTM D 882, compris entre 10 et 70 MPa, préférablement entre 15 et 70 MPa, plus préférablement entre 20 et 50 MPa.
2. La composition de couche de support de tapis selon la revendication 1 dans laquelle la polyoléfine ou le mélange de polyoléfines a une dureté Shore A, selon ASTM D 2240 d'au moins 70, préférablement d'au moins 75, plus préférablement d'au moins 80, le plus préférablement d'au moins 85 ou même d'au moins 90;
3. La composition de couche de support de tapis selon les revendications 1 ou 2, dans laquelle la ou les alpha-oléfines C3 – C8 des une ou plusieurs polyoléfine(s) sont sélectionnées dans le groupe consistant en les isomères d'alpha-oléfines C3 à C8 et une combinaison de ceux-ci.

4. La composition de couche de support de tapis selon l'une quelconque des revendications précédentes, dans laquelle l'alpha-oléfine C3 – C8 des une ou plusieurs polyoléfine(s) est du propène, 1-butène, 1-octène ou une combinaison de ceux-ci.
5. La composition de couche de support de tapis selon l'une quelconque des revendications précédentes dans laquelle la polyoléfine est sélectionnée dans le groupe consistant en du polypropylène, du poly-1-butène, du copolymère propène-éthène, du copolymère propène-1-butène, du copolymère 1-butène-éthène, du copolymère propène-1-butène-éthène et du copolymère 1-octène-éthène.
6. La composition de couche de support de tapis selon l'une quelconque des revendications précédentes, dans laquelle la polyoléfine ou le mélange de polyoléfines est caractérisé par un module de Young à 23°C, selon ASTM D 882, de plus de 10 MPa, préférablement de plus de 20 MPa, plus préférablement de plus de 30 MPa, le plus préférablement de plus de 50 MPa.
7. La composition de couche de support de tapis selon l'une quelconque des revendications précédentes, dans laquelle le matériau de remplissage inorganique est sélectionné dans le groupe consistant en le talc, le mica, le carbonate de calcium, le carbonate de magnésium, la dolomite, la barytine (sulfate de baryum), la bauxite, l'hydroxyde de magnésium, l'hydroxyde d'aluminium, le kaolin, le dioxyde de silicium, le verre, et une combinaison de ceux-ci.
8. La composition de couche de support de tapis selon l'une quelconque des revendications précédentes comprenant un ou plusieurs additifs sélectionnés dans le groupe consistant en des cires, des huiles et des tackifiants.
9. La composition de couche de support de tapis selon l'une quelconque des revendications précédentes comprenant:
 - entre au moins 10% en poids et 50% en poids ou moins, préférablement 40% en poids ou moins, plus préférablement 30% en poids ou moins, encore plus préférablement 20% en poids ou moins d'une composition I, préférablement d'une composition II, plus préférablement d'une composition III, le plus préférablement d'une composition IV;

- entre au plus 90% en poids et 50% en poids ou plus, préférablement 60% en poids ou plus, plus préférablement 70% en poids ou plus, encore plus préférablement 80% en poids ou plus d'un ou plusieurs matériau(x) de remplissage caractérisé(s) par un diamètre de particule médian basé sur le volume (D50) compris entre au plus 1000 μm et au moins 10 μm , préférablement plus que 20 μm , plus préférablement plus que 50 μm et le plus préférablement plus que 100 μm , ou plus que 200 μm tel qu'obtenu par mesures de diffusion d'une lumière laser selon ISO 13320;

où:

- I. comprend 20% en poids ou plus d'une ou plusieurs polyoléfine(s) et 80% en poids ou moins d'une ou plusieurs cire(s), huiles(s) et/ou tackifiant(s);
 - II. comprend 25% en poids ou plus of one or more polyoléfine(s) et 75% en poids ou moins d'une ou plusieurs cire(s), huiles(s) et/ou tackifiant(s);
 - III. comprend 35% en poids ou plus of one or more polyoléfine(s) et 65% en poids ou moins d'une ou plusieurs cire(s), huiles(s) et/ou tackifiant(s);
 - IV. comprend 45% en poids ou plus of one or more polyoléfine(s) et 55% en poids ou moins d'une ou plusieurs cire(s), huiles(s) et/ou tackifiant(s).
10. La composition de couche de support de tapis selon l'une quelconque des revendications précédentes 1 à 8 comprenant:
- entre au moins 10% en poids et 50% en poids ou moins, préférablement 40% en poids ou moins, plus préférablement 30% en poids ou moins, encore plus préférablement 20% en poids ou moins d'une composition V, préférablement d'une composition VI, plus préférablement d'une composition VII; et
 - entre au plus 90% en poids et 50% en poids ou plus, préférablement 60% en poids ou plus, plus préférablement 70% en poids ou plus, encore plus préférablement 80% en poids ou plus d'un ou plusieurs matériau(x) de remplissage caractérisé(s) par un diamètre de particule médian basé sur le volume (D50) compris entre au plus 1000 μm et au moins 10 μm ,

préféablement plus que 20 μm , plus préféablement plus que 50 μm et le plus préféablement plus que 100 μm , ou plus que 200 μm tel qu'obtenu par mesures de diffusion d'une lumière laser selon ISO 13320;

où:

- V. comprend 55% en poids ou plus d'une ou plusieurs polyoléfine(s) et 45% en poids ou moins d'une ou plusieurs cire(s), huiles(s) et/ou tackifiant(s);
 - VI. comprend 65% en poids ou plus d'une ou plusieurs polyoléfine(s) et 35% en poids ou moins d'une ou plusieurs cire(s), huiles(s) et/ou tackifiant(s);
 - VII. comprend 80% en poids ou plus d'une ou plusieurs polyoléfine(s) et 20% en poids ou moins d'une ou plusieurs cire(s), huiles(s) et/ou tackifiant(s).
11. La composition de couche de support de tapis selon l'une quelconque des revendications précédentes, caractérisé par une viscosité à l'état fondu à 160°C dans un viscosimètre rotatif, selon ISO 11443, de 10 Pas à 5000 Pas, préféablement de 20 Pas à 2500 Pas, plus préféablement de 50 à 500 Pas.
 12. Tapis comprenant une couche de support de tapis comprenant la composition de couche de support de tapis selon l'une quelconque des revendications 1 à 11.
 13. Le tapis selon la revendication 12, dans lequel la couche de support de tapis a une densité surfacique comprise entre 1600 et 4000 g/m^2 , préféablement entre 1700 et 3500 g/m^2 , plus préféablement entre 1800 et 3000 g/m^2 , le plus préféablement entre 1900 et 2500 g/m^2 et une épaisseur de la couche comprise entre 0,4 et 4,0 mm, préféablement entre 0,5 et 3,5 mm, plus préféablement entre 0,7 et 2,5 mm, le plus préféablement entre 0,8 et 2,0 mm.
 14. Un procédé de fabrication d'un tapis selon les revendications 12 ou 13, comprenant:
 - a) le revêtement par extrusion de la composition de couche de support de tapis, selon l'une quelconque des revendications 1 à 11, sur la face arrière d'un matériau d'une couche de support primaire, ledit matériau de la couche de support primaire ayant une face avant et une face arrière, une pluralité de fibres

attachée au matériau de la couche de support primaire et s'étendant à partir de la face avant et étant exposée à la face arrière et

b) le refroidissement de la composition de couche de support de tapis et la formation de la couche de support de tapis.

15. Le procédé selon la revendication 14, dans lequel le revêtement par extrusion est réalisé à une température comprise entre 130 et 170°C, préférablement entre 140 et 160°C.
16. Le procédé selon les revendications 14 ou 15 comprenant l'étape additionnelle de soumission de la composition de couche de support ayant subi le revêtement par extrusion de l'étape a) à un traitement thermique subséquent à une température comprise entre 130 et 170°C, préférablement entre 140 et 160°C sur une période de temps comprise entre 1 et 60 s, préférablement entre 5 et 30 s, plus préférablement entre 10 et 20 s, avant le refroidissement de l'étape b).

Abstract

The present invention relates to a carpet backing layer composition, comprising:

- 100 parts by weight of a polyolefin or a blend of polyolefins and optionally a blend of oils, wax and tackifiers, the each polyolefin or polyolefin blend comprising at least 50% by weight of (co)polymerized C3 – C8 alfa-olefins,
- between 100 and 900 parts by weight of one or more inorganic filler(s) characterized by a volume median particle diameter (D50) comprised between 10 and 1000 μm ,
- the backing layer composition having a Young modulus at 23°C comprised between 10 MPa and 70 MPa.

The invention further relates to a carpet comprising a carpet backing layer obtained from the carpet backing layer composition and a method for the preparation of the carpet.



SEARCH REPORT
in accordance with Article 35.1 a)
of the Luxembourg law on patents
dated 20 July 1992

LO 1730
LU 100355

DOCUMENTS CONSIDERED TO BE RELEVANT			
Category	Citation of document with indication, where appropriate, of relevant passages	Relevant to claim	CLASSIFICATION OF THE APPLICATION (IPC)
A	EP 0 518 014 A1 (HUELS CHEMISCHE WERKE AG [DE]) 16 December 1992 (1992-12-16) * abstract * * column 1, lines 26-41 * * column 3, lines 45-50 * * claims 1-6 *	1-16	INV. D06N7/00
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A	US 2016/032521 A1 (ARVIDSON SARA A [US] ET AL) 4 February 2016 (2016-02-04) * paragraphs [0095] - [0102] *	1-16	TECHNICAL FIELDS SEARCHED (IPC) D06N
The present search report has been drawn up for all claims			
Date of completion of the search		Examiner	
9 March 2018		Rella, Giulia	
CATEGORY OF CITED DOCUMENTS			
X : particularly relevant if taken alone Y : particularly relevant if combined with another document of the same category A : technological background O : non-written disclosure P : intermediate document T : theory or principle underlying the invention E : earlier patent document, but published on, or after the filing date D : document cited in the application L : document cited for other reasons & : member of the same patent family, corresponding document			

**ANNEX TO THE SEARCH REPORT
ON LUXEMBOURG PATENT APPLICATION NO.**

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This annex lists the patent family members relating to the patent documents cited in the above-mentioned European search report.
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		WO 2016018670 A1	04-02-2016



WRITTEN OPINION

File No. LO1730	Filing date (day/month/year) 01.08.2017	Priority date (day/month/year)	Application No. LU100355
International Patent Classification (IPC) INV. D06N7/00			
Applicant Tarkett GDL			

This report contains indications relating to the following items:

- ☒ Box No. I Basis of the opinion
- ☐ Box No. II Priority
- ☐ Box No. III Non-establishment of opinion with regard to novelty, inventive step and industrial applicability
- ☐ Box No. IV Lack of unity of invention
- ☒ Box No. V Reasoned statement with regard to novelty, inventive step or industrial applicability; citations and explanations supporting such statement
- ☐ Box No. VI Certain documents cited
- ☒ Box No. VII Certain defects in the application
- ☐ Box No. VIII Certain observations on the application

Form LU237A (Cover Sheet) (January 2007)	Examiner Rella, Giulia
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WRITTEN OPINION

Application No.

LU100355

Box No. I Basis of the opinion

1. This opinion has been established on the basis of the latest set of claims filed before the start of the search.
2. With regard to any **nucleotide and/or amino acid sequence** disclosed in the application and necessary to the claimed invention, this opinion has been established on the basis of:
 - a. type of material:
 - ☐ a sequence listing
 - ☐ table(s) related to the sequence listing
 - b. format of material:
 - ☐ on paper
 - ☐ in electronic form
 - c. time of filing/furnishing:
 - ☐ contained in the application as filed.
 - ☐ filed together with the application in electronic form.
 - ☐ furnished subsequently.
3. ☐ In addition, in the case that more than one version or copy of a sequence listing and/or table relating thereto has been filed or furnished, the required statements that the information in the subsequent or additional copies is identical to that in the application as filed or does not go beyond the application as filed, as appropriate, were furnished.
4. Additional comments:

Box No. V Reasoned statement with regard to novelty, inventive step and industrial applicability; citations and explanations supporting such statement

1. Statement

Novelty	Yes:	Claims	1-16
	No:	Claims	
Inventive step	Yes:	Claims	1-16
	No:	Claims	
Industrial applicability	Yes:	Claims	1-16
	No:	Claims	

2. Citations and explanations

see separate sheet

WRITTEN OPINION

Application No.
LU100355

Box No. VII Certain defects in the application

The following defects in the form or contents of the application have been noted:

see separate sheet

1 **Re Item V**

Reasoned statement with regard to novelty, inventive step or industrial applicability; citations and explanations supporting such statement

1.1 Reference is made to the following documents:

- D1 EP 0 518 014 A1 (HUELS CHEMISCHE WERKE AG [DE]) 16 December 1992 (1992-12-16)
- D2 JP H10 276888 A (UBE REKISEN KK; UBE INDUSTRIES) 20 October 1998 (1998-10-20)
- D3 JP 3 030124 B2 (SUMINOE TEXTILE; UBE INDUSTRIES; UBE REKISEN KK) 10 April 2000 (2000-04-10)
- D4 US 2016/032521 A1 (ARVIDSON SARA A [US] ET AL) 4 February 2016 (2016-02-04)

2 D1 is regarded as being the prior art closest to the subject-matter of claim 1, and discloses a carpet backing composition comprising:

- from 10 to 95% by weight of one or more substantially amorphous polyolefins having the monomer composition from 0 to 80% by weight of an alpha-olefin having 4 to 10 carbon atoms, from 20 to 100% by weight of propene and less than 20% by weight of ethene;
- from 5 to 90% by weight of one or more semi-crystalline polyolefins, preferably polypropylene;
- a maximum of 70% by weight of fillers with a median particle size of maximum 150 μm .

3 The subject-matter of claim 1 therefore differs from this known carpet backing composition in that the Young's modulus is comprised between 10 and 70 MPa and is therefore new. An implicit disclosure of the Young's modulus in said range can not be assumed since the combination of semi-crystalline polyolefins and a filler as disclosed in D1 does not automatically lead to a Young's modulus in this range as demonstrated in example 12 of the present application.

4 The technical effect of this difference seems to be that when the backing layer, produced from the carpet backing composition, has a Young's modulus below 10 MPa the tiles are too soft and difficult to handle (see examples 3 and 5 of the present application). On the contrary for a backing layer with a Young's modulus above 70 MPa the tiles are too stiff and become difficult to handle (see example 12 of the present application). The problem to be solved

by the present invention may be regarded as providing a carpet backing composition for producing a carpet backing layer which gives tiles that are easy to handle.

- 5 The solution to this problem proposed in claim 1 of the present application is considered as involving an inventive step for the following reasons: Although carpet backing composition comprising semi-crystalline polyolefins and fillers with particle size in the range of 10 μm to 1000 μm are known in the art, there is no hint in the prior art to solve the problem posed by adjusting the Young's modulus of the carpet backing composition in a range of 10 to 70 MPa.
- 6 Independent claim 14 is characterized by the carpet backing composition of claim 1, which is considered new and inventive, and is therefore also considered to meet the requirements of novelty and inventive step.
- 7 Claims 2-13, 15 and 16 are dependent on claim 1 or claim 14, respectively and as such also meet the requirements of novelty and inventive step.

8 **Re Item VII**

Certain defects in the application

- 8.1 The relevant background art disclosed in D1 is not mentioned in the description, nor is this document identified therein.