

Claims

1. A multilayer foil comprising at least a layer A and a layer B, wherein the layer A consists of a
5 moulding composition comprising, based on the total weight of the layer A:
- from 0.0 to 78.0 wt.-% of a polyalkyl (meth)acrylate
from 20.0 to 98.0 wt.-% of one or several impact modifiers
from 2.0 to 40.0 wt.-% of particulate silica
10 from 0.0 to 20.0 wt.-% of an adhesion-promoting copolymer comprising, based on the weight
of the adhesion-promoting copolymer:
- (i) from 70.0 to 99.5 wt.-% methyl methacrylate
(ii) from 0.5 to 15.0 wt.-% of an adhesion-promoting monomer; and
(iii) from 0.0 to 25.0 wt.-% of other vinyl-copolymerizable monomers having no
15 functional groups other than the vinyl function
- from 0.0 to 38.0 wt.-% of a fluoropolymer
from 0.0 to 5.0 wt.-% of one or several UV absorbers
from 0.0 to 5.0 wt.-% of one or several UV stabilizers; and
- 20 wherein the cumulative content of the polyalkyl (meth)acrylate and of one or several impact modifiers
in the moulding composition of the layer A is at least 50 wt.-%, preferably at least 60 wt.-%, more
preferably at least 70 wt.-%, yet even more preferably at least 80 wt.-%, particularly preferred at least
85 wt.-%, based on the weight of the layer A; and
- 25 the layer B consists of a moulding composition comprising, based on the total weight of the layer B:
- from 0.0 to 100.0 wt.-% of a polyalkyl (meth)acrylate
from 0.0 to 95.0 wt.-% of one or several impact modifiers
from 0.0 to 40.0 wt.-% of a fluoropolymer
30 from 0.0 to 5.0 wt.-% of one or several UV absorbers
from 0.0 to 5.0 wt.-% of one or several UV stabilizers; and
from 0.0 to 20.0 wt.-% of an adhesion-promoting copolymer comprising, based on the weight
of the adhesion-promoting copolymer:
- (i) from 70.0 to 99.5 wt.-% methyl methacrylate
35 (ii) from 0.5 to 15.0 wt.-% of an adhesion-promoting monomer; and
(iii) from 0.0 to 25.0 wt.-% of other vinyl-copolymerizable monomers having no
functional groups other than the vinyl function; and
- wherein the cumulative content of the polyalkyl (meth)acrylate and of one or several impact modifiers
40 in the moulding composition of the layer B is at least 50 wt.-%, preferably at least 60 wt.-%, more

preferably at least 70 wt.-%, yet even more preferably at least 80 wt.-%, still more preferably at least 90 wt.-%, particularly preferably at least 95 wt.-%, based on the weight of the layer B.

2. A multilayer foil comprising at least a layer A and a layer B, wherein the layer A consists of a
5 moulding composition comprising, based on the total weight of the layer A:

- from 0.0 to 78.0 wt.-% of a polyalkyl (meth)acrylate
from 20.0 to 98.0 wt.-% of one or several impact modifiers
from 2.0 to 40.0 wt.-% of particulate silica
10 from 0.0 to 20.0 wt.-% of an adhesion-promoting copolymer comprising, based on the weight of the adhesion-promoting copolymer:
(i) from 70.0 to 99.5 wt.-% methyl methacrylate
(ii) from 0.5 to 15.0 wt.-% of an adhesion-promoting monomer; and
(iii) from 0.0 to 25.0 wt.-% of other vinyl-copolymerizable monomers having no
15 functional groups other than the vinyl function;
from 0.0 to 38.0 wt.-% of a fluoropolymer
from 0.0 to 5.0 wt.-% of one or several UV absorbers
from 0.0 to 5.0 wt.-% of one or several UV stabilizers; and

- 20 wherein the cumulative content of the polyalkyl (meth)acrylate and of one or several impact modifiers in the moulding composition of the layer A is at least 50 wt.-%, preferably at least 60 wt.-%, more preferably at least 70 wt.-%, yet even more preferably at least 80 wt.-%, particularly preferred at least 85 wt.-%, based on the weight of the layer A; and

- 25 the layer B consists of a moulding composition comprising, based on the total weight of the layer B:

- from 40.0 to 100.0 wt.-% of a fluoropolymer;
from 0.0 to 30.0 wt.-% of a polyalkyl (meth)acrylate; and
from 0.0 to 30.0 wt.-% of glass beads.

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3. Foil according to Claim 1 or 2, wherein the content, in wt.-%, based on the total weight of the layer A, of one or several impact modifiers n_{im} in the polyalkyl (meth)acrylate foil is described by the following relationship:

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$$0.01 \cdot n_{im} \leq n_{si} \leq 0.4 \cdot n_{im}$$

n_{si} being the content, in wt.-%, of particulate silica in the foil.

4. Foil according to any of Claims 1 to 3, wherein the particulate silica has a specific surface area, measured by BET method according to ISO 9277, of more than 200 m²/g, preferably more than 300 m²/g, more preferably more than 400 m²/g, even more preferably more than 500 m²/g.
5. Foil according to any of Claims 1 to 4, wherein the particulate silica is a precipitated silica or a pyrogenic silica, preferably a hydrophilic precipitated silica or a hydrophilic pyrogenic silica.
6. Foil according to any of Claims 1 to 5, wherein the particulate silica is a precipitated silica which preferably has a weight average particle size d₅₀ of from 1.0 μm to 20.0 μm, preferably from 2.0 μm to 15.0 μm, determined by laser diffraction according to ISO 13320.
7. Foil according to any of Claims 1 to 6, wherein the particulate silica has a silanol group density of not lower than 0.5 SiOH/nm², more preferably from 0.5 to 20.0 SiOH/nm², even more preferably from 1.0 to 15.0 SiOH/nm², even more preferably from 1.5 to 10.0 SiOH/nm².
8. Foil according to any of Claims 1 to 7, wherein the particulate silica has DBP absorption of 100 to 500 g/100 g, preferably 150 to 450 g/100 g, even more preferred 150 to 400 g/100 g, determined in accordance with ASTM D6854-12a.
9. Foil according to any of Claims 1 to 8, wherein the particulate silica has a tamped density from 10 g/l to 800 g/l, more preferably from 40 g/l to 500 g/l, even more preferably from 80 g/l to 300 g/l, determined in accordance with DIN EN ISO 787-11.
10. Foil according to any of Claims 1 to 9, wherein the polyalkyl (meth)acrylate is polymethyl methacrylate having a mass average molar weight Mw of from 50 000 g/mol to 180 000 g/mol, preferably from 80 000 g/mol to 160 000 g/mol, and is obtainable by polymerization of a composition whose polymerizable constituents comprise, based on the weight of the polymerizable composition:
- (a) from 50.0 to 99.9 wt.-% of methyl methacrylate
 - (b) from 0.1 to 50.0 wt.-% of an acrylic acid ester of a C1-C4 alcohol
 - (c) from 0.0 to 10.0 wt.-% of at least one further monomer copolymerizable with the monomers (a) and (b).
11. Foil according to any of Claims 1 to 10, wherein the one or several impact modifiers are particulate impact modifiers selected from core, core-shell, core-shell-shell and core-shell-shell-shell type impact modifiers.
12. Foil according to any of Claims 1 to 11, wherein the layer B comprises, based on the total weight of the layer B:

from 0.5 to 4.0 wt.-% of a benzotriazole type compound as a first UV absorber
from 0.5 to 3.0 wt.-% of a triazine type compound as a second UV absorber; and
from 0.2 to 2.0 wt.-% of a HALS type compound as a UV stabilizer.

- 5 13. Foil according to any of Claims 1 or 3 to 12, wherein the foil further comprises a layer C,
wherein the layer B is located between the layer A and the layer C,
the layer B consists of a moulding composition comprising, based on the total weight of the layer B:

10 from 0.0 to 100.0 wt.-% of a polyalkyl (meth)acrylate
from 0.0 to 95.0 wt.-% of one or several impact modifiers
from 0.0 to 40.0 wt.-% of a fluoropolymer
from 0.0 to 5.0 wt.-% of one or several UV absorbers
from 0.0 to 5.0 wt.-% of one or several UV stabilizers; and

- 15 the layer C consists of a moulding composition comprising

from 0.0 to 78.0 wt.-% of a polyalkyl (meth)acrylate
from 20.0 to 98.0 wt.-% of one or several impact modifiers
from 0.0 to 40.0 wt.-% of particulate silica
20 from 0.0 to 40.0 wt.-% of an adhesion-promoting copolymer comprising, based on the weight
of the adhesion-promoting copolymer:
(i) from 70.0 to 99.5 wt.-% methyl methacrylate
(ii) from 0.5 to 15.0 wt.-% of an adhesion-promoting monomer; and
(iii) from 0.0 to 25.0 wt.-% of other vinyl-copolymerizable monomers having no
25 functional groups other than the vinyl function;
from 0.0 to 5.0 wt.-% of one or several UV absorbers
from 0.0 to 5.0 wt.-% of one or several UV stabilizers; and

- 30 wherein the cumulative content of the polyalkyl (meth)acrylate and of one or several impact modifiers
in the moulding composition of the layer C is at least 50 wt.-%, preferably at least 60 wt.-%, more
preferably at least 70 wt.-%, yet even more preferably at least 80 wt.-%, based on the weight of the
layer C; and

the cumulative content of particulate silica and the adhesion-promoting copolymer is at least 2.0 wt.-%,
35 %, preferably at least 4.0 wt.-%, more preferably at least 6.0 wt.-%, yet even more preferably at least
8.0 wt.-%, based on the weight of the layer C.

14. Foil according to any of Claims 1 or 3 to 12, wherein the foil further comprises a layer C,
wherein the layer C consists of a moulding composition comprising, based on the total weight of the
40 layer C:

from 40.0 to 100.0 wt.-% of a fluoropolymer;
from 0.0 to 30.0 wt.-% of a polyalkyl (meth)acrylate; and
from 0.0 to 30.0 wt.-% of glass beads.

5 15. Foil according to any of Claims 1 or 3 to 14, wherein

the layer A has a thickness from 1.0 μm to 30.0 μm
the layer B has a thickness from 15.0 μm to 150.0 μm ; and
the layer C, if present, has a thickness from 1.0 μm to 30.0 μm .

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16. Foil according to any of Claims 1 or 3 to 13 and 15, wherein the foil further comprising a coating layer D adjacent to the layer A, wherein the coating layer D comprises at least a partially cross-linked material selected from crosslinked polyurethanes, crosslinked polyurethane-(meth)acrylates, cross-linked poly(meth)acrylates or a mixture thereof.

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17. A multi-layer article, preferably a high-pressure laminate, having an outer surface, comprising a substrate which is at least partially covered by a foil according to any of Claims 1, or 3 to 13, 15 and 16, comprising the layers in the following order, starting from the outer surface of the multi-layer article:

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- if present, layer D forming the outer surface of the multi-layer article
- layer A
- layer B; and
- if present, layer C.

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18. A multi-layer article, preferably a high-pressure laminate, comprising a substrate which is at least partially covered by a foil according to any of Claims 1 to 16, comprising the layers in the following order, starting from the outer surface:

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- optionally, layer C
- layer B; and
- layer A.

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19. Process for manufacturing of a multi-layer article according to Claim 17 or 18, the process comprising a step of coating a substrate with a foil according to any of Claims 1 to 16 by means of co-extrusion, lamination or extrusion lamination, wherein the least a partially cross-linked material of the coating layer D, if present, preferably undergoes a further cross-linking.

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20. Process according to Claim 19, wherein the multi-layer article is a high-pressure laminate and the step of coating a substrate with a foil according to any of Claims 1 to 16 is carried out at a

pressure of from 1 MPa to 20 MPa, preferably of from 4 MPa to 15 MPa, more preferably from 6 MPa to 10 MPa and a temperature of from 120 °C to 220 °C.