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(54) Benævnelse: **Kunststoffolie til et klæbebånd samt klæbebånd**

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DESCRIPTION

The invention relates to a plastic film for an adhesive tape having at least one first film layer which forms at least one film surface. The subject matter of the invention is also the adhesive tape itself, which comprises the plastic film and a coating of a pressure-sensitive adhesive applied to the first film layer.

Adhesive tapes are provided in practice for various applications, for example in order to cover joins and to connect parts tightly to one another. Thus, adhesive tapes are used in particular in the building sector in order to connect board or films in a draughtproof manner to one another or also to seal joints in a watertight manner.

Such adhesive tapes can be used both indoors and outdoors if they have sufficient temperature resistance, where the adhesive tape according to the invention is provided in particular for use within a wall and/or roof structure. Another preferred use is the sealing of joints in the sanitary area.

For such applications the adhesive tape should usually be draughtproof and in particular watertight. On the other hand, however, a certain water vapour permeability is advantageous in order to avoid any accumulation of water and thus the risk of decay and other building damage.

In this connection, various influences need to be taken into account according to the application. On the one hand, a certain moisture or wetness can be present in the parts or surfaces joined together or sealed by the adhesive tape during application of the adhesive tape, which can then dry out through the adhesive tape if the water vapour permeability is sufficient. In this way, damage due to residual moisture, which can be present in particular in the outer side of a wall structure or in the sanitary area can be avoided.

On the other hand, it should be borne in mind that modern wall and roof structures are frequently watertight but nevertheless breathable, that is they have a certain water vapour permeability. When the adhesive tape is used in such a wall or roof structure, this must also have an adapted water vapour

permeability in order to avoid any condensation and accumulation of water under the adhesive tape.

A generic adhesive tape for adhesion of films in the field of building shells which has a high water vapour permeability, that is a low diffusion resistance to water vapour, is known from EP 1 847 577 B1. The adhesive tape is formed from a plastic film and a coating of a pressure-sensitive adhesive, where the plastic film substantially consists of a mixture of ethylene vinylacetate (EVA) and a thermoplastic elastic ether-ester block copolymer (TPE-E). As a result of the materials used, the manufacturing costs for the film and therefore for the adhesive tape are high.

In order that the adhesive tape can also easily be processed at corners, edges and joints which do not run precisely straight, it is advantageous if the configuration of the plastic film is as soft and smooth as possible, where these properties should also be present at low temperatures depending on the application, in order to enable easy processing, for example in frost, or to avoid any breaking of the already laid adhesive tape.

It is the object of the invention to provide a plastic film for an adhesive tape which is characterized by good mechanical properties with low manufacturing costs. In particular, the plastic film should enable a good and firm connection with a pressure-sensitive adhesive and have a significant water vapour permeability. Furthermore, an adhesive tape should be provided which is formed from the plastic film and pressure-sensitive adhesive.

The subject matter of the invention and solution of the object are a plastic film according to patent claim 1 and an adhesive tape according to patent claim 13.

Starting from a plastic film having the features described initially, it is provided according to the invention that the first film layer comprises a mixture of a thermoplastic polyolefin elastomer (TPE-O) and ethylene vinyl acetate grafted with maleic acid anhydride (EVA-MAH).

According to the invention, the plastic film is formed on the basis of polyolefin, with the result that lower material costs are obtained compared with ether ester

block copolymer (TPE-E). Furthermore, polyolefins can also be processed and extruded comparatively easily, where blow film extrusion also comes into consideration for the plastic film according to the invention.

Preferably the plastic film is not only formed on the basis of polyolefin but is also free from comparatively expensive and difficult-to-process components such as ether ester block copolymer (TPE-E). Preferably it is provided that the first film layer consists completely of thermoplastic polyolefin elastomer (TPE-O), in particular polyproylene copolymer (PP-CO), ethylene vinyl acetate grafted with maleic anhydride (EVA-MAH) and the remainder additives, so that the plastic film is formed purely on the basis of polyolefins including ethylene vinyl acetate.

Possible additives include, for example, chalk, colouring particles such as Weissbatch, UV stabilizers, slip agents, anti-blocking agents, fillers or the like, where the additives are usually contained with a quantitative fraction of less than 20 wt.% and preferably less than 15 wt.%, for example, 10 wt.%.

Preferably a multi-phase, comparatively soft polypropylene copolymer, in particular a polypropylene random copolymer is provided which can be formed from propylene, ethylene and/or ethylene-α-olefins. A suitable polypropylene copolymer as a result of its properties can be produced by after-polymerisation of polypropylene with a propylene-ethylene mixture. Accordingly suitable polypropylene copolymers are also designated in practice as highly modified polypropylene copolymers ("highly modified polypropylene copolymers"). To this end, a multi-stage copolymerisation process is performed in several reactors. In particular, different fractions of propylene, ethylene and N-butene can be supplied in the individual stages.

Suitable thermoplastic polyolefin elastomers are distributed, for example, under the tradenames Vistamaxx, Versify, Infuse, Adflex or Hifax.

Since the polypropylene copolymer is comparatively soft, this also has a low elastic modulus of less than 400 Mpa (Megapascal) according to ISO178. Preferably the elastic modulus is between 20 and 400 MPa, particularly preferably between 80 and 100 MPa.

Within the framework of a preferred embodiment of the invention, the thermoplastic polyolefin elastomer has a hardness of less than 40 Shore D at room temperature. The hardness is determined within the framework of the invention in accordance with EN ISO 868:2003-10.

Another measure for the mechanical properties of the thermoplastic polyolefin elastomer is the bending modulus in accordance with DIN EN ISO 178:2006-04. According to the present invention, the bending modulus of the thermoplastic polyolefin elastomer is preferably between 290 MPa and 370 MPa. With the given properties the first film layer is comparatively soft and smooth so that an adhesive tape formed with the plastic film can abut well against the surfaces to be sealed or against the parts to be joined together. The thermoplastic polyolefin elastomer can, as explained previously, also be formed from a polypropylene random copolymer (PP-RC) or contain a polypropylene random copolymer as a polypropylene copolymer mixture.

A further component of the first film layer is the ethylene vinyl acetate grafted with maleic acid anhydride (EVA-MAH) which enables a particularly good anchoring of a pressure-sensitive adhesive. In particular, when coating the first film layer forming at least one film surface with a butyl dispersion adhesive, a particularly good adhesion, significantly improved compared with the prior art, can be achieved in the wet.

The fraction of the ethylene vinyl acetate grafted with maleic acid anhydride and of the thermoplastic polyolefin elastomer in the first film layer can in each case lie in a range between 30 and 65 wt.%. Thus, in the first film layer the mass ratio of thermoplastic polyolefin elastomer and ethylene vinyl acetate grafted with maleic acid anhydride (EVA-MAH) can, for example, lie between 2:1 and 1:2, where the two components can in particular also be present in approximately the same fractions.

Although the water vapour permeability of thermoplastic polyolefin elastomer, in particular polypropylene is low, as a result of the polymer mixture present in the first film layer according to the invention, a significant water vapour permeability can be achieved.

The plastic film is preferably configured as a monofilm and thus consists only of the first film layer. Furthermore however, configurations are possible with at least one further film layer, where the pressure-sensitive adhesive is then applied to the first film layer. For example, a thin release layer can be provided as a further film layer, which forms a second film surface opposite the first film layer and has a reduced adhesion with respect to the pressure-sensitive adhesive so that the adhesive tape can be rolled up to form a roll and can also be withdrawn from the roll without a separate, removable release film.

The plastic film is preferably characterized by a good stretchability and smoothness even at low temperatures, for example, in frost. Particularly preferably the plastic film also has a certain elasticity so that this can be applied under tension particularly smoothly and crease-free where, as a result of the elasticity a certain compensation can be achieved even during a movement of the joined-together parts without adversely affecting the adhesive connection.

On the other hand, the plastic film also has a relatively high temperature resistance of, for example, 150°C and in particular 160°C. Temperature resistance is understood within the framework of the invention such that the plastic film does not melt up to the given temperature and also does not otherwise undergo any substantial permanent changes such as a significant shrinkage. In particular, in the case of a temperature-resistant plastic film in the extent described, coating with a pressure-sensitive adhesive can readily take place at an elevated temperature of, for example, 110°C.

The mechanical properties can furthermore also be varied by the specific mixture of the materials of the plastic film. Thus, for example, a polypropylene block copolymer can be added to the thermoplastic polyolefin elastomer in order to reduce the smoothness and increase the temperature resistance of the material depending on the particular requirements. Other admixtures can also be provided taking into account the particular application or intended use.

The thickness of the plastic film lies preferably between 40 and 140 micron (µm), particularly preferably between 60 and 100 micron.

The subject matter of the invention is also an adhesive tape with the previously described plastic film and having a coating of a pressure-sensitive adhesive applied to the first film layer.

Since the first film layer has a significant permeability for water vapour, an adhesive tape with a good water vapour permeability can also be provided within the framework of the invention, in particular if the plastic film is formed as mono-film exclusively from the first film layer. Thus, according to a preferred embodiment of the invention, it is provided that the entire adhesive tape has a water vapour permeability between 4 and 12 g/(m^2d), in particular between 5 and 10 g/(m^2d) at 23°C and 90% air humidity according to DIN 53122.

As already explained previously, in particular a butyl dispersion adhesive can be provided as pressure-sensitive adhesive which on the one hand ensures a reliable firm connection to the plastic film and additionally in conjunction with the ethylene vinyl acetate grafted with maleic acid anhydride, is characterized by a good wet adhesion, that is, a good adhesive anchoring when wet.

Thus, a particularly advantageous combination of properties is obtained according to the invention. As a result of the improved wet adhesion, the adhesive tape can also be used when the parts to be joined together or the surfaces to be covered with the adhesive tape are completely dry or dried out. Wetness or moisture can in particular be present on a facade as a result of rain or condensation, or also in the sanitary area. Furthermore, residual moisture can also be present in building materials which have not yet completely hardened such as concrete which sets with water. As a result of the improved wet adhesion, a complete drying off or drying out need not be awaited, the risk of inadequate joining or sealing also being reduced.

Since the adhesive tape can also have a certain water vapour permeability, the surfaces covered by the adhesive tape or joined parts can also continue to dry after the application of the adhesive tape so that at the same time any building damage or adverse effects due to moisture initially still present can be avoided.

According to a preferred embodiment of the invention it is provided that reinforcing threads are arranged inside a layer formed by the pressure-sensitive

adhesive. Depending on the stress to be expected, the reinforcing threads can run in a longitudinal and/or transverse direction, where in particular woven fabric of reinforcing threads comes into consideration, which for example can have a mesh width between 3 and 5 millimetres (mm).

Adhesive tapes in the form of strips having a desired width of, for example, 30 mm to 300 mm, can be separated from the plastic film coated with the pressure-sensitive adhesive.

The invention will be explained hereinafter with reference to a drawing showing merely one exemplary embodiment. The single figure shows schematically the structure of an adhesive tape according to the invention in a section.

The single figure shows an adhesive tape with a plastic film which in the exemplary embodiment is formed from a single film layer 1 as monofilm by blow film extrusion. A pressure-sensitive adhesive 2 is disposed on a surface of the film layer 1, where a grid of perpendicularly intersecting reinforcing threads 3, 3' is disposed inside the pressure-sensitive adhesive 2.

The mono-film formed from the single film layer 1 for example has a thickness of 75 µm and consists of equal parts of 45 wt.% of a soft multi-phase polypropylene copolymer (PP-CO), having a hardness of less than 40 Shore D and an ethylene vinyl acetate grafted with maleic acid anhydride (EVA-MAH), where additives in the form of chalk, Weissbach, UV stabilizers, slip agents, anti-blocking agents are provided as the remainder in a fraction of 10 wt.%.

Within the framework of the exemplary embodiment, a butyl dispersion adhesive is provided as pressure-sensitive adhesive 2 which is applied to the film layer 1 at a temperature of about 100°C to 110°C.

By using the polypropylene copolymer as a main component of the plastic film, this can be produced relatively easily and cost-effectively, where the adhesive tape at the same time has very good mechanical properties such as a high elasticity and smoothness even at low temperatures. At the same time, the adhesive tape is characterized by a good wet adhesion and a significant water

vapour permeability of 6.6 g/(m^2d) at 23°C and 90% air humidity in accordance with DIN 53122.

Patentkrav

1. Kunststoffolie til et klæbebånd med mindst et første folielag (1), som danner mindst en folieoverflade, **kendetegnet ved, at** det første folielag (1) har en blanding af en termoplastisk polyolefin-elastomer (TPE-O) og ethylenvinylacetat (EVA-MAH) podet med maleinsyreanhydrid.

2. Kunststoffolie ifølge krav 1, **kendetegnet ved, at** der som termoplastisk polyolefin-elastomer (TPE-O) er tilvejebragt en polypropylen-copolymer (PP-CO), især en polypropylen-randomcopolymer (PP-RC).

3. Kunststoffolie ifølge krav 1 eller 2, **kendetegnet ved, at** den termoplastiske polyolefin-elastomer (TPE-O) har et E-modul i henhold til ISO 178 på mindre end 400 Mpa (megapascal).

4. Kunststoffolie ifølge et af kravene 1 til 3, **kendetegnet ved, at** det første folielag (1) består af polypropylen-copolymer (PP-CO), ethylenvinylacetat (EVA-MAH) podet med maleinsyreanhydrid og resten tilsætningsstoffer.

5. Kunststoffolie ifølge et af kravene 1 til 4, **kendetegnet ved, at** denne er udformet som en monofolie.

6. Kunststoffolie ifølge et af kravene 1 til 5, **kendetegnet ved** en tykkelse på mellem 40 og 140 mikrometer (µm).

7. Kunststoffolie ifølge et af kravene 1 til 6, **kendetegnet ved, at** andelen af termoplastisk polyolefin-elastomer (TPE-O) i det første folielag (1) er mellem 30 og 65 vægt-%.

8. Kunststoffolie ifølge et af kravene 1 til 7, **kendetegnet ved, at** andelen af ethylenvinylacetat (EVA-MAH) podet med maleinsyreanhydrid i det første folielag (1) udgør mellem 30 og 65 vægt-%.

9. Kunststoffolie ifølge et af kravene 1 til 8, **kendetegnet ved, at** masseforholdet mellem termoplastisk polyolefin-elastomer (TPE-O) og ethylenvinyl-

acetat (EVA-MAH) podet med maleinsyreanhydrid i det første folielag (1) ligger mellem 2:1 og 1:2.

10. Kunststoffolie ifølge et af kravene 1 til 9, **kendetegnet ved, at** den termoplastiske polyolefin-elastomer (TPE-O) ved rumtemperatur har en hårdhed på mindre end 40 Shore D.

11. Kunststoffolie ifølge et af kravene 1 til 10, **kendetegnet ved, at** denne er dannet ved blæsefolieekstrudering.

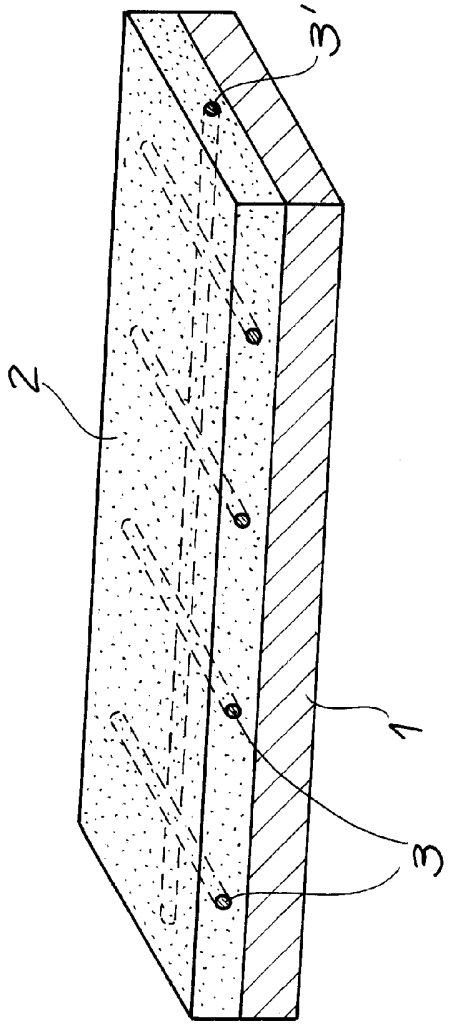
12. Kunststoffolie ifølge et af kravene 1 til 11, **kendetegnet ved** en temperaturbestandighed på op til 150 °C.

13. Klæbebånd med en kunststoffolie ifølge et af kravene 1 til 12 og med en coating af et hæfteklæbestof (2) påført på det første folielag (1).

14. Klæbebånd ifølge krav 13, **kendetegnet ved** en vandgennemtrængelighed på mellem 4 og 12 g/(m^2d) ved 23 °C og 90 % luftfugtighed i henhold til DIN 53122.

15. Klæbebånd ifølge krav 13 eller 14, **kendetegnet ved, at** hæfteklæbestoffet (2) er et butyl-dispersionsklæbestof.

16. Klæbebånd ifølge et af kravene 13 til 15, **kendetegnet ved, at** der er anbragt forstærkningstråde (3, 3') inden i et lag, der er dannet af hæfteklæbestoffet (2).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