METHOD FOR ANTI-CORROSION
TREATMENT

A method provides an adhesive strip for anti-corrosion treatment of metal surfaces. The adhesive strip has a layer of olefin polymer and a crosslinker and is applied onto a metal surface. The strip is heated such that the layer melts, thereby forming an anti-corrosion layer for the metal surface.
METHOD FOR ANTI-CORROSION TREATMENT

[0001] The present invention relates to a method for the corrosion control treatment of metal surfaces, having the features of the preamble of claim 1, and also to the use of a self-adhesive for the corrosion control treatment of metal surfaces.

[0002] Metal components are used in diverse sectors. They are exposed to any of a very wide variety of weathering conditions, and so often there is a need for corrosion control treatment. For this purpose, especially for full-area application of a corrosion control layer to metal components, various methods are known. DE 10 2006 006 910 B3, for example, discloses a method in which a corrosion control layer in the form of a zinc lamellae coating is applied to the metal surfaces that are to be protected. The zinc lamellae coating is applied by means of a dipping or spray process. In a further method known from the prior art, a corrosion control treatment is effected by immersing the metal surfaces into a cathodically depositable electrocoat material (DE 10 2005 059 314 A1). A feature common to the two aforesaid methods is that the corrosion control layer is applied over a relatively large area, more particularly over the full area, of the metal surface to be treated.

[0003] In the construction industry, as sealing strips in the roof area and for corrosion control (particularly for sticking over zinc gutters or metal sheets that have rusted through), adhesive tapes comprising butyl rubber and bitumen are known. However, they exhibit a very high cold flow, which produces effective sealing on rough substrates such as concrete, but on an auto body in vertical bonding, would shear off over the course of time or under brief heating such as in a refinishing oven.

[0004] Particularly in the automobile industry, however, there is a need to provide small areas as well, namely the surface of edges and transitions of metal components, with protection from corrosion by means of a corrosion control layer. For this purpose, in general, a precision seam seal is applied manually or by means of a robot. Material used for the precision seam is typically pumpable PVC plastisol. This material is applied locally by spraying to the metal surface and is subsequently smoothed flat by means of a brush. With this method, which is suitable fundamentally for edges and transitions, it is difficult to produce the precision seam in the optical quality needed in vehicle construction. Instead, the surface often remains rough, and uneven application is visible to the naked eye. Moreover, there is no assurance that the application is complete, in order to ensure complete protection from corrosion.

[0005] The problem on which the present invention is based, therefore, is that of specifying a method for the corrosion control treatment of metal surfaces that can be carried out without great cost and complexity, and in particular that can also be used for protecting edges and transitions of metal components.

[0006] The problem indicated above is solved by a method for the corrosion control treatment of metal surfaces, having the features of the preamble of claim 1, by means of the features of the characterizing part of claim 1. A co-independent solution is represented by the use of an adhesive tape according to claim 11. Advantages embodiments and developments are subject matter of the respective subclaims.

[0007] In accordance with the invention it has been recognized that an adhesive tape having a meltative and crosslinkable special polyolefinic layer is able in such methods to form an effective corrosion control layer on metal surfaces and, accordingly, is suitable for the corrosion control treatment. In tests, moreover, it was found that, by means of suitable self-adhesive formulations, smooth surfaces can be formed. Smooth surfaces of this kind have an even surface structure to the naked eye of a viewer, and are planar. The use of an adhesive tape of this kind for forming a corrosion control layer on metal surfaces is particularly advantageous on account of the ease of operation. Because of the self-adhesive effect, the meltable layer can be applied particularly easily to the surfaces, where it can be fixed preliminarily prior to further operational steps. A design of this kind is also suitable in particular for use on small areas.

[0008] In the method of the invention, the adhesive tape is applied to the metal surface in question, and then heated. The layer comprises a material of a kind which softens by heating, spreads over the metal surface on heating, is able to flow into joints, undergoes cross-linking (curing), and in so doing forms a continuous and generally smooth corrosion control layer. In one embodiment, the adhesive tape may also have been heated prior to application to the metal surface, and so the layer is soft and tacky.

[0009] The invention accordingly provides a method for the corrosion control treatment of metal surfaces, especially at edges and transitions of the metal components, by application of an adhesive layer having a layer of an olefin polymer and of a crosslinker, and by heating such that the layer is melted and so a corrosion control layer is formed. At this point, or on further, later thermal exposure, the corrosion control layer undergoes crosslinking and, as a result, exhibits only very little cold flow. The invention also provides for the use of an adhesive tape of this kind for the corrosion control treatment of metal surfaces. By metal surface is meant not only elemental metal; instead, the surface may also have been treated by roughening, priming, rust prevention treatment such as cathodic electrodeposition coating, or other typical finishing methods. One preferred form of the method is the sealing of joints in automobile bodies.

[0010] The skilled worker considered olefin polymers to be unsuitable for corrosion control layers. On the other hand, soft, noncrystalline materials or those having a melting point of below 105°C, such as VLLDPE are too tacky to be produced in powder form for a powder coating and, on the other hand, in applications involving thermal exposure, such as on an auto body under solar irradiation, for example, they would be excessively tacky and would shear off as a result of cold flow, exposing the unpainted substrate to view in the form of stripes. Through the use of a selected chemical crosslinker, it has been possible to overcome the problem of the tackiness and of the cold flow, without loss of storage life at standard room temperature. Furthermore, the crosslinking increases the resistance to media such as antifreeze, fuel or cold cleaning products. High-melting polyolefins such as HPDPE or PP, in contrast, are highly crystalline and hard, with the consequence that, although powder can be produced, a corrosion control layer comprising such a material is very brittle under flexural loading, and may undergo delamination. Conventional polyolefins also do not adhere well to metals; by means of a pressure-sensitive adhesive formulation of the polyolefin, or of furnishng with a pressure-sensitive adhesive layer, it has been possible for the present invention to overcome this.
problem. Moreover, in contrast to a powder coating or a PVC plastisol coating, the thickness and the surface smoothness of the corrosion control layer can be adjusted.

[0011] In one embodiment, the layer may be pressure-sensitively adhesive, the layer thereby both possessing the quality of an adhesive or of an adhesive tape and at the same time, after heating, forming the corrosion control layer.

[0012] In another embodiment, the layer, for fixing to the metal surface, is equipped with a pressure-sensitive adhesive, preferably based on polyacrylates. This is especially advantageous if the layer does not adhere adequately at application temperature.

[0013] For the skilled person it was surprising that the use of an adhesive tape with a layer of olefin polymer of the invention forms a viscoelastic corrosion control layer which in terms of the simplicity of the method and of the technical properties is superior to the application of a plastisol paste.

[0014] For transport, storage or diecutting, the adhesive tape is preferably provided on at least one side with that is, for example, a silicone-coated film or silicone paper.

[0015] The olefin polymer is, for example, a copolymer or terpolymer of ethylene. One embodiment is based on ethylene and a vinyl ester, preferably vinyl acetate. Another embodiment is based on a copolymer or terpolymer of ethylene and acrylic or methacrylic ester, preferably methyl, ethyl or butyl acrylate. Also suitable are terpolymers of ethylene, vinyl acetate and carbon monoxide, or ethylene, butyl acrylate, and carbon monoxide. Butyl rubber (IR) or ethylene-propylene-ethylene-thiophene copolymer (EPDM) are likewise suitable. Preference, however, is given to copolymers and terpolymers which contain a monomer having carbonyl groups (for example, carbon monoxide, ester groups or carbonyl groups), more preferably with a fraction of more than 10% by weight, more particularly more than 30% by weight. Preferred polymers of this kind, on account of their polarity, are a favorable basis for effective adhesion to metal and to a paint or PVC plastisol to be applied subsequently. Effective adhesion is also exhibited by terpolymers of ethylene, butyl acrylate, and glycidyl methacrylate, and of ethylene, butyl acrylate, and acrylic acid. In another embodiment, carbonyl groups may be introduced not by the usual copolymerization, but instead by grafting with acrylic acid or with maleic anhydride.

[0016] The density of the polyolefin is determined to ISO 1183 and expressed in g/cm³.

[0017] The melt index is tested to ISO 1133 at 2.16 kg and is expressed in g/10 min. As the skilled person is aware, the testing temperature is 190° C. for ethylene-based polymers. The crystallite melting point (T_m) and the heat of fusion are determined by DSC (Mettler DSC 822) with a heating rate of 10° C./min to ISO 3146; where two or more melting peaks occur, the peak with the highest temperature is chosen, since it is this peak which determines the minimum temperature of the heating to cause melting and flow. The olefin polymer of the invention preferably has a melt index of more than 4 g/10 min, more preferably more than 10 g/10 min, and more particularly more than 25 g/10 min. An increasing melt index is accompanied by an increase in the rate of formation of the corrosion control layer and a full in the application temperature. If, however, the melt index is much too high, in other words, for example, 100 g/10 min, there is a marked reduction, however, in the crosslinking rate.

[0018] The olefin polymer is therefore either to have no crystallite melting point or else said point is to be below 105° C., preferably below 75° C. As the melting point drops, the corrosion control layer features improved behavior (dynamomechanical behavior under impact load or alternating climatic conditions, flexibility). The crystallite melting point determines the minimum temperature of heating to produce film and flow on the part of the layer of the invention.

[0019] A key constituent of the layer is a crosslinker for the crosslinking of the olefin polymer. This crosslinker may be added to the layer in the course of its production, as for example by film extrusion. In order to achieve effective distribution without having to carry out prolonged mixing, which can lead to premature reaction, a masterbatch of the crosslinker in a matrix of the olefin polymer of the invention or of another polymer or resin or plasticizer which is highly miscible with olefin polymer is used. In one specific embodiment, in which the crosslinker is highly sensitive thermally, it may be applied with or without a binder to one side of the layer, from where it migrates over the course of time, by diffusion, into the layer.

[0020] The crosslinker is an additive. It is capable of crosslinking the olefin polymer under hot conditions in order thereby to prevent or reduce the cold flow of the non-crosslinked olefin polymer in the end application. Examples are radical-generating compounds such as —C— splitters and peroxides. Preference is given to peroxides, examples being alkyd hydroperoxides, dialkyl peroxides, peroxycarboxylic acids, diacyl peroxides, peroxyacyloxylic esters, α-hydroxy peroxides, and α-amino peroxides. The rate of decomposition of the peroxide must be neither too high (poor storage life at room temperature) nor too low (low crosslinking rate or excessive temperature in the method of the invention). The temperature at which the half-life (t_1/2) is 0.1 hour is therefore to be situated preferably in the range from 120° C. to 170° C. For uniform crosslinking, an effective distribution or good solubility of the peroxide in the layer is important as well. Therefore, for example, 1,1-di(tert-butyleroxy)-3,3,5-trimethyl-cyclohexane or tert-butyl peroxo-2-ethylhexyl carbonate are more favorable than dicumyl peroxide, which tends to crystallize in the layer and hence is inhomogeneously distributed.

[0021] Where the olefin polymer has reactive groups, then other crosslinkers are possible as well. Where, for example, the polymer contains epoxy groups (glycidyl methacrylate as comonomer), suitable crosslinkers are diamines or polyamines, dicarboxylic or poly(carboxylic acids, or Lewis acids such as anhydrous zinc chloride. Where the polymer, for example, contains carbonyl groups, then crosslinking can be carried out with diamines or polyamines, diepoxides or polyepoxides or (optionally capped) diisocyanates or polyisocyanates.

[0022] It has emerged that the olefin polymer is able to accommodate considerable amounts of tackifier resin. Through the tackifier resin it is possible to influence not only adhesive properties of the layer with respect to the metal surface, but also with respect to subsequent plastisol layers or paint layers. Furthermore, through resins, the melting behavior of the layer and also the glass transition temperature and dynamomechanical properties of the corrosion control layer can be adjusted.

[0023] The amount of tackifier resin is preferably 10 to 100 phr (phr denotes parts by weight per 100 parts by weight of resin or rubber, in this case olefin polymer). The polydispersity of the tackifier resin is the ratio of weight average to number average in the molar mass distribution, and can be
determined by gel permeation chromatography. Besides the quantity of resin, polydispersity is important for the properties. The tackifier resin used is therefore present having a polydispersity of less than 2.1, preferably less than 1.8, more preferably less than 1.6. A further influencing variable is the melting point of the tackifier resin (determined in accordance with DIN ISO 4625).

As tackifier resin it has emerged that resins based on resin (for example, balsam resin) or resin derivatives (for example, disproportionated, dimerized or esterified resin), preferably in partially hydrogenated or, with particular preference, fully hydrogenated form, are highly suitable. Like the hydrogenated resins, terpene-phenolic resins are notable for particularly high aging resistance. Use is likewise made of hydrocarbon resins, which are highly compatible presumably on account of their polarity. These resins are, for example, aromatic resins such as coumarone-indene resins or resins based on styrene or α-methyl-styrene, or cycloaliphatic hydrocarbon resins from the polymerization of C5 monomers such as α-methylene or from C6 or C8 fractions from crackers, or terpenes such as β-pinene or 5-limonene, or combinations thereof, preferably in partially or fully hydrogenated form, and hydrocarbon resins obtained by hydrogenating aromatics-containing hydrocarbon resins or cyclopentadiene polymers.

In order to set the desired properties, the layer may comprise a liquid plasticizer such as, for example, aliphatic (paraffinic or branched) and cycloaliphatic (naphthenic) mineral oils, esters of adipic, phthalic, trimellitic, and citric acids, waxes such as wool wax, liquid rubbers (for example, low molecular mass nitrile rubbers, butadiene rubbers or polyisoprene rubbers), liquid polymers of isobutene homopolymer and/or isobutene-butene copolymer, liquid resins and plasticizer resins having a melting point below 40°C and based on the raw materials for tackifier resins, more particularly the above-mentioned classes of tackifier resin. Particular preference is given to using liquid polymers of isobutene and/or butene, mineral oils and esters as for PVC plastisol coatings.

To optimize the properties of the layer, it may comprise further additives such as fillers, pigments, antioxidants or crosslinking agents not stated above. Suitable fillers and pigments are, for example, zinc oxide, titanium dioxide, calcium carbonate, zinc carbonate, silicates, and silica.

The layer of the invention may be prepared from solution and also from the melt. Preferred preparation and processing methods take place from the melt. For the latter case, suitable preparatory operations include not only batch methods but also continuous methods. Particular preference is given to the continuous manufacture by means of an extruder, with subsequent coating directly on a liner with or without a layer of adhesive.

In order to optimize the adhesion between the layer of the invention and any subsequent plastisol layer or paint layer, it may have been modified. Examples of such modifications are physical treatments with corona discharge or plasma, coating with adhesion-promoting substances such as hydrogenated nitrite rubber, vinyliden chloride polymer or adhesion promoters of the kind known to the skilled person for the priming of plastics parts made of polyolefins (for example, automotive fenders) for subsequent paint finishes. Moreover, for this purpose, the surface may also have been modified with a film such as, for example, PVC, polyester (PEN, PET) or polystyrene.

In certain cases, moreover, a barrier layer is useful in order to prevent migration of plasticizer from the plastisol layer into the corrosion control layer, or migration of plasticizer from the corrosion control layer into a paint layer. This barrier layer may be, for example, a coating with vinylidene chloride polymer or application of a polyester film.

The layer of the invention ought to have a layer thickness of at least 50 μm, preferably of at least 100 μm, more preferably of at least 200 μm. Moreover, the layer thickness ought to amount to not more than 750 μm, preferably not more than 600 μm, more preferably not more than 400 μm. The choice of the layer thickness ensures that the metal surface is sufficiently covered when the layer of the invention is melted, and also that the layer does not run out unevenly (as a result of excessive flow, for example) and that the thickness of the corrosion control layer does not become too great.

For use, it has emerged as particularly suitable that the adhesive tape is first wound to a roll. Later on, it can be taken from this roll or applied as a diecut to the metal surface.

In the method, the layer is melted preferably at not less than 90°C, more preferably at not less than 110°C, and more particularly at not less than 130°C.

The general expression “adhesive tape” for the purposes of this invention encompasses all sheetlike structures such as two-dimensionally extended films or film sections, tapes with extended length and limited width, tape sections and the like, and lastly also diecuts or labels.

In the text below, the invention is illustrated by a number of examples, without thereby wishing to restrict the invention.

**Raw Materials of the Examples**

| Levamell VPKA8896 | copolymer of ethylene with 68% by weight vinyl acetate, melt index 25 g/10 min, density 1.08 g/cm³, crystallite melting point not available |
| Elvax PV14000 | copolymer of ethylene with 32% by weight vinyl acetate, melt index 43 g/10 min, density 0.96 g/cm³, crystallite melting point 59°C |
| Loculene A2910/M | copolymer of ethylene with 7% by weight butyl acrylate and 4% by weight acrylic acid, melt index 7 g/10 min, density 0.927 g/cm³, crystallite melting point 96°C |
| Elvaloy HP 662 | copolymer of ethylene with butyl acrylate and carbon monoxide, melt index 25 g/10 min, density 0.96 g/cm³, crystallite melting point 62°C |
| LD 251 | LDPE, melt index 8 g/10 min, density 0.9155 g/cm³, flexural modulus 180 MPa, crystallite melting point 104°C |
| Engage 7467 | copolymer of ethylene and butyl-1-ene, melt index 1.2 g/10 min, density 0.862 g/cm³, flexural modulus 4 MPa, crystallite melting point 34°C |
| Palatinol N Foral 85 | fully hydrogenated glycerol ester of resin, having a melting point of 85°C and a polydispersity of 1.2 |
EXAMPLE 1

[0036] The adhesive tape consists of a silicone paper with a pressure-sensitively adhesive melt coating 300 µm thick and composed of the following components:

<table>
<thead>
<tr>
<th>Component</th>
<th>Amount</th>
</tr>
</thead>
<tbody>
<tr>
<td>100 phr</td>
<td>Levaneh VPKAR086</td>
</tr>
<tr>
<td>20 phr</td>
<td>Foral 85</td>
</tr>
<tr>
<td>10 phr</td>
<td>PalatinsolN</td>
</tr>
<tr>
<td>1.5 phr</td>
<td>Trigonox 117</td>
</tr>
</tbody>
</table>

[0037] The adhesive tape is adhered in a width of 20 mm over the joint of two cathodically electrocoated steel panels 0.5 mm thick, with an overlap of 10 mm between the panels, and the silicone paper is removed.

[0038] This assembly is subsequently heated at 170°C for 40 minutes. The heating causes the melting of the poly-olefin layer onto the metal surface, so forming a uniformly flowed-out corrosion control layer. After cooling of the metal panels, the corrosion control layer exhibits a smooth surface. The panel edge still remains visible between the two metal panels, but the joint is completely sealed.

[0039] The metal panels are then subjected to different ambient conditions. For this purpose the temperature is varied in alternation between about −5°C and 70°C. In spite of the fluctuating thermal expansion, the corrosion control layer does not undergo delamination, owing to its dynamomechanical properties.

[0040] Further panels with this corrosion layer are bent with a radius of 200 mm. The corrosion control layer does not undergo delamination.

[0041] In parallel, panels of this kind were provided with an underbody protection plastisol based on PVC and DinP, and cured at 165°C for 15 minutes. The plastisol layer adheres flawlessly to the metal panel and to the corrosion control layer.

EXAMPLE 2

[0042] The adhesive tape is constructed as follows:

[0043] siliconized polyester film with a thickness of 25 µm

[0044] 40 µm solventborne acrylic pressure-sensitive adhesive

[0045] 250 µm melt coating composed of the following components:

<table>
<thead>
<tr>
<th>Component</th>
<th>Amount</th>
</tr>
</thead>
<tbody>
<tr>
<td>100 phr</td>
<td>Elvax PV14/00</td>
</tr>
<tr>
<td>10 phr</td>
<td>T174</td>
</tr>
<tr>
<td>0.2 phr</td>
<td>Irganox 1726</td>
</tr>
</tbody>
</table>

[0046] Following removal of the liner, the adhesive tape is adhered in a width of 20 mm over the joint of two cathodically electrocoated steel panels 0.5 mm thick, with an overlap of 10 mm between the panels, and the silicone paper is removed.

[0047] This assembly is subsequently heated at 165°C for 20 minutes. The heating causes the melting of the poly-olefin layer onto the metal surface, so forming a uniformly flowed-out corrosion control layer. After cooling of the metal panels, the corrosion control layer exhibits a smooth surface. The panel edge still remains visible between the two metal panels, but the joint is completely sealed.

[0048] The metal panels are then subjected to different ambient conditions. For this purpose the temperature is varied in alternation between about −5°C and 70°C. In spite of the fluctuating thermal expansion, the corrosion control layer does not undergo delamination, owing to its dynamomechanical properties.

[0049] Further panels with this corrosion layer are bent with a radius of 200 mm. The corrosion control layer does not undergo delamination.

[0050] In parallel, panels of this kind were coated with a 2-component PU automotive paint, and dried and cured at 140°C for 10 minutes. The paint adheres flawlessly to the metal panel and to the corrosion control layer.

EXAMPLE 3

[0051] The adhesive tape is constructed as follows:

[0052] siliconized polyester film with a thickness of 25 µm

[0053] 40 µm solventborne acrylic pressure-sensitive adhesive

[0054] 250 µm melt coating composed of the following components:

<table>
<thead>
<tr>
<th>Component</th>
<th>Amount</th>
</tr>
</thead>
<tbody>
<tr>
<td>100 phr</td>
<td>Lucalen A2910M</td>
</tr>
<tr>
<td>20 phr</td>
<td>Foral 85</td>
</tr>
<tr>
<td>10 phr</td>
<td>PalatinsolN</td>
</tr>
<tr>
<td>0.2 phr</td>
<td>Irganox 1726</td>
</tr>
<tr>
<td>0.2 phr</td>
<td>Trigonox 29</td>
</tr>
</tbody>
</table>

25 µm double-sidedly etched PET film 25 µm

[0055] The tests are carried out as in example 2, and the results are likewise flawless.

EXAMPLE 4

[0056] The adhesive tape is constructed as follows:

[0057] siliconized polyester film with a thickness of 25 µm

[0058] 40 µm solventborne acrylic pressure-sensitive adhesive

[0059] 250 µm melt coating composed of the following components:

<table>
<thead>
<tr>
<th>Component</th>
<th>Amount</th>
</tr>
</thead>
<tbody>
<tr>
<td>100 phr</td>
<td>Elvax HP 662</td>
</tr>
<tr>
<td>1 phr</td>
<td>Trigonox 29</td>
</tr>
</tbody>
</table>
The tests are carried out as in example 2, and the results are likewise flawless.

**COMPARATIVE EXAMPLE 1**

Execution takes place as described in example 1, but with LD 251 instead of Levamelt VPKA8896. The formation of the corrosion control layer is incomplete. In the alternating climatic conditions test, there are detachment phenomena at the ends of the corrosion control layer. In the course of the flexural test, the corrosion control layer undergoes complete delamination. The plastisol layer adheres flawlessly to the metal panel, but not to the corrosion control layer.

**COMPARATIVE EXAMPLE 2**

Execution takes place as described in example 1, but with Engage 7467 instead of Levamelt VPKA8896. The formation of the corrosion control layer is incomplete and of nonuniform thickness. At the upper edge of the joint, the corrosion control layer has undergone partial runoff. In the course of the flexural test, the corrosion control layer undergoes complete delamination. The plastisol layer adheres flawlessly to the metal panel, but not to the corrosion control layer.

**COMPARATIVE EXAMPLE 3**

Execution takes place as described in example 2, but without crosslinker T174. The formation of the corrosion control layer is incomplete and of nonuniform thickness. At the upper edge of the joint, the corrosion control layer has undergone partial runoff. In the flexural test, the corrosion control layer holds. During the curing of the paint finish, cracks form in the paint layer, since the corrosion control layer begins to flow.

1. A method for the corrosion control treatment of metal surfaces, the method comprises:
   - applying in that an adhesive tape to a metal surface, wherein the adhesive tape has a layer of an olefin polymer and a crosslinker; and
   - heating the adhesive tape such that the layer melts to form corrosion control layer.

2. The method according to claim 1, wherein the olefin polymer is a copolymer or terpolymer of ethylene and a vinyl ester.

3. The method according to claim 1, wherein the olefin polymer is a copolymer or terpolymer of ethylene and acrylic or methacrylic ester.

4. The method according to claim 1, wherein the olefin polymer has a crystallite melting point.

5. The method according to claim 1, wherein the crosslinker is a peroxide.

6. The method according to claim 1, wherein the layer has a thickness between 50 μm and 750 μm.

7. The method according to claim 1, wherein a surface of the corrosion control layer has been modified to ensure sufficient adhesion to a subsequently applied plastisol layer or paint layer.

8. The method according to claim 1, wherein the layer melts at a temperature of not less than 90°C.

9. The method according to claim 1, wherein the layer is a pressure-sensitive adhesive.

10. The method according to claim 1, wherein pressure-sensitive adhesive is located between the layer and the metal surface.

11. (canceled)

12. The method of claim 1, wherein the olefin polymer is a copolymer or terpolymer of ethylene and vinyl acetate.

13. The method according to claim 3, wherein the olefin polymer is a copolymer or terpolymer of ethylene and methyl, ethyl or butyl acrylate.

14. The method according to claim 1, wherein the layer has a thickness that is between 100 μm and 600 μm.

15. The method according to claim 1, wherein the layer has a thickness that is between 200 μm and 400 μm.

16. The method according to claim 1, wherein the olefin polymer has a crystallite melting point of below 105°C.

17. The method according to claim 1, wherein the layer melts at a temperature of not less than 110°C.

18. The method according to claim 1, wherein the layer melts at a temperature of not less than 130°C.

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