EUROPEAN PATENT SPECIFICATION

(54) LOW APPLICATION TEMPERATURE AMORPHOUS POLY-OLEFIN ADHESIVE
AMORPHOUS POLY-OLEFIN-ADHESIV MIT GERINGER ANWENDUNGSTEMPERATUR
ADHÉSIF À BASE DE POLY-OLÉFINE AMORPHE UTILISABLE À BASSE TEMPÉRATURE

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FIELD OF THE INVENTION

[0001] The invention relates to a low application temperature amorphous poly-\(\alpha\)-olefin adhesive used on nonwoven articles. The adhesive is particularly useful in the construction of nonwoven articles, e.g., disposable absorbent articles such as diapers, feminine hygiene articles, adult incontinence devices, underpads, bed pads, industrial pads and the like.

BACKGROUND OF THE INVENTION

[0002] Hot melt adhesives are applied to a substrate while in a molten state and cooled to harden the adhesive layer. Such adhesives are widely used for various commercial and industrial applications such as product assembly and packaging, and have been widely used in the nonwoven industry to make nonwoven articles. In these applications, adhesive is applied to at least one substrate for binding the substrate to a second similar or different substrate.

[0003] In a hot melt adhesive, base polymer provides cohesive strength and elasticity. The use of high molecular weight polymer or high polymer content usually promotes cohesive strength and adhesion; however, it also results in significant melt viscosity increase. A hot melt adhesive with high viscosity may require very high processing temperature, at which polymers are susceptible to degradation, charring, gelling and loss of adhesion. Moreover, high processing temperature increases energy cost, creates a safety hazard and deforms/discolors polymeric substrate film.

[0004] Conventional low application temperature hot melt adhesives, e.g. styrenebutadiene-styrene, styrene-isoprene-styrene and metallocene polyolefin based adhesives, are known, however, amorphous poly-\(\alpha\)-olefin based adhesives are not processed at low temperature unless large quantities of low molecular weight diluents are added to lower the adhesive viscosity. Adding high levels of diluents, such as tackifiers and waxes, decreases mechanical strength of the adhesive, and more importantly, causes less resistance to flow at body temperature. Also, over time, the low molecular weight diluents in the adhesive tend to migrate and separate out from the adhesive further affecting the strength and appearance of the adhesive.

[0005] There is a need for a hot melt adhesive that can be applied at low temperature, i.e., below about 150°C, which has lower amount of diluents, without sacrificing the mechanical strength and appearance of the adhesive. Such attributes would make the adhesives particularly well-suited for use in the manufacture of absorbent disposable articles. The current invention addresses this need.

BRIEF SUMMARY OF THE INVENTION

[0006] It has been discovered that amorphous poly-\(\alpha\)-olefin copolymer that has a softening point of from about 70 to about 105°C and viscosity of less than about 1,900cP at 190°C can be used in the manufacture of low application temperature hot melt adhesives. Such adhesives find utility as construction adhesives, and are particularly well suited for the manufacture of disposable absorbent articles such as sanitary napkins, incontinent pads, bed pads, feminine pads, panty shields, diaper inserts, and the like.

[0007] The present invention relates to:

1. A hot melt adhesive comprising at least 45 wt%, based on the adhesive of an amorphous polybutene copolymer which has a softening point of from 70 to 105°C and viscosity of less than 1,900cP at 190°C and a tan(\(\delta\)) value greater than 30 at 140°C, and wherein the hot melt adhesive has a viscosity of less than 6,000cP at 150°C.

2. The hot melt adhesive of item 1, wherein the amorphous polybutene copolymer further comprises propylene comonomer.

3. The hot melt adhesive of item 2, wherein the amorphous polybutene copolymer has a butene content greater than 40%.

4. The hot melt adhesive of any one of items 1 to 3 further comprising a tackifier which has a softening point greater than or equal to 80°C, preferably greater than or equal to 100°C.

5. The hot melt adhesive of item 4, wherein the tackifier is selected from the group consisting of C5 resins, petroleum distillates, hydrogenated hydrocarbons, C5/C9, polyterpenes, rosin, hydrogenated rosin, and rosin esters and mixtures thereof.

6. The hot melt adhesive of item 1 further comprising a crystalline wax which has a melting point greater than 60°C.
7. The hot melt adhesive of item 6, wherein the crystalline wax is selected from the group consisting of Fischer-Tropsch wax, petroleum based wax, conventional wax, natural-based wax, functionalized wax, polyolefin copolymers and mixtures thereof.

8. The hot melt adhesive of item 1 which is essentially free of wax and/or plasticizer.

9. The hot melt adhesive of item 1 which comprises greater than 50wt.%, preferably greater than 60wt.% of the amorphous polybutene copolymer.

10. The hot melt adhesive of item 1, wherein the adhesive has a tensile peak value greater than 55 psi at 23°C at a pulling rate of 12 in/min.

11. An article comprising the adhesive of item 1.

12. The article of item 11 which is a personal care, health, medical, household or industrial product.

13. The article of item 12 which is a diaper, training pants, feminine hygiene pad, meat pads and adult incontinence products.

14. A method comprising applying the adhesive of item 1 at 150°C or below to a first substrate: applying a second substrate onto the adhesive, thereby forming a bond.

15. The method of item 14, wherein the first and/or second substrate is a nonwoven film.

16. The method of item 15, wherein the adhesive is applied onto the substrate by melt spraying, swirl patterning, random spraying and/or slot coating with an add-on-range of from 0.1 to 20 g/m², preferably from 0.1 to 10 g/m².

[0008] In a preferred embodiment, the hot melt adhesive according to the present invention provides a low application temperature hot melt adhesive.

[0009] In a further preferred embodiment, the amorphous polybutene copolymer of the low application temperature hot melt adhesive according to the present invention is copolymerized with ethylene, propylene, hexene and/or octene comonomers.

[0010] In another preferred embodiment, the low application temperature hot melt adhesive according to the present invention further comprises a tackifier which has a softening point greater than or equal to 80°C.

[0011] Yet another preferred embodiment provides an article manufactured with the low application temperature adhesive according to the present invention. The articles include disposable absorbent articles such as sanitary napkins, incontinence pads, bed pads, feminine pads, panty shields, diaper inserts, meat pads and the like.

[0012] Another preferred embodiment is directed to a method of applying the low application temperature adhesive according to the present invention at 150°C or below to a first substrate, applying a second substrate onto the adhesive, thereby forming a bond.

DETAILED DESCRIPTION OF THE INVENTION

[0013] The present invention is directed to adhesive compositions comprising amorphous poly-α-olefin copolymer, which adhesive compositions have better performance characteristics and/or cost less than conventional hot-melt adhesives. It has been discovered that amorphous polybutene copolymers that have a softening point of from 70 to 105°C and viscosity of less than 1,900cP at 190°C possess desirable properties and may be used to make a low application temperature hot melt adhesive for disposable absorbent articles.

[0014] For the purpose of this disclosure, the term "poly-α-olefin" means an atactic poly-α-olefin copolymer that is amorphous with minor crystallinity.

[0015] The amorphous polybutene copolymer has a Ring and Ball softening point (as measured in accordance with ASTM E28) of from 70 to 105°C. The Ring and Ball softening point is related to the butene content of the copolymer. By varying the levels of butene in the copolymer, the desired softening point of the copolymer can be selected. The preferred polybutene is a high 1-butene atactic poly-α-olefin. The term "high butene poly-α-olefin" typically indicates that greater than 40 wt %, preferably greater than about 50 wt%, of the polymer comprises a 1-butene monomer. The other monomers that are copolymerized with butene are ethylene, propylene, hexene, octene and mixtures thereof. Typically, about 40 to about 70% of 1-butene with about 30 to about 60% of propylene and minor amounts of other monomers are present in the amorphous polybutene copolymer.
The amorphous polybutene copolymer has a viscosity less than 1,900 cP at 190°C, as determined by Brookfield viscometer according to the ASTM D3236 test method. The viscosity of the amorphous polybutene copolymer is dependent upon the molecular weight of the copolymer. As the molecular weight of the copolymer increases, the viscosity increases.

The copolymer’s tan δ value is also an important factor in selecting the polymer for the low application temperature hot melt adhesive. Tan δ of a polymer is the ratio of the loss modulus (G") to the storage modulus (G'): (G"/G'). This is a dimensionless quantity that is proportional to the ratio of the energy lost to energy stored. It has been discovered that copolymers with a tan δ value greater than 30, preferably greater than 40, more preferably greater than 50, at 140°C can advantageously be used as a low application hot melt adhesive because they can flow and be sprayed using a conventional applicator at or below 150°C. Adhesives prepared with copolymers with tan δ value less than 30 at 140°C cannot be sprayed at or below 150°C, and must be sprayed at higher temperature.

The polymer provides the important adhesive properties such as open time, shear strength, tensile strength, cohesiveness and viscosity. The adhesive can comprise, in its entirety, one of a number of useful polymers, a blend of polymers, or alternatively the adhesive can comprise a hot melt adhesive comprising at least one polymer admixed with other components. The polymer may be combined with a tackifier or additives to modify the adhesive properties.

Suitable tackifiers have a softening point greater than or equal to 80°C. Examples of suitable tackifiers are listed in Paul C. W. (2002) Hot Melt Adhesives, Chaudhury M and Pocus AV (ed) Surfaces, Chemistry and Applications: Adhesion Science and Engineering, Elsevier Science B. V., The Netherlands pp 711 - 757, which include fully or substantially saturated (e.g. hydrogenated) C5 resins, derived from piperylene or di-cyclopentadiene (DCPD). Other suitable tackifiers include hydrocarbons derived from petroleum distillates, rosins, rosin esters, hydrogenated rosin esters, polyterpenes derived from wood, polyterpenes derived from synthetic chemicals, as well as combinations of any of these.

A commercially available example of a suitable tackifier is ESCOREZ® 5340 tackifier, available from Exxon-Mobil. ESCOREZ® 5340 has a softening point of 140°C and viscosity of 5000 cps at 177°C. Another suitable tackifier, ESCOREZ® 5320, has a softening point of 122°C, and a relatively low viscosity of 1,500 cP at 177°C. Yet another suitable tackifier, ESCOREZ® 5415, has a softening point of 118°C, and a lower viscosity of 900 cPs at 177°C. The amount of tackifier in the adhesive composition ranges from 0 to about 55 wt%, based on the total weight of the adhesive.

Additionally, the adhesive composition may include an antioxidant stabilizer, suitably in an amount sufficient for maintaining the desired properties of adhesives. Sufficient amounts of antioxidant stabilizer would be apparent to one skilled in the art. For example, the adhesive composition may include an antioxidant stabilizer in an amount of about 1% or less by weight of the adhesive composition. One example of a suitable antioxidant is available from Ciba Specialty Chemicals under the trade designation IRGANOX® 1010.

Also, optionally, wax may be present in the adhesive. Suitable wax includes paraffin waxes, microcrystalline waxes, polyethylene waxes, polypropylene waxes, by-product polyethylene waxes, Fischer-Tropsch waxes, oxidized Fischer-Tropsch waxes and functionalized waxes such as hydroxy stearamide waxes and fatty amide waxes. It is common in the art to use the terminology, synthetic high melting point waxes, to include high density low molecular weight polyethylene waxes, by-product polyethylene waxes and Fischer-Tropsch waxes. Modified waxes, including vinyl acetate modified waxes such as AC-400 (Honeywell) and MC-400 (available from Marcus Oil Company), maleic anhydride modified waxes such as Epolene C-18 (available from Eastman Chemical) and AC-575A and AC-575P (available from Honeywell) and oxidized waxes may be used in the practice of the invention. If used, the wax is generally present in an amount of up to about 15 wt %, based on the total weight of the adhesive.

Additional additives include a plasticizer/oil, color pigment or dye, fragrance, filler, a polymer compatibilizer, and/or a low softening point additive. Examples of suitable plasticizer/oil include benzoates, phthalates, paraffin oils, mineral oils, polyisobutylene, chlorinated paraffins, and the like. Examples of suitable color pigments and fillers include TiO₂, carbon black, and calcium carbonate. Examples of suitable polymer compatibilizers include polypropylene-b-polyethylene, polypropylene-b-polybutene diblock copolymers.

Hot-melt processable means that an adhesive composition may be liquefied under heat, from about 38-235°C. In general, at the point of application, the substantially liquefied adhesive composition will pass through a nozzle or bank of nozzles, but may pass through some other mechanical element such as a slot. The hot melt adhesive prepared with amorphous polybutene copolymer has a Ring-and-Ball softening point of about 70 to about 105°C and viscosity of less than about 1,900cP at 190°C is processable at temperature of at or less than 150°C. The hot melt adhesive prepared with the amorphous polybutene copolymer has a viscosity less than about 6,000cP at 150°C and can be sprayed using conventional nozzles to provide desired pattern and add-on levels of adhesive on a moving web. Suitable nozzles are commercially available from Nordson Corporation and Illinois Tool Works Inc.

It has been discovered that amorphous polybutene copolymer based adhesives with a tan δ value greater than 30 at 140°C can advantageously be sprayed at temperatures of at or less than 150°C. Preferably, amorphous polybutene
copolymer based adhesives with a tan δ value greater than 40 at 140°C, more preferably greater than 50 at 140°C, can be sprayed at temperatures of at or less than 150°C.

[0026] The adhesive composition is processed by heating and blending the amorphous polybutene copolymer, and optionally with additional components. This can be heated or heated/blended using an extruder or hot-melt processing equipment. For the heating and blending method, various methods are contemplated: (1) amorphous polybutene copolymer could be heated and the optional components could be added subsequent to heating the copolymer, (2) optional components could be heated and the copolymer is added subsequent to heating the optional components or (3) both amorphous polybutene copolymer and the optional components could be combined prior to heating. This resultant adhesive can be used directly to bond articles or it can be cooled and processed to make a solid form (e.g., palletized, pillowed, or cast into molds or drums, etc), which can be stored and/or shipped. The blend, in solid form, would be heated to substantially liquefy the tackified adhesive composition prior to its being used to make a bonded article.

[0027] One method of making a bonded article includes the steps of heating the amorphous polybutene copolymer adhesive to a temperature of about 150°C, applying the adhesive on a first substrate, joining a second substrate so that some or all of the applied adhesive composition is positioned between the first substrate and second substrate, and cooling the adhesive to form a bond.

[0028] Typical substrates are nonwoven film materials that typically have a basis weight in the range of about 10 to 25 gsm (g/m²) based on fibers of polyethylene, polypropylene, polyester or cellulose. Also typical substrates are flexible sheet-like film such as polyethylene or polypropylene films. The adhesive according to the invention may be used to bond the same or different substrate materials to one another.

[0029] The bonded article has a dynamic peel strength of at least 50 grams per inch, even at low add-on levels. The adhesive of the invention exhibits a peel strength far greater than conventional hot melt adhesive, e.g., based on metallocene polyolefins and rubber based adhesives. Due to the high peel strength of the inventive adhesive, lower amounts of adhesive coatings weights, e.g. less than or equal to 20 gsm or less than or equal to 10 gsm, preferably less than or equal to 5 gsm, more preferably less than or equal to 3 gsm, can be used to achieve sufficient bond strength to the substrate. Moreover, the adhesive prepared with the amorphous polybutene copolymer is less expensive than conventional adhesive that requires large quantities of tackifiers, which are often more expensive than polymers.

[0030] The amorphous poly-α-olefin copolymer based adhesive is sprayable at or below 150°C. Because the adhesive of the invention can be applied at lower temperatures with low add-on levels, there is a reduced likelihood of deformation and discoloration of polymeric substrate film.

[0031] The bonded articles of the invention are suitable for use in absorbent articles such as diapers, diaper pants, baby wipes, training pants, absorbent underpants, child care pants, swimwear, and other disposable garments; feminine care products including sanitary napkins, wipes, menstrual pads, panty liners, panty shields, tampons, and tampon applicators; adult-care products including wipes, pads, containers, incontinence products, and urinary shields; clothing components; athletic and recreation products; products for applying hot or cold therapy, medical gowns (i.e., protective and/or surgical gowns), surgical drapes, caps, gloves, face masks, bandages, wound dressings, wipes, covers, containers, filters, disposable garments and bed pads, medical absorbent garments, underpants; construction and packaging supplies, industrial pads including meat pads; products for cleaning and disinfecting, wipes, covers, filters, towels, bath tissue, facial tissue, nonwoven roll goods, home-comfort products including pillows, pads, cushions, masks and body care products such as products used to cleanse or treat the skin, laboratory coats, cover-alls, and the like.

[0032] Many modifications and variations of this invention can be made without departing from its scope, as will be apparent to those skilled in the art. The specific embodiments described herein are offered by way of example only, and the invention is to be limited only by the terms of the appended claims.

EXAMPLES

[0033] Viscosities were determined using a Brookfield viscometer with a Thermosel heating unit and spindle 27 at 190°C or 150°C.

[0034] Ring and ball softening point is the reported values in accordance with ASTM E 28.

[0035] Storage modulus and loss moduli were measured and the Tan δ value was calculated by ARES M Rheometer from Rheometric Scientific using the Temperature Ramp Method (ARES LS). A sample was placed in parallel plates (25 mm geometry diameter) with a 2 mm gap. Dynamic temperature sweep from 150°C to 0°C was tested with a frequency of 10 rad/sec and cooling rate of 5°C/minute. The storage modulus (G’) and the loss modulus (G”) were calculated from the torque and strain data. Their ratio (G’/G”), also known as the tan (δ), was calculated.

[0036] Dumbbell shaped sample was prepared in a mold for the tensile peak test. The test sample was shaped with two 1"x1" ends connected by a ¼"x½" connector (the total length was 2 ½"), and the thickness of the sample was 1/8". The sample was then conditioned at 23°C and 50% relative humidity for at least 72 hours and tested on a Sintech 1/D mechanical tester at 23°C and 50% relative humidity. The sample was gripped at the dumbbell ends (1"x1" area) and pulled at a crosshead speed of 12"/min until the sample tore or broke. This test was repeated three to four times, and
the average tensile peak value was calculated and reported.

[0037] Peel strength was measured by Sintech 1/D mechanical tester at 23°C/50% relative humidity. Coated laminate sample was prepared by applying the adhesive in between a nonwoven film and a Pliant poly film (Pliant Corporation) and left at room temperature for at least 72 hours. A three inches wide laminated sample was tested for peak peel strength. Each film end was pulled apart from each other, in T-shape, at a rate of 12 inches/min at an angle of 180°, and the resultant peel strength was reported in g/in.

[0038] Table 1 lists various amorphous polybutene copolymers and their respective viscosity, softening point and tan δ values. Copolymers of this class can be purchased through Rextac, Evonik or Eastman, or can be formed by known processes in the art.

Table 1. Amorphous butene-propylene copolymer examples

<table>
<thead>
<tr>
<th>Polymer</th>
<th>Viscosity @ 190°C</th>
<th>R&amp;B S.P. (°C)</th>
<th>Tan δ at 140°C</th>
</tr>
</thead>
<tbody>
<tr>
<td>Copolymer 1</td>
<td>840 cps</td>
<td>88.4</td>
<td>59.0</td>
</tr>
<tr>
<td>Copolymer 2</td>
<td>1550 cps</td>
<td>90.8</td>
<td>53.0</td>
</tr>
<tr>
<td>Copolymer A</td>
<td>3375 cps</td>
<td>91.5</td>
<td>17.0</td>
</tr>
<tr>
<td>Copolymer B</td>
<td>3560 cps</td>
<td>105.2</td>
<td>22.8</td>
</tr>
<tr>
<td>Copolymer C</td>
<td>3100 cps</td>
<td>103.0</td>
<td>15.4</td>
</tr>
<tr>
<td>Copolymer D</td>
<td>1560 cps</td>
<td>145.0</td>
<td>10.5</td>
</tr>
<tr>
<td>Copolymer E</td>
<td>3025 cps</td>
<td>108.0</td>
<td>21.0</td>
</tr>
<tr>
<td>Copolymer F</td>
<td>2200 cps</td>
<td>111.5</td>
<td>31.3</td>
</tr>
<tr>
<td>Copolymer G</td>
<td>8100 cps</td>
<td>118.0</td>
<td>8.5</td>
</tr>
</tbody>
</table>

[0039] Useful copolymer for the invention has a viscosity less than 1,900 cP measured at 190°C, Ring and Ball softening point ranges of 70-105°C, and tan δ value greater than 30 at 140°C. Only Copolymers 1 and 2 meet all three criteria, and comparative Copolymers A-G have at least one criteria outside of the useful ranges.

[0040] Table 2 lists adhesive samples made with Copolymer 2 with various types and amounts of tackifiers. The adhesive and resin/tackifier, listed in Table 2, were melted together with heat (at or greater than 140°C) until a homogenous melt was formed. The resultant adhesive characteristics of the samples were tested and the results are listed in Table 2.

Table 2. Adhesive composition

<table>
<thead>
<tr>
<th>Components</th>
<th>Sample 1</th>
<th>Sample 2</th>
<th>Sample 3</th>
<th>Sample 4</th>
</tr>
</thead>
<tbody>
<tr>
<td>Copolymer 2</td>
<td>40</td>
<td>45</td>
<td>70</td>
<td>80</td>
</tr>
<tr>
<td>Resin/tackifier - Escorez 5380</td>
<td>59.5</td>
<td>54.5</td>
<td>29.5</td>
<td></td>
</tr>
<tr>
<td>Resin/tackifier - Eastotac H130</td>
<td></td>
<td></td>
<td></td>
<td>19.5</td>
</tr>
<tr>
<td>Anti-oxidant - Irganox 1010</td>
<td>0.5</td>
<td>0.5</td>
<td>0.5</td>
<td>0.5</td>
</tr>
</tbody>
</table>

Adhesive characteristics

<table>
<thead>
<tr>
<th></th>
<th>Sample 1</th>
<th>Sample 2</th>
<th>Sample 3</th>
<th>Sample 4</th>
</tr>
</thead>
<tbody>
<tr>
<td>Viscosity @ 150°C (cP)</td>
<td>1290</td>
<td>1465</td>
<td>2700</td>
<td>4150</td>
</tr>
<tr>
<td>Tan δ at 140°C</td>
<td>61</td>
<td>67</td>
<td>75</td>
<td>58</td>
</tr>
<tr>
<td>R&amp;B S.P. (°C)</td>
<td>66.4</td>
<td>69.3</td>
<td>84.6</td>
<td>91.6</td>
</tr>
<tr>
<td>Tg (°C)</td>
<td>22.8</td>
<td>18.4</td>
<td>-5.0</td>
<td>-7.1</td>
</tr>
</tbody>
</table>

[0041] All of the above adhesive samples have viscosity less than 6,000cP at 150°C. The adhesive formulations comprise a wide range of copolymer and resin amounts as demonstrated above, and may also comprise prominently of copolymer.

[0042] Several adhesive samples were prepared with different base polymer and tested against the inventive adhesive for their performance properties in Table 3. The base polymer type and content is noted in Table 3. Each sample was mixed with a tackifier under heat (greater than 140°C) until a homogenous melt was formed. Adhesive characteristics were measured and reported in Table 3. Each adhesive was then applied in between a nonwoven and a poly film.
substrate with a specified add-on level and the resultant peel strength are shown in Table 3.

<table>
<thead>
<tr>
<th>Table 3. Construction Adhesives with Various Base Polymer</th>
</tr>
</thead>
<tbody>
<tr>
<td>Sample 4</td>
</tr>
<tr>
<td>Base polymer</td>
</tr>
<tr>
<td>Adhesive characteristics</td>
</tr>
<tr>
<td>Viscosity @ 150°C</td>
</tr>
<tr>
<td>R&amp;B S.P. (°C)</td>
</tr>
<tr>
<td>Tanδ at 140°C</td>
</tr>
<tr>
<td>Tensile Peak (psi)</td>
</tr>
</tbody>
</table>

Peel strength was measured after attaching substrates together with the specific Sample adhesive (general purpose 13.5 gsm spunbond nonwoven and 0.5 mil Pliant poly film, Pliant Corporation)

| Spiral patterna application Temp (°F/°C) | 260/127 | 280/138 | 290/143 | 325/163 |
| Peel strength (g/in) (Spiral @ 3 gsm on GP substrates) | 600 | 470 | 405 | 460 |
| Random patternb application Temp (°F/°C) | 300/149 | 300/149 | 320/160 | 350/177 |
| Peel strength (g/in) (Signature @ 1.5 gsm on GP substrates) | 318 | 149 | 153 | 120 |

[a]Nordson® Spiral nozzle head which sprays spiral patterns of hot melt adhesive
[b]Nordson® Signature spray nozzle which sprays random patterns with dense, uniform coverage of hot melt adhesive

[0043] For Comparative Samples X and Y of Table 3, less than 20 wt% of the total composition is made up of the base polymer. While Comparative Sample Z (prepared with Copolymer E) also utilizes 80 wt% of amorphous butene copolymer, this application temperature is higher than the application temperature of Sample 4 (prepared with Copolymer 2). Moreover, the use of the base Copolymer 2 in Sample 4 adhesive resulted in the highest peel strength.

Claims

1. A hot melt adhesive comprising at least 45 wt%, based on the adhesive, of an amorphous polybutene copolymer which has a softening point of from 70 to 105°C and viscosity of less than 1,900cP at 190°C and a tan(δ) value greater than 30 at 140°C, and wherein the hot melt adhesive has a viscosity of less than 6,000cP at 150°C.

2. The hot melt adhesive of claim 1, wherein the amorphous polybutene copolymer further comprises propylene comonomer.

3. The hot melt adhesive of claim 2, wherein the amorphous polybutene copolymer has a butene content greater than 40%.
4. The hot melt adhesive of any one of claims 1 to 3 further comprising a tackifier which has a softening point greater than or equal to 80°C, preferably greater than or equal to 100°C.

5. The hot melt adhesive of claim 4, wherein the tackifier is selected from the group consisting of C5 resins, petroleum distillates, hydrogenated hydrocarbons, C5/C9, polyterpenes, rosin, hydrogenated rosin, and rosin esters and mixtures thereof.

6. The hot melt adhesive of claim 1 further comprising a crystalline wax which has a melting point greater than 60°C.

7. The hot melt adhesive of claim 6, wherein the crystalline wax is selected from the group consisting of Fischer-Tropsch wax, petroleum based wax, conventional wax, natural-based wax, functionalized wax, polyolefin copolymers and mixtures thereof.

8. The hot melt adhesive of claim 1 which is essentially free of wax and/or plasticizer.

9. The hot melt adhesive of claim 1 which comprises greater than 50wt.%, preferably greater than 60wt% of the amorphous polybutene copolymer.

10. The hot melt adhesive of claim 1, wherein the adhesive has a tensile peak value greater than 55 psi at 23°C at a pulling rate of 12 in/min.

11. An article comprising the adhesive of claim 1.

12. The article of claim 11 which is a personal care, health, medical, household or industrial product.

13. The article of claim 12 which is a diaper, training pants, feminine hygiene pad, meat pads and adult incontinence products.

14. A method comprising applying the adhesive of claim 1 at 150°C or below to a first substrate; applying a second substrate onto the adhesive, thereby forming a bond.

15. The method of claim 14, wherein the first and/or second substrate is a nonwoven film.

16. The method of claim 15, wherein the adhesive is applied onto the substrate by melt spraying, swirl patterning, random spraying and/or slot coating with an add-on-range of from 0.1 to 20 g/m², preferably from 0.1 to 10 g/m².

Patentansprüche

1. Schmelzklebstoff, der mindestens 45 Gew.-%, bezogen auf den Klebstoff, eines amorphen Polybuten-Copolymers umfasst, das einen Erweichungspunkt von 70 bis 105 °C und eine Viskosität von weniger als 1900 cP bei 190 °C und einen tan(δ)-Wert von mehr als 30 bis 140 °C aufweist, und wobei der Schmelzklebstoff eine Viskosität von weniger als 6000 cP bei 150 °C aufweist.

2. Schmelzklebstoff nach Anspruch 1, wobei das amorphe Polybuten-Copolymer ferner Propilen-Comonomer umfasst.

3. Schmelzklebstoff nach Anspruch 2, wobei das amorphe Polybuten-Copolymer einen Butengehalt von mehr als 40 % aufweist.

4. Schmelzklebstoff nach einem der Ansprüche 1 bis 3, der ferner einen Klebrigmacher umfasst, der einen Erwei-

5. Schmelzklebstoff nach Anspruch 4, wobei der Klebrigmacher ausgewählt ist aus der Gruppe bestehend aus C5-

6. Schmelzklebstoff nach Anspruch 1, der ferner ein kristallines Wachs umfasst, das einen Schmelzpunkt von mehr als 60 °C aufweist.
7. Schmelzklebstoff nach Anspruch 6, wobei das kristalline Wachs ausgewählt ist aus der Gruppe bestehend aus Fischer-Tropsch-Wachs, Wachs auf Erdölbasis, herkömmlichen Wachs, Wachs auf natürlicher Basis, funktionisierten Wachs, Polyolefin-Copolymeren und Gemischen davon.

8. Schmelzklebstoff nach Anspruch 1, der im Wesentlichen frei von Wachs und/oder Weichmacher ist.


11. Gegenstand, der den Klebstoff nach Anspruch 1 umfasst.


14. Verfahren, das das Aufbringen des Klebstoffs nach Anspruch 1 bei 150 °C oder einer niedrigeren Temperatur auf ein erstes Substrat und das Aufbringen eines zweiten Substrats auf den Klebstoff umfasst, wodurch eine Klebverbindung gebildet wird.

15. Verfahren nach Anspruch 14, wobei es sich bei dem ersten und/oder dem zweiten Substrat um einen Vliesstoff handelt.

16. Verfahren nach Anspruch 15, wobei der Klebstoff durch Schmelzprühen, Wirbelstrukturieren, Zufallssprühen und/oder Schlitzbeschichten mit einem Zugabebereich von 0,1 bis 20 g/m², vorzugsweise von 0,1 bis 10 g/m² auf das Substrat aufgebracht wird.

**Revendications**

1. Adhésif thermofusible comprenant au moins 45 % en poids, sur la base de l’adhésif, d’un copolymère de polybutène amorphe qui a un point de ramollissement de 70 à 105°C et une viscosité inférieure à 1 900 cP à 190°C et une valeur de tan(δ) supérieure à 30 à 140°C, et l’adhésif thermofusible ayant une viscosité inférieure à 6 000 cP à 150°C.

2. Adhésif thermofusible selon la revendication 1, dans lequel le copolymère de polybutène amorphe comprend en outre un comonomère de propylène.

3. Adhésif thermofusible selon la revendication 2, dans lequel le copolymère de polybutène amorphe a une teneur en butène supérieure à 40 %.

4. Adhésif thermofusible selon l’une quelconque des revendications 1 à 3 comprenant en outre un agent donnant du collant qui a un point de ramollissement supérieur ou égal à 80°C, de préférence supérieur ou égal à 100°C.

5. Adhésif thermofusible selon la revendication 4, dans lequel l’agent donnant du collant est choisi dans le groupe consistant en résines en C5, distillats du pétrole, hydrocarbures hydrogénés, C5/C9, polyterpènes, colophane, colophane hydrogénée et esters de colophane et leurs mélanges.

6. Adhésif thermofusible selon la revendication 1 comprenant en outre une cire cristalline qui a un point de fusion supérieur à 60°C.

7. Adhésif thermofusible selon la revendication 6, dans lequel la cire cristalline est choisie dans le groupe consistant en cire de Fischer-Tropsch, cire à base de pétrole, cire classique, cire d’origine naturelle, cire fonctionnalisée, copolymères de polyoléfine et leurs mélanges.
8. Adhésif thermofusible selon la revendication 1 qui est sensiblement exempt de cire et/ou de plastifiant.

9. Adhésif thermofusible selon la revendication 1 qui comprend plus de 50 % en poids, de préférence plus de 60 % en poids du copolymère de polybutène amorphe.

10. Adhésif thermofusible selon la revendication 1, dans lequel l’adhésif a une valeur de pic de traction supérieure à 55 livres par pouce carré (psi) à 23°C à une vitesse de traction de 12 pouces/min.

11. Article comprenant l’adhésif selon la revendication 1.

12. Article selon la revendication 11 qui est un produit de soins personnels, de santé, médical, d’entretien ou industriel.

13. Article selon la revendication 12 qui est une couche, une culotte de propreté, un tampon d’hygiène féminine, des tampons pour viande et des produits d’incontinence pour adultes.

14. Procédé comprenant l’application de l’adhésif selon la revendication 1 à 150°C ou au-dessous sur un premier substrat; l’application d’un second substrat sur l’adhésif, permettant ainsi de former une liaison.

15. Procédé selon la revendication 14, dans lequel le premier et/ou le second substrat est un film non-tissé.

16. Procédé selon la revendication 15, dans lequel l’adhésif est appliqué sur le substrat par pulvérisation à l’état fondu, formation de motifs par tourbillonnement, pulvérisation aléatoire et/ou revêtement par fente avec une plage d’addition de 0,1 à 20 g/m², de préférence de 0,1 à 10 g/m².
REFERENCES CITED IN THE DESCRIPTION

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