



21 August 2000

Ro/sb



\*G00002\*

Applicant: ~~Firma~~ <sup>KG</sup> Carl Freudenberg, 69469 Weinheim

5

## Synthetic leather

## Description

10 This invention relates to a synthetic leather composed of a polymer-impregnated and/or -coated nonwoven fabric having basis weights of from 100 to 500 g/m<sup>2</sup> and tensile strengths of > 300 N/5 cm in the longitudinal and transverse directions.

15

EP-A 0 090 397 discloses nonwoven fabrics which are composed of ultrafine clewed filaments and which have a layered structure and are processible by impregnating and/or coating with polymers to form synthetic leather.

20 The starting fibers used are preferably those of the "islands-in-the-sea" type, from which the ultrafine fibers are released by dissolving the matrix polymer. This reference further reports the use of splittable starting fibers.

25

EP-A 0 624 676 discloses nonwoven fabrics composed of ultrafine fibers and methods for producing them from bicomponent fibers. The starting polymers of the bicomponent fibers shall have a melting point difference of from 30 to 180°C and are spun as multisegment fibers. The bicomponent fibers are laid down to form a fleece which is subjected to a point calendering operation in which only the fiber component having the lower melting point is melted and consolidated. In a subsequent step, the nonwoven fabric formed from the multisegment fibers is subjected to mechanical action causing not less than 70% of the fibers to split into the ultrafine subsegment fibers.

30

35

The nonwoven fabrics thus obtained attain tensile strength values of up to 260 N/5 cm in the longitudinal and transverse directions and can be used as bedding, as an absorbent for sanitary products, such as  
5 handkerchiefs, diapers, waddings for sleeping bags, artificial leather, heat insulating materials and so on.

It is an object of the present invention to provide cost-effective synthetic leathers of high tensile  
10 strength and also a process for producing same.

This object is achieved by a synthetic leather composed of a polymer-impregnated and/or -coated nonwoven fabric having basis weights of from 100 to 500 g/m<sup>2</sup> and tensile  
15 strengths of > 300 N/5 cm in the longitudinal and transverse directions, wherein said nonwoven fabric is composed of multicomponent filaments having a linear density of < 2 dtex which are spun from melt, aerodynamically stretched, directly laid down to form a  
20 web and subjected to a preconsolidating operation before being at least 90% split into supermicrofilaments having a linear density of < 0.2 dtex and consolidated. Such a synthetic leather combines a comparatively low weight with high tensile  
25 strengths and therefore is cost effective. Furthermore, it is similar to natural materials with regard to hand.

Preference is given to a synthetic leather wherein said multicomponent filament is a bicomponent filament of  
30 two incompatible polymers, especially of a polyester and a polyamide. Such a bicomponent filament comprises good splittability into supermicrofilaments and provides a favorable ratio of strength to basis weight.

35 Preference is given to a synthetic leather wherein said multicomponent filaments have a cross section having an orangelike multisegment structure in which segments each containing one of the two incompatible polymers alternate. As well as this orangelike multisegment

structure for the multicomponent filaments, there are other possible arrangements for the incompatible polymers in the multicomponent filament, such as side-by-side or chrysanthemumlike arrangements. Such arrangements of the incompatible polymers in the multicomponent filament have been found to provide very good splittability.

Preference is further given to a synthetic leather wherein at least one of the incompatible polymers forming said multicomponent filament contains an additive, such as color pigments, permanently active antistats and/or hydrophilicity and/or hydrophobicity modifiers in amounts of up to 10 percent by weight. The synthetic leather composed of solution-dyed fibers possesses a very high high-temperature lightfastness. Moreover, the modifiers make it possible to control static charge buildup and to improve moisture transportation properties.

Particular preference is given to a synthetic leather wherein said nonwoven fabric is impregnated with from 10 to 45 percent by weight of a polymer, based on the starting weight of said nonwoven fabric. To achieve equivalent or even superior strength properties for the synthetic leather, the invention requires less impregnation of the starting nonwoven fabric than prior art products.

The process provided by the invention for producing a synthetic leather is characterized in that multicomponent filaments are spun from the melt, aerodynamically stretched and directly laid down to form a web, a preconsolidation is effected and the nonwoven fabric is consolidated using high pressure fluid jets and at the same time split into supermicrofilaments having a linear density of  $< 0.2$  dtex and subsequently impregnated and/or coated with a polymer. The synthetic leathers thus obtained

are very uniform with regard to thickness, have an isotropic distribution of fiber, have no tendency to delaminate and are notable for high moduli.

- 5 In an advantageous embodiment of the process for producing the synthetic leather, the consolidation and splitting of said multicomponent filaments is effected by subjecting the preconsolidated fabric repeatedly to high pressure water jets alternately from both sides.
- 10 The starting nonwoven fabric for the synthetic leather as a result has a large surface area and a splitting percentage of > 90% for the multicomponent filaments.

Advantageously, the process for splitting and  
15 consolidating the multicomponent filament is carried out on an assembly having rotating sieve drums. Such an assembly permits the construction of very compact equipment.

20 Advantageously, the nonwoven fabric split into supermicrofilaments and consolidated with high pressure fluid jets is impregnated using a polyurethane dissolved in dimethylformamide and said polymer is coagulated in known manner.

25 In a particularly preferred embodiment of the process for producing the synthetic leather according to the invention, the impregnating with a polymer is effected using an aqueous polyurethane latex dispersion,  
30 followed by coagulation. This form of impregnating the starting nonwoven fabric does not lead to solvent residues and thus is environmentally friendly.

Particular preference is given to a process wherein the  
35 multicomponent filaments are solution dyed. The encapsulation of the dyes in the polymeric fibers leads to excellent hot lightfastnesses.

Preference is further given for various applications to

an aftertreatment by grinding or buffing. This provides a way of improving the hand and/or surface properties and also of achieving a so-called "writing effect". By "writing effect" is meant the baring of microfiber ends on the surface of the synthetic leather which are orientable in a visible manner.

The synthetic leathers produced according to the invention are particularly useful as an upper material, as a lining, including as a heel lining, or as facing in the shoe industry. They are further useful as clothing materials. Owing to their good mechanical strength and, in the case of solution-dyed products, their high hot lightfastness, the synthetic leathers according to the invention are useful in the automotive interior for the production of dashboards, side trim, parcel shelves, inner roof liners or trunk liners and for producing upholstered furniture, especially as covering materials for armchairs, sofas or chairs.

#### Example 1

A polyester-polyamide (PES-PA) bicomponent filament is used to produce a filament fleece having a basis weight of 160 g/m<sup>2</sup> which is subjected to water jet needling at pressures of up to 250 bar on both sides. After the water jet needling operation, which leads to a simultaneous splitting of the starting filaments, the bicomponent filaments have a linear density of < 0.2 dtex. The consolidated nonwoven fabric is subjected to an impregnation with a polyurethane (PU) dissolved in dimethylformamide (DMF) to apply about 12% by weight of PU based on the starting weight of the nonwoven fabric. The polymer-impregnated nonwoven fabric obtained is surface buffed and finished with specific silicones for hand improvement for example. The synthetic leather obtained has a nubucklike surface.

#### Example 2

A PES-PA bicomponent filament is used to produce a filament fleece having a basis weight of  $110 \text{ g/m}^2$  which is subjected to water jet needling at pressures of up to 250 bar on both sides. After the water jet needling operation, which leads to a simultaneous splitting of the starting filaments, the bicomponent filaments have a linear density of  $< 0.2 \text{ dtex}$ . The consolidated nonwoven fabric is subjected to an impregnation with an aqueous polyurethane latex dispersion to apply about 10% by weight of PU based on the starting weight of the nonwoven fabric. The polyurethane is coagulated by treatment with hot water or saturated steam and subsequently dried and crosslinked at about  $150\text{-}160^\circ\text{C}$ . The polymer-impregnated nonwoven fabric obtained is surface buffed and finished with specific silicones for hand improvement for example. The synthetic leather obtained has a nubucklike surface.

Claims

1. A synthetic leather composed of a polymer-impregnated and/or -coated nonwoven fabric having  
5 basis weights of from 100 to 500 g/m<sup>2</sup> and tensile strengths of > 300 N/5 cm not only in the longitudinal but also in the transverse direction, wherein said nonwoven fabric is composed of multicomponent filaments having a linear density  
10 of < 2 dtex which are spun from melt, aerodynamically stretched, directly laid down to form a web and subjected to a preconsolidating operation before being at least 90% split into supermicrofilaments having a linear density of  
15 < 0.2 dtex and consolidated.
2. A synthetic leather according to claim 1, characterized in that said multicomponent filament is a bicomponent filament of two incompatible  
20 polymers, especially of a polyester and a polyamide.
3. A synthetic leather according to claim 1 or 2, characterized in that said multicomponent  
25 filaments have a cross section having an orangelike multisegment structure in which segments each containing one of the two incompatible polymers alternate.
- 30 4. A synthetic leather according to any of claims 1 to 3, characterized in that at least one of said incompatible polymers forming said multicomponent filament contains an additive, such as color pigments, permanently active antistats and/or  
35 hydrophilicity and/or hydrophobicity modifiers in amounts of up to 10 percent by weight.
5. A synthetic leather according to any of claims 1 to 4, characterized in that said nonwoven fabric

is impregnated with from 10 to 45 percent by weight of a polymer, based on the starting weight of said nonwoven fabric.

- 5 6. A process for producing a synthetic leather according to any of claims 1 to 5, characterized in that multicomponent filaments are spun from the melt, aerodynamically stretched and directly laid down to form a web, a preconsolidation is effected and the nonwoven fabric is consolidated using high pressure fluid jets and at the same time split into supermicrofilaments having a linear density of  $< 0.2$  dtex and subsequently impregnated and/or coated with a polymer.  
10
- 15 7. A process according to claim 6, characterized in that the consolidation and splitting of said multicomponent filaments is effected by subjecting the preconsolidated fabric repeatedly to high pressure fluid jets alternately from both sides.  
20
8. A process according to claim 7, characterized in that the consolidating and splitting of said multicomponent filament is carried out on an assembly having rotating sieve drums.  
25
9. A process according to any of claims 6 to 8, characterized in that the impregnating with a polymer is effected using a polyurethane dissolved in dimethylformamide and said polymer is coagulated.  
30
10. A process according to any of claims 6 to 8, characterized in that the impregnating with a polymer is effected using an aqueous polyurethane latex dispersion.  
35
11. A process according to any of claims 7 to 10, characterized in that the coloring of said

multicomponent filaments is effected by solution dyeing.

- 5 12. A process according to any of claims 7 to 11, characterized in that an aftertreatment is effected by grinding or buffing.
- 10 13. Use of a synthetic leather produced according to any of claims 7 to 12, characterized in that the synthetic leather is used as an upper material, as a lining, including as a heel lining, or as facing in the shoe industry.
- 15 14. Use of a synthetic leather produced according to any of claims 7 to 12, characterized in that the synthetic leather is used in the automotive interior for the production of dashboards, side trim, parcel shelves, inner roof liners or trunk liners.
- 20 15. Use of a synthetic leather produced according to any of claims 7 to 12, characterized in that the synthetic leather is used in the clothing or upholstery industry especially as a covering material for armchairs, sofas or chairs.
- 25