The Technologies about Bi-component Microfilaments Spunbond Spunlaced Nonwoven

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Background

- The annual output of nonwoven fabric in China was about 3.5 million tons in 2018
- The growth rate increased by 9.7% over the same period of the year
- More functional & individualized products are demanded
- Differentiated fibers or filaments have been successfully developed and applied
- Bicomponent spunbond and spunlaced technology combined to produce microfilaments nonwoven
● Island-sea bicomponent fiber was applied to nonwoven by carding and needle-pouching.
● Segmented pie (PET/PA) staple fibers were cared and spunlaced to produce 0.1D microfiber nonwoven
● Micro-staple fibers (0.1D) were applied wet-laid and spunlace process.
1. Island-sea Microfiber Nonwoven

Two-step production process:

- Staple fibers were processed by opening, carding and needle punching.
- Chemical treatment: the sea component (PET) was dissolved in solvent (Alkali)
Current Situation of Bicomponent Microfiber Nonwoven Technology Abroad

- The spunbonded microfilament spunlace process was developed in 1999.
- PET and PA component filaments are split by water jet.

The cross section of Segmented microfilaments in Hollow Structure before and after splitting:

Before

After
Comparison of bicomponent microfiber technology

Microfiber nonwoven: Island-sea & segmented pie

Microfiber

- Sea-island
  - Staple Fiber: Opening, Carding → Needlepunch → Alkali Reduction → Microfiber Nonwoven
  - Filament

- Segmented pie
  - Staple Fiber: Opening, Carding → Needlepunch → Spunlaced → Microfiber Nonwoven
  - Filament: Spunbonded → Spunlaced → Micro-filament Nonwoven
Segmented-pie Microfiber Nonwoven

Segmented-pie bicomponent micro-filament with hollow structure

Process:

- PET chips → Drying → Extruder A → Melt filtration → Metering pump A →
- PA6 chips → Drying → Extruder B → Melt filtration → Metering pump B →
- Spinning beam → Air Quenching → Web forming → Flat screen spunlace
- Drum spunlace → Drum dryer → Winder
Bicomponent microfiber spunlaced nonwoven equipment

1. Bicomponent spinning equipment

- Key factors: melt viscosity, pressure drop, residence time, and thermal degradation
Bicomponent microfiber spunlaced nonwoven equipment

2. Air quenching equipment

- Steady temperature, humidity & air pressure
- Precise spinning monomer remover
3. Air drawing equipment

- Higher filaments stretching ratio (drawing speed 4500-5000 m/min)
- Higher bico-filaments orientation ratio, greater tensile strength, lower elongation and heat shrinkage.
Bicomponent microfiber spunlaced nonwoven equipment

3. Web-forming equipment

- Double-suction & multi-stage suction air system
- Balanced suction air volume & air pressure at various points
Bicomponent microfiber spunlaced nonwoven equipment

4. Spunlace equipment

- Well distributed high-pressure hydroentanglement
- Prevent dense layer, surface lint & intermediate delamination
1. Micro-filament Facial Mask (2-4 μm)

- Extremely soft, silky, skin-friendly, fluffy & breathable
- Large fiber specific surface area, special three-dimensional network structure
- High water absorption and high water release.
Market and application

2. Artificial leather substrate

- Denser three-dimensional structure
- Great Peeling strength and flexing endurance
- No moldy, odor, embrittlement

Applied in shoe leather, luggage leather, sofa leather, automobile interior and clothing leather, etc.
3. Functional Wipes

- a large specific surface area. (0.075D)
- superior water absorption capacity (general is 400%-500%)
- lint free, no scratches

Particularly suitable for:
1. Advanced cleaning wipes: optical lens, glasses, laptop screen wiping.
2. Industry wipes: mechanical processing, electronic devices production, advanced mirror fabrication.
3. High-grade household wipes: dishes, baths, furniture, automotives and jewelry.
4. Filter materials

- more than 90% filaments are splitted
- a denser three-dimensional structure
- extremely fine pore size and stronger dust holding capacity

Especially suitable for air filtration efficiency can reach 99.9%.

Applied in cabin filters: Golf, Bora, Lavida and other models.
Market and application

**Bedding**

- 0.075D-0.175D and a fiber diameter of less than 5μm
- Excellent anti-mite effect, great air permeability, down penetration resistance
Prospect development

1. 8+8 segmented pies (16 petals). Finer fiber can be obtained by applying a 16+16 distribution (32 lobes) section.

2. Not only PET+PA as raw material, it is possible to develop more raw materials such as PET/COPET, PA6/PP, PA6/PE, etc.

3. Needle punching process added before spunlacing. A more fluffy product can be obtained.
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