CLAIMS

We claim:

1. A radiative cooling fabric, comprising a flexible substrate layer and a functional layer stacked in order;

wherein the functional layer comprises a first functional layer with a thickness of 10 μm to 200 μm, and the first functional layer comprises a first functional resin and a first functional filler dispersed in the first functional resin;

wherein a mass fraction of the first functional filler in the first functional layer is in a range of 1% to 20%, an emissivity of the radiative cooling fabric in a wavelength of 7 μm to 14 μm is not less than 80%, a reflectivity of the radiative cooling fabric in a wavelength of 300 nm to 2500 nm is not less than 80%, an average value of warp recovery angles of the radiative cooling fabric is greater than or equal to 95°, and an average value of the weft recovery angles of the radiative cooling fabric is greater than or equal to 91°,

wherein, the functional layer further comprises a second functional layer, which is formed by disposing a second functional filler on the surface of the first functional layer away from the flexible substrate layer, and the second functional filler is disposed on the surface of the first functional layer with a single layer structure;

wherein, a particle size of the second functional filler is 0.5 times to 1.5 times of the thickness of the first functional layer; a thickness of the second functional layer is less than or equal to the particle size of the second functional filler, and an amount of the second functional filler is in a range of 10 g/m^2 to 200 g/m^2, with respect to an area of a surface of the radiative cooling fabric.

2. The radiative cooling fabric of claim 1, wherein the first functional filler further comprises a first filler and a second filler, a particle size of the first filler is greater than or equal to 0.01 μm and less than 5 μm, a particle size of the second filler is greater than or equal to 5 μm and less than or equal to 15 μm, a ratio of a mass of the first filler to a mass of the second filler is in a range of 1:4 to 4:1;

or

the first filler and the second filler are independently selected from cesium tungsten bronze, tin antimony oxide, indium tin oxide, zinc aluminum oxide, silicon dioxide, silicon carbide, titanium dioxide, calcium carbonate, barium sulfate, silicon nitride, or a combination thereof.

3. The radiative cooling fabric of claim 1, wherein the first functional layer is located on the flexible substrate layer;

wherein the thickness of the first functional layer is in a range of 10 μm to 30 μm, and the particle size of the second functional filler is in a range of 1 μm to 40 μm.

4. The radiative cooling fabric of claim 1, wherein

the second functional filler is ceramic powder, titanium white powder, glass microbeads, silicon dioxide, calcium carbonate powder, barium sulfate, talcum powder, zinc sulfate, aluminum silicate, calcium carbonate powder, pearl powder, alumina, zinc oxide, zirconia, cerium oxide, lanthanum oxide, rhodium oxide, magnesium oxide, or a combination thereof.

5. The radiative cooling fabric of claim , wherein the functional layer further comprises a third functional layer located on a surface of the second functional layer away from the first functional layer, and the third functional layer comprises a second functional resin, and a thickness of the third functional layer is in a range of 10 μm to 30 μm.

6. The radiative cooling fabric of claim 5, wherein the third functional layer further comprises a third functional filler, the third functional filler is ceramic powder, titanium white powder, glass microbeads, silicon dioxide, calcium carbonate powder, barium sulfate, talcum powder, zinc sulfate, aluminum silicate, calcium carbonate powder, pearl powder, alumina, zinc oxide, zirconia, cerium oxide, lanthanum oxide, rhodium oxide, magnesium oxide, or a combination thereof; and

a particle size of the third functional filler is in a range of 4 μm to 20 μm.

7. The radiative cooling fabric of claim 5, wherein the first functional resin and the second functional resin are independently selected from polyimide, cycloolefin polymer, epoxy resin, polyester resin, polyurethane resin, acrylic resin, silicone resin, fluorine resin, or a combination thereof.

8. The radiative cooling fabric of claim 1, wherein a thickness of the flexible substrate layer is in a range of 300 μm to 2 mm; and the flexible substrate layer comprises a fabric layer and a resin coating layer coated on one side or both sides of the fabric layer,

wherein a thickness of the resin coating layer is in a range of 1 μm to 20 μm,

a material of the fabric layer is selected from polyester, nylon, acrylic, silk, cotton, hemp, or a combination thereof, and

a material of the resin coating layer is selected from polyvinyl chloride resin, acrylic resin, epoxy resin, phenol resin, polyurethane resin, or a combination thereof.

9. The radiative cooling fabric of claim 1, further comprising an interfacial agent layer located between the flexible substrate layer and the functional layer, a thickness of the interfacial agent layer is in a range of 1 μm to 20 μm, and a material of the interfacial agent layer is selected from acrylic resin, polyurethane resin, epoxy resin, or a combination thereof.

10. The radiative cooling fabric of claim 1, further comprising a waterproof layer located on a side of the flexible substrate layer away from the functional layer, a thickness of the waterproof layer is in a range of 1 μm to 20 μm, a material of the waterproof layer is selected from acrylic resin, polyurethane resin, epoxy resin, or a combination thereof, and a transmittance of the waterproof layer is greater than or equal to 80% in a wavelength of 400 nm to 700 nm.

11. The radiative cooling fabric of claim 1, further comprising a hydrophobic layer located on a side of the functional layer away from the flexible substrate layer, a thickness of the hydrophobic layer is a range of 1 μm to 20 μm, a material of the hydrophobic layer is selected from fluorine resin, silicone resin, or a combination thereof,

nano-scaled silicon dioxide particles are dispersed in the hydrophobic layer, a mass fraction of the silicon dioxide particles in the hydrophobic layer is in a range of 0.5% to 5%, and

a transmittance of the hydrophobic layer is greater than or equal to 80% in a wavelength of 7 μm to 14 μm.

12. The radiative cooling fabric of claim 1, further comprising a weather resistant layer located on a side of the functional layer away from the flexible substrate layer, a material of the weather resistant layer is selected from fluorine resin, epoxy resin, polyester resin, polyurethane resin, acrylic resin, silicone resin, or a combination thereof, and

a thickness of the weather resistant layer is in a range of 10 μm to 50 μm.

13. A product, wherein the product comprising a part which is made of the radiative cooling fabric of any one of claims 1 to 12.

14. The product of claim 13, wherein the product is an umbrella comprising a rod, an umbrella rib and an umbrella cloth which is the part made of the radiative cooling fabric of any one of claims 1 to 12, wherein the umbrella rib is connected to the rod, and the umbrella cloth is supported by the umbrella rib.

15. The product of claim 13, wherein the product is a car cover comprising a fixing member and a cover body which is the part made of the radiative cooling fabric of any one of claims 1 to 12, wherein the fixing member is located on the cover body, and the fixing member is configured for fixing the cover body on a car.

16. The product of claim 13, wherein the product is a tent comprising a tent frame and a flysheet made of the radiative cooling fabric of any one of claims 1 to 12, and the tent frame is covered by the flysheet.

17. The product of claim 13, wherein the product is a hat comprising a hat body made of the radiative cooling fabric of any one of claims 1 to 12, and the hat body has a cavity configured for accommodating a head.

18. The product of claim 13, wherein the product is a curtain comprising a curtain body made of the radiative cooling fabric of any one of claims 1 to 12, and the curtain body is a part of the curtain.

19. The product of claim 13, wherein the product is an awning comprising an awning frame and an awning cloth made of the radiative cooling fabric of any one of claims 1 to 12, and the awning frame is covered by the awning cloth.

20. The product of claim 13, the product is clothing comprising cloth made of the radiative cooling fabric of any one of claims 1 to 12.