CLAIMS

1. A near-infrared ray shielding film, characterized in the near-infrared ray shielding film comprises:

a PET film comprising PET, wherein a raw material of the PET film has a water content below 30 ppm, and

a plurality of tungsten oxides-containing nanoparticles which spread and are mounted in the PET film;

wherein the near-infrared ray shielding film comprises 80-99.99 wt% of PET and 0.01-20 wt% of the tungsten oxides-containing nanoparticle, wherein the plurality of tungsten oxides-containing nanoparticles spreads and are mounted in the PET film in a density of 0.01-10 grams per square meter of the PET film.

2. The near-infrared ray shielding film as claimed in claim 1, characterized in the near-infrared ray shielding film has a thickness of 1-1000 μm.

3. The near-infrared ray shielding film as claimed in claim 1, characterized in the tungsten oxides-containing nanoparticle is selected from a group consisting of a nanoparticle of tungsten oxides and a nanoparticle of tungsten bronzes.

4. The near-infrared ray shielding film as claimed in claim 3, characterized in the nanoparticle of tungsten oxides is represented by a formula WO_x, wherein W represents tungsten, O represents oxygen, and x is a number satisfying requirements $2.2 \leqq x \leqq 3$.

5. The near-infrared ray shielding film as claimed in claim 3, characterized in the nanoparticle of tungsten bronzes is represented by a formula A_yWO_z, wherein A represents at least one chemical elements selected from main group elements, W represents tungsten, O represents oxygen, and y and z are numbers satisfying requirements $0.01 \leqq y \leqq 1$ and $2.2 \leqq z \leqq 3$, respectively.

6. The near-infrared ray shielding film as claimed in claim 3, characterized in the nanoparticle of tungsten oxides is represented by a formula $WO_{2.72}$, wherein W represents tungsten, O represents oxygen.

7. The near-infrared ray shielding film as claimed in claim 5, characterized in A represents at least one chemical elements selected form lithium, sodium, potassium, rubidium, cesium, magnesium, calcium, strontium, barium, aluminum, gallium, carbon, silicon, tin, antimony, fluorine, chlorine, bromine or iodine.

8. The near-infrared ray shielding film as claimed in claim 3, characterized in the nanoparticle of tungsten bronzes is represented by a formula $Cs_{0.33}WO_3$, wherein Cs represents cesium, W represents tungsten, O represents oxygen.

9. The near-infrared ray shielding film as claimed in any of claims 1-8, characterized in the tungsten oxides-containing nanoparticle are particles between 1 and 800 nm in size.

10. A method of manufacturing a near-infrared ray shielding film, characterized in the method of manufacturing a near-infrared ray shielding film comprises:

providing a raw material of PET with a water content below 30 ppm;

providing a tungsten oxides-containing nanoparticle;

blending the raw material of PET and the tungsten oxides-containing nanoparticles at 180-360°C to obtain a polyester mixture with 80-99.99 wt% of the raw material of PET and 0.01-20 wt% of the tungsten oxides-containing nanoparticles;

extrusing or compression molding the polyester mixture to obtain a polyester sheet; and

uniaxially- or biaxially-orientating the polyester sheet with an orientating rate of 1-100 meters per minute at 60-300°C.

11. The method of manufacturing a near-infrared ray shielding film as claimed in claim 10, characterized in an additive selected from a group consisting of UV protective agents, light stabilizers, durability -improving agents, anti-hydrolysis-improving agents, heat resistant agents, lubricants and crystallinity-improving agents is further added to the raw material of PET before blending the raw material of PET and the tungsten oxides-containing nanoparticles.

12. The method of manufacturing a near-infrared ray shielding film as claimed in claim 10, characterized in the tungsten oxides-containing nanoparticle is selected from a group consisting of a nanoparticle of tungsten oxides and a nanoparticle of tungsten bronzes.

13. The method of manufacturing a near-infrared ray shielding film as claimed in claim 12, characterized in the nanoparticle of tungsten oxides is represented by a formula WO_x, wherein W represents tungsten, O represents oxygen, and x is a number satisfying requirements $2.2 \leqq x \leqq 3$.

14. The method of manufacturing a near-infrared ray shielding film as

claimed in claim 12, characterized in the nanoparticle of tungsten bronzes is represented by a formula A_yWO_z, wherein A represents at least one chemical elements selected from main group elements, W represents tungsten, O represents oxygen, and y and z are numbers satisfying requirements $0.01 \leqq y \leqq 1$ and $2.2 \leqq z \leqq 3$, respectively.

15. The method of manufacturing a near-infrared ray shielding film as claimed in claim 12, characterized in the nanoparticle of tungsten oxides is represented by a formula $WO_{2.72}$, wherein W represents tungsten, O represents oxygen.

16. The method of manufacturing a near-infrared ray shielding film as claimed in claim 14, characterized in A represents at least one chemical elements selected form lithium, sodium, potassium, rubidium, cesium, magnesium, calcium, strontium, barium, aluminum, gallium, carbon, silicon, tin, antimony, fluorine, chlorine, bromine or iodine.

17. The method of manufacturing a near-infrared ray shielding film as claimed in claim 12, characterized in the nanoparticle of tungsten bronzes is represented by a formula $Cs_{0.33}WO_3$, wherein Cs represents cesium, W represents tungsten, O represents oxygen.

18. The method of manufacturing a near-infrared ray shielding film as claimed in any of claims 10-17, characterized in the tungsten oxides-containing nanoparticle are particles between 1 and 800 nm in size.

19. The method of manufacturing a near-infrared ray shielding film as claimed in claim 10, characterized in blending the raw material of PET and the tungsten oxides-containing nanoparticles is carried out at 200-320°C by a single screw extruder or a twin screw extruder with a screw speed between 100 and 900 rpm.

20. The method of manufacturing a near-infrared ray shielding film as claimed in claim 10, characterized in rolling the polyester mixture is carried out at 30-100°C by a casting drum or compression molding the polyester mixture at 180-350°C.

21. The method of manufacturing a near-infrared ray shielding film as claimed in claim 10, characterized in uniaxially- or biaxially-orientating the polyester sheet is carried out at 80-240°C.

CLAIMS

1. A near-infrared ray shielding film, characterized in the near-infrared ray shielding film comprises:

a PET film comprising PET, wherein a raw material of the PET film has a water content below 30 ppm, and

a plurality of dried tungsten oxides-containing nanoparticles which spread and are mounted in the PET film;

wherein the near-infrared ray shielding film comprises 80-99.99 wt% of PET and 0.01-20 wt% of the dried tungsten oxides-containing nanoparticle, wherein the plurality of dried tungsten oxides-containing nanoparticles spreads and are mounted in the PET film in a density of 0.01-10 grams per square meter of the PET film;

wherein the raw material of the PET film with the water content below 30 ppm and the plurality of dried tungsten oxides-containing nanoparticles are prepared separately.

2. The near-infrared ray shielding film as claimed in claim 1, characterized in the near-infrared ray shielding film has a thickness of 1-1000 μm.

3. The near-infrared ray shielding film as claimed in claim 1, characterized in the dried tungsten oxides-containing nanoparticle is selected from a group consisting of a nanoparticle of tungsten oxides and a nanoparticle of tungsten bronzes.

4. The near-infrared ray shielding film as claimed in claim 3, characterized in the nanoparticle of tungsten oxides is represented by a formula WO_x, wherein W represents tungsten, O represents oxygen, and x is a number satisfying requirements $2.2 \leqq x \leqq 3$.

5. The near-infrared ray shielding film as claimed in claim 3, characterized in the nanoparticle of tungsten bronzes is represented by a formula A_yWO_z, wherein A represents at least one chemical elements selected from main group elements, W represents tungsten, O represents oxygen, and y and z are numbers satisfying requirements $0.01 \leqq y \leqq 1$ and $2.2 \leqq z \leqq 3$, respectively.

6. The near-infrared ray shielding film as claimed in claim 3, characterized in the nanoparticle of tungsten oxides is represented by a formula $WO_{2.72}$, wherein W represents tungsten, O represents oxygen.

7. The near-infrared ray shielding film as claimed in claim 5, characterized in A represents at least one chemical elements selected form lithium, sodium, potassium, rubidium, cesium, magnesium, calcium, strontium, barium, aluminum, gallium, carbon, silicon, tin, antimony, fluorine, chlorine, bromine or iodine.

8. The near-infrared ray shielding film as claimed in claim 3, characterized in the nanoparticle of tungsten bronzes is represented by a formula $Cs_{0.33}WO_3$, wherein Cs represents cesium, W represents tungsten, O represents oxygen.

9. The near-infrared ray shielding film as claimed in any of claims 1-8, characterized in the dried tungsten oxides-containing nanoparticle are particles between 1 and 800 nm in size.

10. A method of manufacturing a near-infrared ray shielding film, characterized in the method of manufacturing a near-infrared ray shielding film comprises:

separately drying a raw material of PET and a tungsten oxides-containing nanoparticle,

until the raw material of PET has a water content below 30 ppm;

blending the dried raw material of PET and the dried tungsten oxides-containing nanoparticles at 180-360°C to obtain a polyester mixture with 80-99.99 wt% of the raw material of PET and 0.01-20 wt% of the tungsten oxides-containing nanoparticles;

extrusing or compression molding the polyester mixture to obtain a polyester sheet; and

uniaxially- or biaxially-orientating the polyester sheet with an orientating rate of 1-100 meters per minute at 60-300°C.

11. The method of manufacturing a near-infrared ray shielding film as claimed in claim 10, characterized in an additive selected from a group consisting of UV protective agents, light stabilizers, durability -improving agents, anti-hydrolysis-improving agents, heat resistant agents, lubricants and crystallinity-improving agents is further added to the raw material of PET before blending the dried raw material of PET and the dried tungsten oxides-containing nanoparticles.

12. The method of manufacturing a near-infrared ray shielding film as claimed in claim 10, characterized in the tungsten oxides-containing nanoparticle is selected from a group consisting of a nanoparticle of tungsten oxides and a nanoparticle of tungsten bronzes.

13. The method of manufacturing a near-infrared ray shielding film as claimed in claim 12, characterized in the nanoparticle of tungsten oxides is represented by a formula WO_x, wherein W represents tungsten, O represents oxygen, and x is a number satisfying requirements $2.2 \leqq x \leqq 3$.

14. The method of manufacturing a near-infrared ray shielding film as claimed in claim

12, characterized in the nanoparticle of tungsten bronzes is represented by a formula A_yWO_z, wherein A represents at least one chemical elements selected from main group elements, W represents tungsten, O represents oxygen, and y and z are numbers satisfying requirements $0.01 \leqq y \leqq 1$ and $2.2 \leqq z \leqq 3$, respectively.

15. The method of manufacturing a near-infrared ray shielding film as claimed in claim 11, characterized in the nanoparticle of tungsten oxides is represented by a formula $WO_{2.72}$, wherein W represents tungsten, O represents oxygen.

16. The method of manufacturing a near-infrared ray shielding film as claimed in claim 14, characterized in A represents at least one chemical elements selected form lithium, sodium, potassium, rubidium, cesium, magnesium, calcium, strontium, barium, aluminum, gallium, carbon, silicon, tin, antimony, fluorine, chlorine, bromine or iodine.

17. The method of manufacturing a near-infrared ray shielding film as claimed in claim 12, characterized in the nanoparticle of tungsten bronzes is represented by a formula $Cs_{0.33}WO_3$, wherein Cs represents cesium, W represents tungsten, O represents oxygen.

18. The method of manufacturing a near-infrared ray shielding film as claimed in any of claims 10-17, characterized in: the tungsten oxides-containing nanoparticle are particles between 1 and 800 nm in size.

19. The method of manufacturing a near-infrared ray shielding film as claimed in claim 10, characterized in blending the dried raw material of PET and the dried tungsten oxides-containing nanoparticles is carried out at 200-320°C by a single screw extruder or a twin screw extruder with a screw speed between 100 and 900 rpm.

20. The method of manufacturing a near-infrared ray shielding film as claimed in claim 10, characterized in rolling the polyester mixture is carried out at 30-100°C by a casting drum or compression molding the polyester mixture at 180-350°C.

21. The method of manufacturing a near-infrared ray shielding film as claimed in claim 10, characterized in

uniaxially- or biaxially-orientating the polyester sheet is carried out at 80-240°C.