WHAT IS CLAIMED IS:

1. A multifunctional temperature self-regulating film, from outside to inside, comprising at least:

a carrier layer loaded with functional materials, and

a thermal-insulation layer directly contacted with a skin of a body part to which the multifunctional temperature self-regulating film is applied;

wherein the carrier layer loaded with functional materials has a sealed cavity sealed with a flexible water-impermeable material, the sealed cavity is loaded with a solid-liquid phase change chemical material which generates heat when the material changes from liquid to solid and absorbs heat when the material changes from solid to liquid; wherein at least one side of the carrier layer is provided with a fluid reservoir; the fluid reservoir and the carrier layer are manufactured in one piece, and they are interconnected by an one-way valve;

wherein the thermal-insulation layer is made of a material having waterproof and thermal-insulation properties;

wherein the thermal-insulation layer is a metal plating film made of metal and polyethylene terephthalate, oriented polypropylene, nylon, polyethylene or cast polypropylene film.

2. The multifunctional temperature self-regulating film according to claim 1, wherein the thermal-insulation layer is a metallized polyethylene terephthalate film made of polyethylene terephthalate film and metal.

3. The multifunctional temperature self-regulating film according to claim 2, wherein the metal used for the metallized polyethylene terephthalate film is aluminum, nickel, chromium or a mixture thereof.

4. The multifunctional temperature self-regulating film according to claim 1, wherein the flexible water-impermeable material is made of plastics, synthetic rubbers, synthetic fibers, waterproof fabrics or waterproof papers.

5. The multifunctional temperature self-regulating film according to claim 4, wherein the

flexible water-impermeable material is transparent.

6. The multifunctional temperature self-regulating film according to claim 1, wherein the sealed cavity is loaded with

an actuating means which is used to trigger an exothermic state of the solid-liquid phase change material.

7. The multifunctional temperature self-regulating film according to claim 6, after the liquid-to-solid phase change process of the solid-liquid phase change material has been triggered, the film maintains a heating temperature at 40℃ to 55℃, and the heating time lasts 5 to 30 minutes.

8. The multifunctional temperature self-regulating film according to claim 7, wherein the solid-liquid phase change material is an oversaturated aqueous solution of sodium acetate, the actuating means is a flexible metal disc which takes a shape of an arc and has a plurality of corrugations on its surface, and the flexible metal disc is located in the oversaturated aqueous solution of sodium acetate.

9. The multifunctional temperature self-regulating film according to claim 8, wherein the oversaturated aqueous solution of sodium acetate is added with a nucleating agent.

10. The multifunctional temperature self-regulating film according to claim 9, wherein the nucleating agent is selected from one or more of the group consisting of sodium borate, sodium sulfate, sodium silicate, sodium pyrophosphate, and sodium phosphate dibasic dodecahydrate.

11. The multifunctional temperature self-regulating film according to claim 6, the fluid reservoir is loaded with fluid, when the fluid reservoir is pressed by an external force, the fluid loaded in the fluid reservoir is injected into the carrier layer through the one-way valve to trigger a solid-to-liquid phase change process to adjust the temperature of the carrier layer.

12. The multifunctional temperature self-regulating film according to claim 11, after the solid-to-liquid phase change process of the solid-liquid phase change chemical material has been triggered, the film maintains a cooling temperature at -3℃ to 20℃, and the cooling time lasts 5 to 30 minutes.

13. The multifunctional temperature self-regulating film according to claim 11, wherein a suitable amount of thickener is added in the fluid loaded in the fluid reservoir.

14. The multifunctional temperature self-regulating film according to claim 11, wherein the sealed cavity and/or the fluid reservoir is further loaded with a pigment.

15. The multifunctional temperature self-regulating film according to any one of claims 1 to11, wherein the film is ergonomically designed in shape to be applied to various body parts.

16. The multifunctional temperature self-regulating film according to claim 15, wherein there is provided a layer of water-soluble hydrogel on the surface of the thermal-insulation layer that is in contact with a skin of a body part to which the multifunctional temperature self-regulating film is applied, the layer of soluble hydrogel being used for adhering the film to the skin.

17. The multifunctional temperature self-regulating film according to claim 16, wherein there is provided an active ingredient of a topically-applied healthcare product, a topically-applied medicine or a skincare product in the layer of water-soluble hydrogel.

18. The multifunctional temperature self-regulating film according to claim 15, wherein the film is 2 mm to 15 mm thick.

19. A method of using the multifunctional temperature self-regulating film according to claim 15, wherein the film is used in combination with a health care product, a skincare product or a nourishing face mask for non-medical purpose .

20. A multifunctional temperature self-regulating three-dimensional face mask which has a facial concave-convex shape formed by joining two sheets together, wherein the face portion of the three-dimensional face mask is made of the multifunctional temperature self-regulating film according to claim 15.

21. The multifunctional temperature self-regulating three-dimensional face mask according to claim 20, wherein the three-dimensional face mask comprises a left side sheet and a right side sheet respectively matching the left area of the face and the right area of the face, front edge portions of the left side sheet and the right side sheet are provided with an adhesive material, the left side sheet and the right side sheet are thereby adhered together by the adhesive material along a median line of the face to form a facial concave-convex shape.

22. The multifunctional temperature self-regulating three-dimensional face mask according to claim 21, wherein either of the front edge portions of the left side sheet and the right side sheet has a protrusion projecting outwards from above down and matching the shape of the left area or right area of the external nose, a mouth portion which is a notch matching the mouth is provided below the protrusion, a portion of the front edge portion below the notch has an arc shape with a certain radian and extends downwards to the bottom the face mask; except the notch matching the mouth, either of the front edge portions of the left side sheet and the right side sheet is provided with an adhesive material, and the left side sheet and the right side sheet are thereby adhered together by the adhesive material.

23. The multifunctional temperature self-regulating three-dimensional face mask according to claim 22, wherein a glabella portion of either of the front edge portions of the left side sheet and the right side sheet which faces a space between the user's eyebrows, just above the protrusion, is formed as an arc which is slightly concaved inwards.

24. The multifunctional temperature self-regulating three-dimensional face mask according to claim 22, wherein an eye-and-glabella portion of either of the front edge portions of the left side sheet and the right side sheet which faces the user's eyes and glabella, just above the protrusion, is

formed as a notch which is concaved inwards; except the eye-and-glabella portion and the mouth portion, either of the front edge portions of the left side sheet and the right side sheet are provided with an adhesive material , and the left side sheet and the right side sheet are thereby adhered together by the adhesive material.

25. The multifunctional temperature self-regulating three-dimensional face mask according to claim 21, there is a fixing strap provided on either of the rear edge portions of the left side sheet and the right side sheet, and there is a velcro provided at the end of the fixing strap.

26. A method of using the multifunctional temperature self-regulating three-dimensional face mask according to claim 20, wherein the three-dimensional face mask is used in combination with a health care product, a skincare product or a nourishing face mask for non-medical purpose.

27. A multifunctional temperature self-regulating face mask, wherein the face portion of the face mask is made of the multifunctional temperature self-regulating film according to claim 15.

28. The multifunctional temperature self-regulating face mask according to claim 27, wherein the face mask has notches matching the user’s nose and mouth, respectively.

29. The multifunctional temperature self-regulating face mask according to claim 28, wherein the face mask also has notches matching the user’s eyes.

30. The multifunctional temperature self-regulating face mask according to claim 29, wherein there is a fixing strap provided on either side of the face mask, and there is a velcro provided at the end of the fixing strap.

31. A method of using the multifunctional temperature self-regulating face mask according to claim 27, wherein the face mask is used in combination with a health care product, a skincare product or a nourishing face mask for non-medical purpose.

32. A multifunctional temperature self-regulating eye mask, wherein the eye portion of the eye mask is made of the multifunctional temperature self-regulating film according to claim 15.

33. The multifunctional temperature self-regulating eye mask according to claim 32, wherein the eye mask comprises hanging parts which have ears slits and can be hung on the user's ears.

34. The multifunctional temperature self-regulating eye mask according to claim 33, wherein a slit is vertically cut along a lower half of a central vertical axis of the eye mask.