Claims

1. An exothermic warmer comprising:

an exothermic warmer main body that generates heat through an oxidation reaction and in which a flat-shaped exothermic element comprising an oxidizable metal, an electrolyte, a carbon component, and water is covered with a first cover sheet and a second cover sheet,

wherein the first cover sheet is a sheet that is air permeable and does not substantially limit the oxidation reaction,

a water-retaining material is provided so as to be at least partially in contact with the exothermic element, and

the exothermic warmer satisfies conditions (A) to (C) given below:

(A) a difference between an internal temperature of the exothermic element and a highest surface temperature of the exothermic warmer main body is 10°C or less;

(B) a highest skin temperature obtained when the exothermic warmer is applied to human skin is 38°C to 42°C; and

(C) a ratio of an amount (mg/cm^2•10 min) of steam generated in 10 minutes after the oxidation reaction has started to a mass (g/cm^2) of the exothermic element takes a value of 50 to 250,

wherein, in a state before the oxidation reaction has started, the exothermic element has a water content of 9 mass% to 25 mass%.

2. The exothermic warmer according to claim 1,

wherein the water-retaining material is disposed on a surface of the exothermic

element that is on the first cover sheet side or a surface of the exothermic element that is on the second cover sheet side.

3. The exothermic warmer according to claim 1,

wherein the exothermic element is formed on a substrate sheet, and the water-retaining material is disposed on a surface of the exothermic element that is opposite to a surface of the exothermic element that opposes the substrate sheet.

4. The exothermic warmer according to claim 3,

wherein an air permeable sheet is provided on the far side of the water-retaining material relative to the exothermic element.

5. The exothermic warmer according to claim 1,

wherein the water-retaining material is a water-absorbing polymer.

6. The exothermic warmer according to claim 1,

wherein the first cover sheet has an air permeability of 0 sec / (100 ml•6.42 cm^2) to 1500 sec / (100 ml•6.42 cm^2), and a water pressure resistance of 1500 mmH_2O or more.

7. The exothermic warmer according to claim 1,

wherein, in a state before the oxidation reaction has started, the exothermic element has an electrolyte concentration of 1 mass% or more.

8. The exothermic warmer according to claim 1,

wherein, in a state before the oxidation reaction has started, the exothermic element has an electrolyte concentration of 20 mass% or less.

9. The exothermic warmer according to claim 1,

wherein, in a state before the oxidation reaction has started, the exothermic element has an electrolyte concentration of 3 mass% to 15 mass%.

10. The exothermic warmer according to claim 9,

wherein, in the state before the oxidation reaction has started, the exothermic element has an electrolyte concentration of 5 mass% to 10 mass%.

11. The exothermic warmer according to claim 1,

wherein, in a state before the oxidation reaction, a concentration of the electrolyte with respect to a total of an electrolyte amount and a water amount in the exothermic element is 5 mass% to 50 mass%.

12. The exothermic warmer according to claim 11,

wherein, in the state before the oxidation reaction, the concentration of the electrolyte with respect to the total of the electrolyte amount and the water amount in the exothermic element is 10 mass% to 40 mass%.

13. The exothermic warmer according to claim 5,

wherein the water-absorbing polymer is capable of retaining pure water in an amount that is 20 times or more its own weight.

14. The exothermic warmer according to claim 5,

wherein the water-absorbing polymer is capable of retaining water in an amount that is 3 times or more its own weight at 20°C, with respect to an aqueous solution having the same electrolyte concentration as a concentration of the electrolyte contained in the exothermic element in a state before the oxidation reaction has started.

15. The exothermic warmer according to claim 5,

wherein, in a state before the oxidation reaction has started, the water-absorbing polymer has a total water retention capacity, in terms of mass, of 1 to 15 times of an amount of water contained in the exothermic element.

16. The exothermic warmer according to claim 15,

wherein, in the state before the oxidation reaction has started, the water-absorbing polymer has a total water retention capacity, in terms of mass, of 2 to 10 times the amount of water contained in the exothermic element.

17. The exothermic warmer according to claim 1,

wherein the exothermic warmer has a thickness of 0.5 mm to 8 mm.

18. The exothermic warmer according to claim 17,

wherein the exothermic warmer has a thickness of 1 mm to 6 mm.

19. The exothermic warmer according to claim 1,

wherein an outer jacket is provided on an outer side of the first cover sheet and/or the second cover sheet of the exothermic warmer main body.

20. The exothermic warmer according to claim 19,

wherein the first cover sheet is located on a skin contact side that comes into contact with the skin of a wearer relative to the second cover sheet, and the outer jacket is provided on the skin contact side relative to the first cover sheet.

21. The exothermic warmer according to claim 19,

wherein the outer jacket is a non-woven fabric.

22. The exothermic warmer according to claim 19,

wherein a thickness of the exothermic warmer main body excluding the outer jacket in the exothermic warmer is 10% to 80% of a thickness of the exothermic warmer.

23. The exothermic warmer according to claim 22,

wherein the thickness of the exothermic warmer main body excluding the outer jacket in the exothermic warmer is 20% to 60% of the thickness of the exothermic warmer.

24. An exothermic warmer comprising:

an exothermic element that comprises an oxidizable metal, an electrolyte, a carbon component, and water, and generates heat through an oxidation reaction; and

a water-absorbing polymer that is at least partially in contact with the exothermic element,

the exothermic element and the water-absorbing polymer being interposed between a first cover sheet that is air permeable and does not suppress the oxidation reaction and a second cover sheet,

wherein, in a state before the oxidation reaction has started, the exothermic element has a water content of 9 mass% to 25 mass%, and a concentration of the electrolyte of 1 mass% or more,

wherein the water-absorbing polymer is capable of retaining water in an amount that is 3 times or more its own weight at 20°C, with respect to an aqueous solution having the same electrolyte concentration as the concentration of the electrolyte contained in the exothermic element in the state before the oxidation reaction has started.

25. The exothermic warmer according to claim 24,

wherein an electrolyte content in the exothermic element before the oxidation reaction has started is 3 mass% or more.

26. The exothermic warmer according to claim 25,

wherein the electrolyte content in the exothermic element before the oxidation reaction has started is 4 mass% or more.

27. The exothermic warmer according to claim 24,

wherein, in the state before the oxidation reaction has started, the water-absorbing polymer has a total water retention capacity, in terms of mass, of 1 to 15 times of an amount of water contained in the exothermic element.

28. The exothermic warmer according to claim 27,

wherein, in the state before the oxidation reaction has started, the water-absorbing polymer has a total water retention capacity, in terms of mass, of 2 to 10 times of the amount of water contained in the exothermic element.

29. The exothermic warmer according to claim 24,

wherein the exothermic element is formed by being applied in a flat shape on the first cover sheet or the second cover sheet.

30. The exothermic warmer according to claim 24,

wherein the exothermic element is formed on a substrate sheet, and the water-retaining material is disposed on a surface of the exothermic element that is opposite to a surface of the exothermic element that opposes the substrate sheet.

31. The exothermic warmer according to claim 24,

wherein an air permeable sheet is provided between the water-absorbing polymer and the first cover sheet.

32. The exothermic warmer according to claim 24,

wherein the first cover sheet has an air permeability of 0 sec / (100 ml•6.42 cm^2) to 1500 sec / (100 ml•6.42 cm^2), and a water pressure resistance of 1500 mmH_2O or more.

33. The exothermic warmer according to claim 24,

wherein the water-absorbing polymer is disposed on a surface of the exothermic element that is on the first cover sheet side.

34. The exothermic warmer according to claim 24,

wherein the exothermic warmer has a thickness of 0.5 mm to 8 mm.

35. The exothermic warmer according to claim 34,

wherein the exothermic warmer has a thickness of 1 mm to 6 mm.

36. The exothermic warmer according to claim 24,

wherein, in the exothermic warmer, an outer jacket is provided on an outer side of the first cover sheet and/ or the second cover sheet.

37. The exothermic warmer according to claim 36,

wherein the first cover sheet is located on a skin contact side that comes into contact with the skin of a wearer relative to the second cover sheet, and the outer jacket is provided on the skin contact side relative to the first cover sheet.

38. The exothermic warmer according to claim 36,

wherein the outer jacket is a non-woven fabric.

39. The exothermic warmer according to claim 36,

wherein a thickness of the exothermic warmer main body excluding the outer jacket in the exothermic warmer is 10% to 80% of a thickness of the exothermic warmer.

40. The exothermic warmer according to claim 39,

wherein the thickness of the exothermic warmer main body excluding the outer jacket in the exothermic warmer is 20% to 60% of the thickness of the exothermic warmer.

41. A method for manufacturing an exothermic warmer in which an exothermic element comprising an oxidizable metal, an electrolyte, a carbon component, and water is provided on a sheet, the method comprising:

forming an exothermic element by adding the electrolyte in a solid state to one surface of the sheet and applying a coating material that comprises the oxidizable metal, the carbon component, and the water, but not the electrolyte, in this order or in a reversed order, or performing the two steps simultaneously,

before or after the exothermic element forming step, or between the two steps of the exothermic element forming step, or concurrently with the exothermic element forming step, supplying a water-retaining material to an exothermic element forming surface side of the sheet on which the exothermic element is formed, and

after the water-retaining material supplying step, overlaying another sheet that is the same as or different from the sheet on the exothermic element forming surface side,

wherein an amount of water in the exothermic element is 9 mass% or more and 25 mass% or less.

42. The method for manufacturing an exothermic warmer according to claim 41,

wherein the applying the coating material onto one surface of the sheet is performed, thereafter, supplying the water-retaining material is performed, and thereafter the adding the electrolyte in a solid state is performed.

43. The method for manufacturing an exothermic warmer according to claim 41,

wherein the applying the coating material onto one surface of the sheet is performed, thereafter, the adding the electrolyte in a solid state is performed, and thereafter the supplying the water-retaining material is performed.

44. The method for manufacturing an exothermic warmer according to claim 43, further comprising

covering each outer surface of the sheet and the other sheet with a sheet that serves as a cover sheet.