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 containing 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,

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

wherein the first cover sheet has an air permeability of 0 sec / (100 ml•6.42 cm^2) or more and 1500 sec / (100 ml•6.42 cm^2) or less, and a water pressure resistance of 1500 mm H_2O or more,

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

thus enabling the exothermic warmer to satisfy 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 or more and 42°C or less; 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 or more and 250 or less.

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 1or claim 2, 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 any one of claims 1 to 4, wherein, in a state before the oxidation reaction has started, the exothermic element has an electrolyte concentration of 1 mass% or more.

6. The exothermic warmer according to any one of claims 1 to 5, wherein, in a state before the oxidation reaction has started, the exothermic element has an electrolyte concentration of 20 mass% or less.

7. The exothermic warmer according to any one of claims 1 to 6, wherein, in a state before the oxidation reaction has started, the exothermic element has an electrolyte concentration of 3 mass% or more and 15 mass% or less.

8. The exothermic warmer according to claim 7, wherein, in the state before the oxidation reaction has started, the exothermic element has an electrolyte concentration of 5 mass% or more and 10 mass% or less.

9. The exothermic warmer according to any one of claims 1 to 8, 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% or more and 50 mass% or less.

10. The exothermic warmer according to claim 1, 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% or more and 40 mass% or less.

11. 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.

12. The exothermic warmer according to claim 1 or 11, 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.

13. The exothermic warmer according to claim 1, 11 or 12, 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 time or more and 15 times or less of an amount of water contained in the exothermic element.

14. The exothermic warmer according to claim 13, 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 times or more and 10 times or less of the amount of water contained in the exothermic element.

15. The exothermic warmer according to any one of claims 1 to 14, wherein the exothermic warmer has a thickness of 0.5 mm or more and 8 mm or less.

16. The exothermic warmer according to claim 15, wherein the exothermic warmer has a thickness of 1 mm or more and 6 mm or less.

17. The exothermic warmer according to any one of claims 1 to 16, 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.

18. The exothermic warmer according to claim 17, 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.

19. The exothermic warmer according to claim 17 or claim 18, wherein the outer jacket is a non-woven fabric.

20. The exothermic warmer according to any one of claims 17 to 19, wherein a thickness of the exothermic warmer main body excluding the outer jacket in the exothermic warmer is 10% or more and 80% or less of a thickness of the exothermic warmer.

21. The exothermic warmer according to claim 20, wherein the thickness of the exothermic warmer main body excluding the outer jacket in the exothermic warmer is 20% or more and 60% or less of the thickness of the exothermic warmer.

22. An exothermic warmer comprising:

an exothermic element that contains 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% or more and 25 mass% or less, and a concentration of the electrolyte of 1 mass% or more.

23. The exothermic warmer according to claim 22, 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.

24. The exothermic warmer according to claim 22or claim 23, wherein an electrolyte content in the exothermic element before the oxidation reaction has started is 3 mass% or more.

25. The exothermic warmer according to claim 24, wherein the electrolyte content in the exothermic element before the oxidation reaction has started is 4 mass% or more.

26. The exothermic warmer according to any one of claims 22to 25, 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 time or more and 15 times or less of an amount of water contained in the exothermic element.

27. The exothermic warmer according to claim 26, 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 times or more and 10 times or less of the amount of water contained in the exothermic element.

28. The exothermic warmer according to any one of claims 22to 27, wherein the exothermic element is formed by being applied in a flat shape on the first cover sheet or the second cover sheet.

29. The exothermic warmer according to any one of claims 22to 28, wherein the exothermic element is formed on a substrate sheet, and the water-absorbing polymer is disposed on a surface of the exothermic element that is opposite to a surface of the exothermic element that opposes the substrate sheet.

30. The exothermic warmer according to any one of claims 22to 29, wherein an air permeable sheet is provided between the water-absorbing polymer and the first cover sheet.

31. The exothermic warmer according to any one of claims 22to 30, wherein the first cover sheet has an air permeability of 0 sec/(100 ml•6.42 cm^2) or more and 1500 sec/(100 ml•6.42 cm^2) or less, and a water pressure resistance of 1500 mm H_2O or more.

32. The exothermic warmer according to any one of claims 22to 31, wherein the water-absorbing polymer is disposed on a surface of the exothermic element that is on the first cover sheet side.

33. The exothermic warmer according to any one of claims 22to 32, wherein the exothermic warmer has a thickness of 0.5 mm or more and 8 mm or less.

34. The exothermic warmer according to claim 33, wherein the exothermic warmer has a thickness of 1 mm or more and 6 mm or less.

35. The exothermic warmer according to any one of claims 22to 34, 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.

36. The exothermic warmer according to claim 35, 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.

37. The exothermic warmer according to claim 35or claim 36, wherein the outer jacket is a non-woven fabric.

38. The exothermic warmer according to any one of claims 35to 37, wherein a thickness of the exothermic warmer main body excluding the outer jacket in the exothermic warmer is 10% or more and 80% or less of a thickness of the exothermic warmer.

39. The exothermic warmer according to claim 38, wherein the thickness of the exothermic warmer main body excluding the outer jacket in the exothermic warmer is 20% or more and 60% or less of the thickness of the exothermic warmer.

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

an exothermic element forming step of forming an exothermic element that is performed by performing a step of adding the electrolyte in a solid state to one surface of the sheet and a step of applying a coating material that contains 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, and

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, a water-retaining material supplying step of supplying a water-retaining material to an exothermic element forming surface side of the sheet on which the exothermic element is formed,

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

41. The method for manufacturing an exothermic warmer according to claim 40, wherein the step of applying the coating material onto one surface of the sheet is performed, thereafter, the step of supplying the water-retaining material is performed, and thereafter the step of adding the electrolyte in a solid state is performed.

42. The method for manufacturing an exothermic warmer according to claim 40or claim 41, wherein the step of applying the coating material onto one surface of the sheet is performed, thereafter, the step of adding the electrolyte in a solid state is performed, and thereafter the step of supplying the water-retaining material is performed.

43. The method for manufacturing an exothermic warmer according to any one of claims 40to 42, further comprising

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

44. The method for manufacturing an exothermic warmer according to claim 42, further comprising

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