PATENT DOCUMENT

[0004]

Patent Document 1: Japanese Unexamined Patent Publication No. 2009-019863

SUMMARY OF THE INVENTION

TECHNICAL PROBLEM

[0005]

In the adsorption heat exchanger, adsorption performance may deteriorate, especially when the adsorption layer deteriorates in a short period of time.

[0006]

~~It is an object~~Embodiments of the present disclosure ~~to~~ substantially prevent deterioration of the adsorption layer in the adsorption heat exchanger.

SOLUTION TO THE PROBLEM

[0007]

~~A first~~According to an aspect of the present disclosure, ~~is directed to~~there is provided an adsorption heat exchanger ~~(20)~~ including: a base sheet ~~(26)~~; and an adsorbent ~~(41)~~ supported on the base sheet ~~(26)~~ by using a binder ~~(42)~~. The binder ~~(42)~~ is resistant to acid.

[0008]

In the ~~first~~above aspect, the binder ~~(42)~~ is resistant to acid. Thus, deterioration of the adsorption layer ~~(30)~~ is substantially prevented.

[0009]

~~A second aspect of the present disclosure is an embodiment of the first aspect. In the second aspect~~In an embodiment, the binder ~~(42)~~ is resistant to at least one of nitric acid or sulfuric acid.

[0010]

In the ~~second aspect~~above embodiment, the binder ~~(42)~~ is resistant to at least one of nitric acid or sulfuric acid as specific acid. Thus, deterioration of the adsorption layer ~~(30)~~ is substantially prevented.

[0011]

~~A third aspect of the present disclosure is an embodiment of the first aspect. In the third aspect~~In an embodiment, the binder ~~(42)~~ is resistant to nitric acid.

[0012]

In the ~~third aspect~~above embodiment, the binder ~~(42)~~ is resistant to nitric acid as specific acid. Thus, deterioration of the adsorption layer ~~(30)~~ is substantially prevented.

[0013]

~~A fourth aspect of the present disclosure is an embodiment of any one of the first to third aspects. In the fourth aspect~~In an embodiment, the binder ~~(42)~~ has a mass loss of 35% or less when immersed in 10% nitric acid at 70°C for 40 hours.

[0014]

In the ~~fourth aspect~~above embodiment, the resistance of the binder ~~(42)~~ to nitric acid is specifically stated. Thus, deterioration of the adsorption layer ~~(30)~~ is substantially prevented more reliably.

[0015]

~~A fifth aspect of the present disclosure is an embodiment of any one of the first to fourth aspects. In the fifth aspect~~In an embodiment, the binder ~~(42)~~ has a moisture permeation amount of equal to or higher than 40 g/m^2 per day when being a film having a thickness of 100 μm.

[0016]

In the ~~fifth aspect~~above embodiment, the binder ~~(42)~~ permeates moisture to a desired degree, which is advantageous for the performance of the adsorption heat exchanger ~~(20)~~.

[0017]

~~A sixth aspect of the present disclosure is an embodiment of any one of the first to fifth aspects. In the sixth aspect~~In an embodiment, an elongation percentage of the binder ~~(42)~~ is equal to or greater than a cubic root of (X/100)*100 (%) when an expansion rate of the adsorbent ~~(41)~~ is X (%).

[0018]

In the ~~sixth aspect~~above embodiment, even when the adsorbent ~~(41)~~ expands due to moisture absorption, the binder ~~(42)~~ is sufficiently elongated, thereby reducing the adsorbent (41) detached.

[0019]

~~A seventh aspect of the present disclosure is an embodiment of the sixth aspect. In the seventh aspect~~In an embodiment, the binder ~~(42)~~ has a tensile strength of 12 N/mm^2 or less.

[0020]

In the ~~seventh aspect~~above embodiment, the binder ~~(42)~~ is easily elongated. Thus, the binder ~~(42)~~ is easily elongated even when the adsorbent ~~(41)~~ expands, thereby reducing the adsorbent ~~(41)~~ detached.

BRIEF DESCRIPTION OF THE DRAWINGS

[0021]

FIG. 1 is a piping system diagram illustrating a configuration of a refrigerant circuit in a humidity control apparatus. In FIG. 1, an illustration (A) illustrates an operation during a first operation, and an illustration (B) illustrates an operation during a second operation.

FIG. 2 is a schematic perspective view of an adsorption heat exchanger.

FIG. 3 is a side view of a heat exchanger unit constituting the adsorption heat exchanger.

FIG. 4 is a sectional view taken along line A-A in FIG. 3.