short period leads to high cost and a large amount of labor and there is a concern of an increase in treatment cost of membrane separation. Accordingly, an operation of separating and removing the components that destroy the zeolite membrane from the substance to be treated by distillation or the like needs to be performed before the separation treatment using the membrane module. However, a unit operation such as distillation has such a problem that energy consumption is large and the operation cannot always sufficiently remove the components that destroy the zeolite membrane.

[0003]

Patent Document 1 proposes a technique of increasing the life of a zeolite membrane by bringing a substance to be treated into contact with zeolite particles filling an inside of a pretreatment device independent of a membrane separation device before the substance to be treated is brought into contact with the zeolite membrane. However, there is a demand for a treatment method that performs the aforementioned pretreatment more efficiently with less energy to further improve membrane separation efficiency and further increase the life of the zeolite membrane.

PRIOR ART DOCUMENT

PATENT DOCUMENT

[0004]

[Patent Document 1] Japanese Patent Application Publication No. 2012-35163

SUMMARY

PROBLEMS TO BE SOLVED

[0005]

An object of the present disclosure is to provide a method

of efficiently treating a fluid to be treated containing a compound that destroys a zeolite membrane to prevent destruction of the zeolite membrane.

MEANS FOR SOLVING THE PROBLEMS

[0006]

A treatment method of a fluid to be treated by a zeolite membrane in the present disclosure that achieves the aforementioned object is characterized in that the treatment method treats the fluid to be treated formed of a liquid mixture or a gas mixture and containing a compound that destroys the zeolite membrane, and the treatment method comprises: filling a pretreatment device installed upstream of a membrane module including the zeolite membrane or a portion upstream of the zeolite membrane in the membrane module with particles made of the same type of zeolite as the zeolite membrane; and bringing the fluid to be treated into contact with the particles to destroy the zeolite forming the particles and causing the fluid to be treated to contain a component generated by the destruction.

[0006a]

In an aspect, there is provided a treatment method of a fluid to be treated by a zeolite membrane, characterized in that

the treatment method treats the fluid to be treated formed of a liquid mixture or a gas mixture and containing a compound that destroys the zeolite membrane, and

the treatment method comprises:

filling a particle filled layerinstalled a portion upstream of the zeolite membrane in a membrane module including the zeolite membrane with particles made of the same type of zeolite as the zeolite membrane; and

bringing the fluid to be treated into contact with

the particles to destroy the zeolite forming the particles and causing the fluid to be treated to contain a component generated by the destruction.

EFFECTS

[0007]

In the treatment method of a fluid to be treated by a zeolite membrane in the present disclosure, the pretreatment device installed upstream of the membrane module or the portion upstream of the zeolite membrane in the membrane module is filled with the particles made of the same type of zeolite as the zeolite membrane and the fluid to be treated containing the compound that destroys the zeolite membrane is brought into contact with the particles to destroy the zeolite forming the particles and is made to contain the component generated by the destruction. Accordingly, the fluid to be treated can be

CLAIMS

[Claim 1] A treatment method of a fluid to be treated by a zeolite membrane, characterized in that

the treatment method treats the fluid to be treated formed of a liquid mixture or a gas mixture and containing a compound that destroys the zeolite membrane, and

the treatment method comprises:

filling a particle filled layer installed a portion upstream of the zeolite membrane in a membrane module including the zeolite membrane with particles made of the same type of zeolite as the zeolite membrane; and

bringing the fluid to be treated into contact with the particles to destroy the zeolite forming the particles and causing the fluid to be treated to contain a component generated by the destruction.

[Claim 2] The treatment method according to claim 1, characterized in that

the compound that destroys the zeolite membrane is at least one of an organic acid and an inorganic acid, and

the fluid to be treated contains 2000 ppm or less of the compound.

[Claim 3] The treatment method according to claim 1, characterized in that

the compound that destroys the zeolite membrane is at least one of 3-methyl-1-butanol and acetal, and

the fluid to be treated contains 2000 ppm or less of the compound.

[Claim 4] The treatment method according to claim 1, characterized in that

the compound that destroys the zeolite membrane is at least one of dimethyl sulfide and dimethyl sulfoxide, and

the fluid to be treated contains 2000 ppm or less of the compound.

[Claim 5] The treatment method according to any one of claims 1 to 4, characterized in that

the fluid to be treated is a liquid mixture, and

contact time with the particles is 60 to 600 seconds.

[Claim 6] The treatment method according to any one of claims 1 to 4, characterized in that

the fluid to be treated is a gas mixture, and

contact time with the particles is 1 to 60 seconds.