DESCRIPTION

TITLE OF INVENTION:

Method of Separating Perfluorotripropylamine, Heat Transfer Fluid, Heat Transfer Apparatus, and Heat Transfer Method

TECHNICAL FIELD

[0001] The present disclosure relates to a method of separating perfluorotripropylamine, a heat transfer fluid, a heat transfer apparatus, and a heat transfer method.

BACKGROUND ART

[0002] It is known that perfluorotripropylamine is usable as a heat transfer fluid (PTL 1).

CITATION LIST

PATENT LITERATURE

[0003] PTL 1: Japanese National Patent Publication No. 2016-505882

SUMMARY

TECHNICAL PROBLEM

[0004] As a heat transfer fluid, a hexafluoropropene (HFP) trimer, a perfluoroalkene ether, or a perfluoropolyether is usable as a replacement for perfluorotripropylamine.

[0005] Inside an apparatus in which perfluorotripropylamine is used as heat transfer fluid, in order to replace the perfluorotripropylamine by another heat transfer fluid (for example, by a hexafluoropropene trimer), it is possible to pass the another heat transfer fluid through the apparatus. This yields a mixture of the perfluorotripropylamine and the another heat transfer fluid. If it is possible to separate the perfluorotripropylamine from this mixture, it is possible to reuse the heat transfer fluid used for replacing.

[0006] The present disclosure aims at providing a separation method capable of efficiently separating perfluorotripropylamine from a mixture containing perfluorotripropylamine and at least one selected from the group consisting of a hexafluoropropene trimer represented by C_9F_{18}, a perfluoroalkene ether, and a

perfluoropolyether.

SOLUTION TO PROBLEM

[0007] The present disclosure includes:

[1] A method of separating perfluorotripropylamine from a mixture B, the mixture B containing perfluorotripropylamine and a mixture A containing at least one selected from the group consisting of a hexafluoropropene trimer represented by C_9F_{18}, a perfluoroalkene ether, and a perfluoropolyether, wherein

a coagulation point of the mixture A is a temperature equal to or less than a coagulation point of the perfluorotripropylamine, and

separating the perfluorotripropylamine from the mixture B is carried out at a temperature equal to or less than the coagulation point of the perfluorotripropylamine.

[2] The method of separating perfluorotripropylamine according to [1] above, wherein a difference between the coagulation point of the mixture A and the coagulation point of the perfluorotripropylamine is 20°C or more.

[3] The method of separating perfluorotripropylamine according to [1] or [2] above, wherein a content of the perfluorotripropylamine in a mixture C is 1000 ppm by mass or less and the mixture C is a mixture obtained after the perfluorotripropylamine is separated.

[4] The method of separating perfluorotripropylamine according to any one of [1] to [3] above, wherein the hexafluoropropene trimer represented by C_9F_{18} includes at least one of hexafluoropropene trimers represented by formulae (I) to (III) below.

[17] A semiconductor production apparatus comprising the heat transfer apparatus according to [15] or [16] above.

[18] A heat transfer method comprising:

preparing a device; and

transferring heat to the device or from the device by using the heat transfer fluid according to any one of [7] to [13] above.

[19] The heat transfer method according to [18] above, wherein the device is a wafer for use in semiconductor production.

[0007a] In one aspect, the present disclosure provides a method of separating perfluorotripropylamine from a mixture B, the mixture B containing perfluorotripropylamine and a mixture A containing at least one selected from the group consisting of a hexafluoropropene trimer represented by C_9F_{18}, a perfluoroalkene ether, and a perfluoropolyether, wherein

a coagulation point of the mixture A is a temperature equal to or less than a coagulation point of the perfluorotripropylamine, and

separating the perfluorotripropylamine from the mixture B is carried out at a temperature equal to or less than the coagulation point of the perfluorotripropylamine.

[0007b] In another aspect, the present disclosure provides a heat transfer fluid comprising:

at least one selected from the group consisting of a hexafluoropropene trimer represented by C_9F_{18}, a perfluoroalkene ether, and a perfluoropolyether; and

perfluorotripropylamine, wherein

a content of the perfluorotripropylamine is 1000 ppm by mass or less.

[0007c] In another aspect, the present disclosure provides use of the heat transfer fluid as defined herein for transferring heat.

[0007d] In another aspect, the present disclosure provides a heat transfer apparatus comprising:

a device; and

a mechanism for transferring heat to the device or from the device, wherein the

mechanism comprises the heat transfer fluid as defined herein.

[0007e] In another aspect, the present disclosure provides a semiconductor production apparatus comprising the heat transfer apparatus as defined herein.

[0007f] In another aspect, the present disclosure provides a heat transfer method comprising:

preparing a device; and

transferring heat to the device or from the device by using the heat transfer fluid as defined herein.

ADVANTAGEOUS EFFECTS OF INVENTION

[0008] The present disclosure provides a separation method capable of efficiently separating perfluorotripropylamine from a mixture containing perfluorotripropylamine and at least one selected from the group consisting of a hexafluoropropene trimer represented by C_9F_{18}, a perfluoroalkene ether, and a perfluoropolyether.

DESCRIPTION OF EMBODIMENTS

[0009] Herein, when the expression "each independently" or a similar expression is used for defining a term (a symbol) that can appear multiple times in a chemical structure, this definition applies to every time it appears, independently of one another, whether or not the expression is explicitly described and unless otherwise specified.

[0010] In the present specification, a numerical range "(from) A to B" is intended to include both the lower limit numerical value and the upper limit numerical value. In other words, a numerical range "(from) A to B" means not less than A and not more than B.

[0011] In the following, a description will be given of a heat transfer fluid according to the present disclosure.

[0012] (Method of Separating Perfluorotripropylamine)

A method of separating perfluorotripropylamine according to the present disclosure is a method of separating perfluorotripropylamine from a mixture B, the mixture B containing perfluorotripropylamine and a mixture A containing at least one selected from the group consisting of a hexafluoropropene trimer represented by C_9F_{18},