CLAIMS

1. A method for separating, with a multi-stage distillation column, a mixture containing an active hydrogen-containing compound (A) and a compound (B) that reversibly reacts with the active hydrogen-containing compound (A), the method comprising:

distillation-separating the active hydrogen-containing compound (A) and the compound (B) with the multi-stage distillation column in the presence of an intermediate-boiling-point inactive compound (C) that has a normal boiling point between a normal boiling point of the active hydrogen-containing compound (A) and a normal boiling point of the compound (B) and is chemically inactive for the active hydrogen-containing compound (A) and the compound (B), wherein

the active hydrogen-containing compound (A) is at least one compound selected from the group consisting of a hydroxy compound, a thiol, an aromatic thiol, and a hydrogen halide,

the compound (B) is an isocyanate and/or an isothiocyanate,

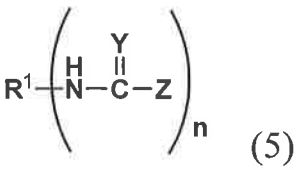
the intermediate-boiling-point inactive compound (C) is at least one kind of compound selected from the group consisting of (1) hydrocarbon compounds having a linear, branched, or cyclic structure; (2) compounds in which hydrocarbon compounds of the same kind or different kind having a linear, branched, or cyclic structure are bonded via an ether bond or a thioether bond; (3) aromatic hydrocarbon compounds that may have a substituent comprising a hydrocarbon group; (4) compounds in which aromatic hydrocarbon compounds of the same kind or different kind are bonded via an ether bond or a thioether bond; (5) compounds in which a hydrocarbon compound having a linear, branched, or cyclic structure is bonded to an aromatic hydrocarbon compound via an ether bond or a thioether bond; and (6) halides in which at least one hydrogen atom constituting a hydrocarbon compound having a linear, branched, or cyclic structure, or at least one hydrogen atom constituting an aromatic hydrocarbon compound that may have a substituent comprising a hydrocarbon group is substituted by a halogen atom.

2. The method according to claim 1, comprising supplying the mixture to

an inactive layer comprising the intermediate-boiling-point inactive compound (C), formed within the multi-stage distillation column.

3. The method according to claim 1 or 2, comprising supplying the mixture in a gas state to the multi-stage distillation column.

4. The method according to any one of claims 1 to 3, wherein the mixture is a mixture obtained by the thermal decomposition reaction of a compound represented by formula (5):
[Chemical Formula 1]



(5)

wherein R^1 represents one group selected from the group consisting of an aliphatic group having 1 to 22 carbon atoms and an aromatic group having 6 to 22 carbon atoms, and the group may contain an oxygen atom and/or a nitrogen atom; Y represents an oxygen atom or a sulfur atom; Z represents one group selected from the group consisting of a residue in which a hydrogen atom has been removed from the -OH group of the hydroxy compound, a residue in which a hydrogen atom has been removed from the -SH group of the thiol or the aromatic thiol, and a halogen atom; and n represents an integer of 1 to 10.

5. The method according to claim 4, wherein the compound represented by formula (5) is an N-substituted thiocarbamic acid ester wherein Y is a sulfur atom and Z is a residue in which a hydrogen atom has been removed from the -OH group of the hydroxy compound.

6. The method according to claim 4, wherein the compound represented by formula (5) is an N-substituted carbamic acid ester wherein Y is an oxygen atom and Z is a residue in which a hydrogen atom has been removed from the -OH group of the hydroxy compound.

7. The method according to claim 6, wherein the N-substituted carbamic

acid ester is an N-substituted carbamic acid ester obtained by reacting a carbonic acid ester and an organic primary amine.

8. The method according to claim 6, wherein the N-substituted carbamic acid ester is an N-substituted carbamic acid ester obtained by reacting urea, an organic primary amine, and a hydroxy compound.

9. The method according to claim 8, wherein the N-substituted carbamic acid ester is N-substituted aryl carbamate.

10. A method for producing an isocyanate, comprising: a step of obtaining a mixture containing an isocyanate and a hydroxy compound by the thermal decomposition reaction of an N-substituted carbamic acid ester; and a step of separating the isocyanate from the mixture by the method according to claim 1.

CLAIMS

1. A method for separating, with a multi-stage distillation column, a mixture containing an active hydrogen-containing compound (A) and a compound (B) that reversibly reacts with the active hydrogen-containing compound (A), the method comprising:

distillation-separating the active hydrogen-containing compound (A) and the compound (B) with the multi-stage distillation column in the presence of an intermediate-boiling-point inactive compound (C) that has a normal boiling point between a normal boiling point of the active hydrogen-containing compound (A) and a normal boiling point of the compound (B) and is chemically inactive for the active hydrogen-containing compound (A) and the compound (B).

2. The method according to claim 1, comprising supplying the mixture to an inactive layer comprising the intermediate-boiling-point inactive compound (C), formed within the multi-stage distillation column.

3. The method according to claim 1 or 2, comprising supplying the mixture in a gas state to the multi-stage distillation column.

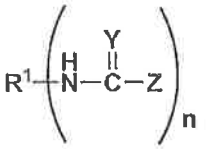
4. The method according to any one of claims 1 to 3, wherein the compound (B) is an isocyanate and/or an isothiocyanate.

5. The method according to any one of claims 1 to 4, wherein the

active hydrogen-containing compound (A) is at least one compound selected from the group consisting of a hydroxy compound, a thiol, an aromatic thiol, and a hydrogen halide.

6. The method according to any one of claims 1 to 5, wherein the mixture is a mixture obtained by the thermal decomposition reaction of a compound represented by formula (5):

[Chemical Formula 1]



(5)

wherein R^1 represents one group selected from the group consisting of an aliphatic group having 1 to 22 carbon atoms and an aromatic group having 6 to 22 carbon atoms, and the group may contain an oxygen atom and/or a nitrogen atom; Y represents an oxygen atom or a sulfur atom; Z represents one group selected from the group consisting of a residue in which a hydrogen atom has been removed from the -OH group of the hydroxy compound, a residue in which a hydrogen atom has been removed from the -SH group of the thiol or the aromatic thiol, and a halogen atom; and n represents an integer of 1 to 10.

7. The method according to claim 6, wherein the compound represented by formula (5) is an N-substituted thiocarbamic acid ester wherein Y is a sulfur atom and Z is a residue in which a hydrogen atom has been removed from the -OH group of the hydroxy compound.

8. The method according to claim 6, wherein the compound represented by formula (5) is an N-substituted carbamic acid ester wherein Y is an oxygen atom and Z is a residue in which a hydrogen atom has been removed from the -OH group of the hydroxy compound.

9. The method according to claim 8, wherein the N-substituted carbamic acid ester is an N-substituted carbamic acid ester obtained by reacting a carbonic acid ester and an organic primary amine.

10. The method according to claim 9, wherein the N-substituted carbamic acid ester is an N-substituted carbamic acid ester obtained by reacting urea, an organic primary amine, and a hydroxy compound.

11. The method according to claim 10, wherein the N-substituted carbamic acid ester is N-substituted aryl carbamate.

12. A method for producing an isocyanate, comprising: a step of obtaining a mixture containing an isocyanate and a hydroxy compound by the thermal decomposition reaction of an N-substituted carbamic acid ester; and a step of separating the isocyanate from the mixture by the method according to claim 1.