DESCRIPTION

Title of Invention: METHOD FOR PRODUCING HEXAFLUOROBUTADIENE

Technical Field

[0001]

The present invention relates to a method for producing hexafluorobutadiene.

Background Art

[0002]

Miniaturization and the use of new materials for semiconductor devices have been studied for the purpose of acceleration and energy-saving. Fluorocarbons are known to be suitable for the microfabrication of semiconductor devices. Of these, hexafluorobutadiene (CF_2=CFCF=CF_2, 1,1,2,3,4,4-hexafluorobutadiene, etc.) is attracting attention as an etching gas used for forming state-of-the-art microstructures, such as semiconductors and liquid crystals.

[0003]

It is necessary to reduce impurities in a dry etching gas as much as possible in order to increase the yield. The purity of a gas used for dry etching is generally as high as 99.99% (4N) or 99.999% (5N). On the other hand, as a method for producing hexafluorobutadiene, a dehalogenation reaction, for example, in which a corresponding halide is reacted with zinc metal, is known (for example, see Patent Literature 1).

Citation List

Patent Literature

[0004]

PTL 1: No. 1987-26240

Summary

Technical Problem

[0005]

However, hexafluorobutadiene purified by the reaction described in Patent Literature 1 includes, as additional compounds, octafluoro-1-butene, octafluoro-2-butene, heptafluoro-1-butene, hebutafluoro-2-butene, and the like.

[0006]

Hexafluorobutadiene has a structure and a boiling point similar to those of the additional compounds. For this reason, separation by a normal distillation method is difficult, and a method for obtaining hexafluorobutadiene with high purity is desired.

[0007]

The present disclosure has been made to solve the above problem, and aims to provide a method for obtaining hexafluorobutadiene with high purity.

Solution to Problem

[0008]

As a result of extensive research to solve the above problem, the present inventors accomplished the present disclosure. The present disclosure includes the following structure.

Item 1. A method for producing hexafluorobutadiene, comprising a step of subjecting a starting material composition containing hexafluorobutadiene and at least one additional compound selected from the group consisting of octafluoro-1-butene, octafluoro-2-butene, heptafluoro-1-butene, and heptafluoro-2-butene to extractive distillation in the presence of an extraction solvent to reduce the concentration of the additional compound.

Item 2. The production method according to Item 1, wherein the extraction solvent used in the extractive distillation is at least one solvent selected from the group consisting of oxygen-containing hydrocarbons and halogen-containing hydrocarbons.

Item 3. A method for separating hexafluorobutadiene and at least one additional compound selected from the group consisting of octafluoro-1-butene, octafluoro-2-butene, heptafluoro-1-butene, and heptafluoro-2-butene, the method comprising a step of subjecting a composition containing hexafluorobutadiene and the additional compound to extractive distillation in the presence of an extraction solvent.

Item 4. The method according to Item 3, wherein the extraction solvent contains at least one compound selected from the group consisting of oxygen-containing hydrocarbons and halogen-containing hydrocarbons.

Item 5. A composition containing hexafluorobutadiene and at least one additional compound selected from the group consisting of octafluoro-1-butene, octafluoro-2-butene, heptafluoro-1-butene, and heptafluoro-2-butene, wherein the additional compound is contained in an amount of less than 0.1 mol% per 100 mol% of the total amount of the composition.

Item 6. An azeotropic composition containing hexafluorobutadiene and at least one additional compound selected from the group consisting of octafluoro-1-butene, octafluoro-2-butene, heptafluoro-1-butene, and heptafluoro-2-butene.

Item 7. The composition according to Item 5 or 6, for use in an etching gas, a refrigerant, a heat transfer medium, a foaming agent, or a resin monomer.

[0008a]

In one aspect, the present disclosure relates to method for producing hexafluorobutadiene, comprising a step of subjecting a starting material composition containing hexafluorobutadiene and at least one additional compound selected from the group consisting of octafluoro-1-butene, octafluoro-2-

butene, and heptafluoro-2-butene to extractive distillation in the presence of an extraction solvent to reduce the concentration of the additional compound.

[0008b]

In another aspect, the present disclosure relates to a method for separating hexafluorobutadiene and at least one additional compound selected from the group consisting of octafluoro-1-butene, octafluoro-2-butene, and heptafluoro-2-butene, the method comprising a step of subjecting a composition containing hexafluorobutadiene and the additional compound to extractive distillation in the presence of an extraction solvent.

[0008c]

In another aspect, the present disclosure relates to a composition containing hexafluorobutadiene and at least one additional compound selected from the group consisting of octafluoro-1-butene, octafluoro-2-butene, and heptafluoro-2-butene, wherein the additional compound is contained in an amount of less than 0.1 mol% per 100 mol% of the total amount of the composition.

[0008d]

In another aspect, the present disclosure relates to an azeotropic composition containing hexafluorobutadiene and at least one additional compound selected from the group consisting of octafluoro-1-butene, octafluoro-2-butene, and heptafluoro-2-butene.

Advantageous Effects of Invention

[0009]

According to the present invention, hexafluorobutadiene with high purity can be obtained.

Brief Description of Drawings

CLAIMS

[Claim 1]

A method for producing hexafluorobutadiene, comprising a step of subjecting a starting material composition containing hexafluorobutadiene and at least one additional compound selected from the group consisting of octafluoro-1-butene, octafluoro-2-butene, and heptafluoro-2-butene to extractive distillation in the presence of an extraction solvent to reduce the concentration of the additional compound.

[Claim 2]

The production method according to claim 1, wherein the extraction solvent contains at least one compound selected from the group consisting of oxygen-containing hydrocarbons and halogen-containing hydrocarbons.

[Claim 3]

A method for separating hexafluorobutadiene and at least one additional compound selected from the group consisting of octafluoro-1-butene, octafluoro-2-butene, and heptafluoro-2-butene, the method comprising a step of subjecting a composition containing hexafluorobutadiene and the additional compound to extractive distillation in the presence of an extraction solvent.

[Claim 4]

The method according to claim 3, wherein the extraction solvent contains at least one compound selected from the group consisting of oxygen-containing hydrocarbons and halogen-containing hydrocarbons.

[Claim 5]

A composition containing hexafluorobutadiene and at least one additional compound selected from the group consisting of octafluoro-1-butene, octafluoro-2-butene, and heptafluoro-2-butene, wherein the additional compound is contained in an amount

of less than 0.1 mol% per 100 mol% of the total amount of the composition.

[Claim 6]

An azeotropic composition containing hexafluorobutadiene and at least one additional compound selected from the group consisting of octafluoro-1-butene, octafluoro-2-butene, and heptafluoro-2-butene.

[Claim 7]

The composition according to claim 5, for use in an etching gas, a refrigerant, a heat transfer medium, a foaming agent, or a resin monomer.

[Claim 8]

The composition according to claim 6, for use in an etching gas, a refrigerant, a heat transfer medium, a foaming agent, or a resin monomer.