DESCRIPTION

Title of Invention: CYCLOBUTENE PRODUCTION METHOD

Technical Field

[0001]

The present disclosure relates to a method for producing cyclobutene.

Background Art

[0002]

Cyclobutenes that contain halogen atoms are useful compounds, for example, in various refrigerants, foaming agents, and heat transfer mediums, as well as dry etching gas for semiconductors.

[0003]

Of cyclobutenes that contain halogen atoms, 1H-pentafluorocyclobutene is known to be produced from 1H,2H-hexafluorocyclobutane by a method performing a dehydrofluorination reaction (e.g., Non-patent Literature 1 and 2). This technique synthesizes 1H-pentafluorocyclobutene in an open reaction system by using a glass instrument.

Citation List

Non-patent Literature

[0004]

NPL 1: Buxton, Tatlow, Journal of the Chemical Society, (1954), pp. 1177-1179

NPL 2: Fuller, G., Tatlow, J. C., Journal of the Chemical Society, (1961), pp. 3198-3203

Summary

Technical Problem

[0005]

An object of the present disclosure is to produce a halogen atom-containing cyclobutene at a high conversion rate

(yield) and a high selectivity.

Solution to Problem

[0006]

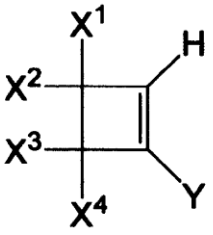
The present disclosure includes the following subject matter.

[0007]

Item 1.

In one aspect, there is provided a method for producing a cyclobutene represented by formula (1):

[0008]



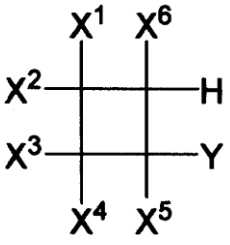
(1)

[0009]

wherein X^1, X^2, X^3, and X^4 are the same or different and represent a hydrogen atom, a halogen atom, or a perfluoroalkyl group, and Y represents a halogen atom,

[0010]

the method comprising subjecting to an elimination reaction a cyclobutane represented by formula (2):



(2)

[0011]

wherein X^1, X^2, X^3, X^4, and Y are as defined above, X^5 and X^6 are the same or different and represent a hydrogen atom, a halogen atom, or a perfluoroalkyl group,

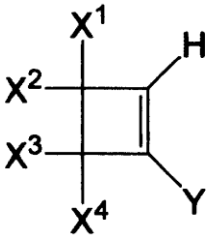
wherein the elimination reaction is performed in the presence of a base in a closed reaction system.

[0012]

Item 2.

In another aspect, there is provided a method for producing a cyclobutene represented by formula (1):

[0013]



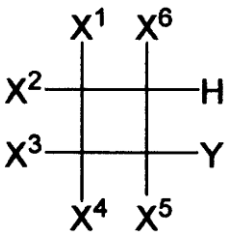
(1)

[0014]

wherein X^1, X^2, X^3, and X^4 are the same or different and represent a hydrogen atom, a halogen atom, or a perfluoroalkyl group, and Y represents a halogen atom,

the method comprising subjecting to an elimination reaction a cyclobutane represented by formula (2):

[0015]



(2)

[0016]

wherein X^1, X^2, X^3, X^4, and Y are as defined above, and X^5 and X^6 are the same or different and represent a hydrogen atom, a halogen atom, or a perfluoroalkyl group,

wherein the elimination reaction is performed at a reaction temperature of 20°C or more under a reaction pressure of 0 kPa or more in the presence of a base.

[0017]

Item 3.

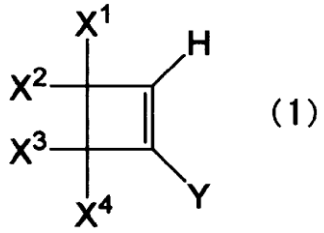
The method according to Item 1 or 2, wherein X^5 represents a hydrogen atom, X^6 represents a halogen atom, and the elimination reaction is a dehydrohalogenation reaction.

[0018]

Item 4.

In another aspect, there is provided a composition comprising a cyclobutene represented by formula (1):

[0019]



(1)

[0020]

wherein X^1, X^2, X^3, and X^4 are the same or different and represent a hydrogen atom, a halogen atom, or a perfluoroalkyl group, and Y represents a halogen atom, wherein the cyclobutene represented by formula (1) is present in an amount of 99 mol% or more based on the total amount of the composition taken as 100 mol%.

[0021]

Item 5.

The composition according to Item 4, wherein 1H-perfluorocyclobutene (1H-cC_4F_5H) is present in an amount of 99 mol% or more, and 3H-perfluorocyclobutene (3H-cC_4F_5H) is present in an amount of 1 mol% or less.

[0022]

Item 6.

The composition according to Item 4 or 5, which is for use in cleaning gas, etching gas, deposit gas, or a building block for organic synthesis.

Advantageous Effects of Invention

[0023]

The present disclosure enables the production of a halogen atom-containing cyclobutene at a high conversion rate (yield) and a high selectivity.