DESCRIPTION

Title of Invention: METHOD FOR PRODUCING PERFLUOROALKYNE COMPOUND

Technical Field

[0001]

The present disclosure relates to a method for producing a perfluoroalkyne compound.

Background Art

[0002]

Perfluoroalkyne compounds are useful compounds as cleaning gases, building blocks for organic synthesis, etc., in addition to being useful as dry etching gases for semiconductors; and have a triple bond between carbon atoms. In particular, 1,1,1,4,4,4-hexafluoro-2-butyne, which has four carbon atoms, is used in various applications.

[0003]

As a method for producing a perfluoroalkyne compound, there is a method in which, using N,N-dimethylformamide, N,N-diethylformamide, 1,3-dimethyl-2-imidazolidinone, and the like as solvents, a dechlorination reaction is performed in the presence of zinc, thus obtaining 1,1,1,4,4,4-hexafluoro-2-butene from 2,3-dichloro-1,1,1,4,4,4-hexafluoro-2-butene (1316mxx) (see, for example, Patent Literature 1).

Citation List

Patent Literature

[0004]

PTL 1: Specification of Chinese Patent Application No. 106008147

Summary

Technical Problem

[0005]

An object of the present disclosure is to provide a

diisopropylformamide, N-methyl-2-pyrrolidone, 1,3-dimethyl-3,4,5,6-tetrahydropyrimidinone, triamide hexamethylphosphate, amine compounds, pyridine compounds, and quinoline compounds in the presence of zinc or a zinc alloy, to obtain a perfluoroalkyne compound represented by formula (1A).

[0013]

Item 5.

The production method according to any one of Items 1 to 4, wherein the reaction temperature is 0 to 250°C.

[0014]

Item 6.

A composition comprising:

a perfluoroalkyne compound represented by formula (1A):

$R^1C{\equiv}CR^2$ (1A)

wherein

R^1 and R^2 are the same or different, and each represents a fluorine atom or a perfluoroalkyl group, and

a compound represented by formula (3):

$R^1CH{=}CHR^2$ (3)

wherein

R^1 and R^2 are as defined above.

[0015]

Item 7.

The composition according to Item 6, wherein the amount of the perfluoroalkyne compound represented by formula (1A) is 85 to 99.9 mol% based on the total amount of the composition defined as 100 mol%.

[0016]

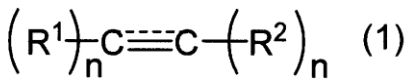
Item 8.

The composition according to Item 6 or 7, which is used as a cleaning gas, an etching gas, or a building block for organic synthesis.

[0016a]

In one aspect, the present disclosure refers to a method for producing a perfluorocarbon compound represented by

formula (1):



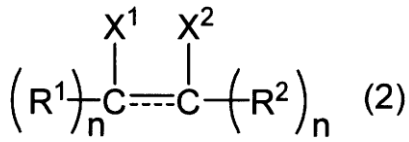
wherein

a bond indicated by a double line and a dotted line is a double bond or a triple bond,

if the bond indicated by the double line and the dotted line is a double bond, both ns represent 2, and if the bond indicated by the double line and the dotted line is a triple bond, both ns represent 1, and

R^1 and R^2 are the same or different, and each represents a fluorine atom or a perfluoroalkyl group,

the method comprising the step of reacting a halogenated hydrocarbon compound represented by formula (2),



wherein

a bond indicated by a solid line and a dotted line is a single bond or a double bond,

if the bond indicated by the solid line and the dotted line is a single bond, both ns represent 2, and if the bond indicated by the solid line and the dotted line is a double bond, both ns represent 1,

R^1 and R^2 are as defined above, and

X^1 and X^2 are the same or different, and each represents a halogen atom,

in an organic solvent in the presence of metal iodides zinc or a zinc alloy, to obtain a perfluorocarbon compound represented by formula (1).

[0016b]

In another aspect, the present disclosure refers to a method for producing a perfluoroalkyne compound represented by formula (1A):

$R^1C{\equiv}CR^2$ (1A)

wherein

R^1 and R^2 are the same or different, and each represents a fluorine atom or a perfluoroalkyl group,

the method comprising the step of reacting a halogenated alkene compound represented by formula (2A):

$X^1R^1C=CR^2X^2$ (2A)

wherein

R^1 and R^2 are as defined above, and

X^1 and X^2 are the same or different, and each represents a halogen atom,

in at least one nitrogen-containing polar organic solvent selected from the group consisting of N-methyl-2-pyrrolidone, 1,3-dimethyl-3,4,5,6-tetrahydropyrimidinone, triamide hexamethylphosphate, triethylamine, 1-methylpyrrolidine, pyridine compounds, and quinoline compounds in the presence of zinc or zinc alloy, to obtain a perfluoroalkyne compound represented by formula (1A).

[0016c]

In another aspect, the present disclosure refers to a composition comprising:

a perfluoroalkyne compound represented by formula (1A):

$R^1C\equiv CR^2$ (1A)

wherein

R^1 and R^2 are the same or different, and each represents a fluorine atom or a perfluoroalkyl group, and

a compound represented by formula (3):

$R^1CH=CHR^2$ (3)

wherein

R^1 and R^2 are as defined above,

wherein the amount of the perfluoroalkyne compound represented by formula (1A) is 85 to 99.9 mol% and the amount of the compound represented by formula (3) is 3.82 mol% or less, based on the total amount of the composition defined as 100 mol%.

Advantageous Effects of Invention

[0017]