

METHOD FOR PREPARING SULFONIUM SALT AND SULFONIUM SALT

PREPARED BY THE SAME

BACKGROUND OF THE INVENTION

5 1. Field of the Invention

The present invention relates to a method for preparing a sulfonium salt, and a sulfonium salt prepared by the method. More particularly, the invention relates to a method for preparing a sulfonium salt, by which a sulfonium
10 salt that is an intermediate mainly used in the production of acid generators or the like, can be synthesized in large quantities at high yields through simplified preparation processes, and a sulfonium salt prepared by the method.

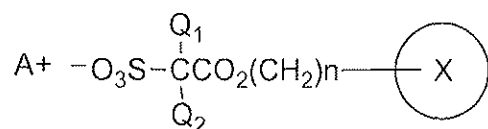
2. Description of the Related Art

15 As generations pass by, there has been a demand for higher resolution photoresists in the field of fine processing of semiconductors or the like using photolithography. Chemically amplified type photoresist compositions that have been developed in response to such a
20 demand, contain acid generators. In order to produce a resist having increased resolution and desired properties, various types of acid generators have been invented so far.

As an acid generator used in chemically amplified resist compositions, for example, Korean Patent Application
25 No. 10-2006-0104564 (hereinafter, referred to as "Patent

Document 1") discloses an acid generator represented by the following formula (A):

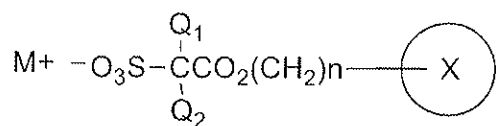
[Formula A]



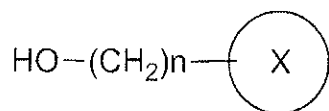
5 wherein ring X is a monocyclic or bicyclic hydrocarbon group having 3 to 30 carbon atoms, and the ring X is unsubstituted, or substituted with an alkyl group having 1 to 6 carbon atoms, an alkenyl group having 2 to 6 carbon atoms, an alkoxy group having 2 to 6 carbon atoms or a perfluoroalkyl
10 group having 1 to 4 carbon atoms at one or more positions on the ring; Q^1 and Q^2 each independently represent a fluorine atom or a perfluoroalkyl group having 1 to 6 carbon atoms; A^+ represents an organic counterion; and n is an integer from 1 to 12.

15 The Patent Document 1 also discloses, as an intermediate for the production of the acid generator, for example, an organic compound represented by the following formula (B). Specifically, the patent document discloses a method for preparing an ester compound of the formula (B) by
20 reacting an alcohol compound represented by the following formula (C) with a carboxylic acid compound represented by the following formula (D):

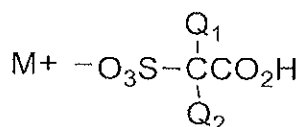
[Formula B]



[Formula C]



[Formula D]

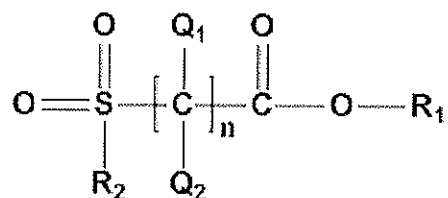


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wherein in the formulas (B) to (D), X, Q₁, Q₂ and n have the same meanings as defined above for the formula (A); and M represents lithium (Li), sodium (Na), potassium (K) or silver (Ag).

10 Here, the formula (D) is a product obtained in a carboxylic acid form by hydrolyzing a compound of the following formula (1) with a strong base such as NaOH:

[Formula 1]



15 wherein R₁ and R₂ each independently represent any one selected from the group consisting of a halogen atom, a hydroxyl group, a carboxyl group, a nitrile group, an aldehyde group, an epoxy group, an alkyl group, a cycloalkyl

group, a heterocycloalkyl group, an aryl group and a heteroaryl group;

Q_1 and Q_2 each independently represent any one selected from the group consisting of a hydrogen atom, a halogen atom
5 and a perfluoroalkyl group; and

n is an integer from 1 to 10.

However, the compound of the formula (D) is obtained through two steps of reactions, and the product from each reaction step must be separated through separate
10 purification processes. Furthermore, when a reaction intermediate produced during the purification process carried out after the first step reaction is separated from an aqueous solution phase, the reaction intermediate adheres to the reaction vessel, so that there arises a problem that
15 the yield drop is significant, which is industrially undesirable.

Korean Unexamined Patent Application No. 10-2008-0099784 discloses inventions related to crystals of an organic compound and a method for production thereof, and
20 the document suggests a method of obtaining crystals using a porous film in order to increase the yield of the first step reaction. However, there is a limit in this method to be used in an industrial scale, and since the solubility of carboxylic acid is poor, the yield of the esterification
25 reaction as the second step reaction is also low. There is

also a problem that the particles of the product substance are so small that it is difficult to filter the particles during the purification process.

SUMMARY OF THE INVENTION

The present invention has been made in view of such circumstances, and it is an object of the invention to provide a method for preparing a sulfonium salt, which, unlike the conventional methods that are achieved in two-step reactions, employs a reduced number of reaction steps to enhance the yield of the sulfonium salt serving as an intermediate for the acid generator, and enables large-scale syntheses without requiring separation by purification of the product substance at each reaction step.

It is another object of the present invention to provide a sulfonium salt prepared by the method for preparing a sulfonium salt described above.

BRIEF DESCRIPTION OF THE DRAWINGS

Fig. 1 is a nuclear magnetic resonance spectrum of the sulfonium salt produced according to Example 1 of the present invention;

Fig. 2 is a nuclear magnetic resonance spectrum of the sulfonium salt produced according to Example 2 of the present invention; and

Fig. 3 is a nuclear magnetic resonance spectrum of the sulfonium salt produced according to Example 3 of the present invention.

DESCRIPTION OF THE PREFERRED EMBODIMENTS

Hereinafter, the present invention will be described in detail so that those having ordinary skill in the art to which the present invention is pertained may easily carry out the invention. However, it will be apparent to those skilled in the art that the present invention definitely includes various modifications and modifications, and the present invention is not intended to be limited to the exemplary embodiments explained herein.

All of the compounds or substituents as used herein may be unsubstituted or substituted, unless stated otherwise. Here, the term "substituted" means that a hydrogen atom of the compound or substituent is substituted by any one selected from the group consisting a halogen atom, a hydroxyl group, a carboxyl group, a nitrile group, a cyano group, an aldehyde group, an epoxy group, an alkyl group, a perfluoroalkyl group, a hydroxyalkyl group, a cycloalkyl group, a heterocycloalkyl group, an alkoxy group, an allyl group, a benzyl group, an aryl group, a heteroaryl group, derivatives thereof and combinations thereof.

Unless stated otherwise, the "halogen atom" as used

herein means any one atom selected from the group consisting of fluorine, chlorine, bromine and iodine.

Unless stated otherwise, the "perfluoroalkyl group" as used herein means an "alkyl group" having a part or all of the hydrogen atoms substituted by fluorine.

Unless stated otherwise, the "heterocycloalkyl group" or "heteroaryl group" as used herein means a "cycloalkyl group" or "aryl group" containing 1 to 3 heteroatoms selected from the group consisting of nitrogen (N), oxygen (O), sulfur (S) and phosphorus (P) within one ring, with the other atoms in the ring being carbon atoms.

Unless stated otherwise, the "alkyl group" as used herein means a linear or branched alkyl group having 1 to 30 carbon atoms; the "allyl group" as used herein means a linear or branched allyl group having 2 to 30 carbon atoms; the "perfluoroalkyl group" as used herein means a linear or branched perfluoroalkyl group having 1 to 30 carbon atoms; the "cycloalkyl group" as used herein means a cycloalkyl group having 3 to 30 carbon atoms; the "heterocycloalkyl group" as used herein means a heterocycloalkyl group having 2 to 30 carbon atoms; and the "aryl group" means an aryl group having 6 to 30 carbon atoms. The "alkylene group" as used herein means a linear or branched alkylene group having 1 to 30 carbon atoms; the "perfluoroalkylene group" as used herein means a linear or branched perfluoroalkylene group

having 1 to 30 carbon atoms; the "cycloalkylene group" as used herein means a cycloalkylene group having 3 to 30 carbon atoms; the "heterocycloalkylene group" as used herein means a heterocycloalkylene group having 2 to 30 carbon atoms; and the "arylene group" as used herein means an
5 arylene group having 6 to 30 carbon atoms.

Unless stated otherwise, the "norbornyl group" as used herein means a monocyclic or polycyclic norbornyl group having 7 to 30 carbon atoms; and the "adamantyl group" as
10 used herein means an adamantyl group having 10 to 30 carbon atoms.

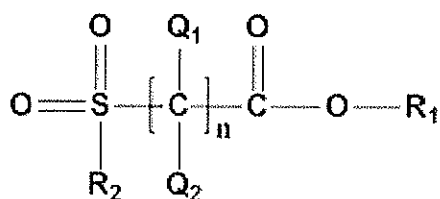
According to an embodiment of the present invention, there is provided a method for preparing a sulfonium salt, in which a sulfonium salt can be produced with a high yield
15 through reduced reaction steps and simplified production processes. Hereinafter, the method for preparing a sulfonium salt will be explained.

The method for preparing a sulfonium salt of the present invention is actually carried out in a one-step
20 reaction without any purification processes, unlike the conventional methods that require purification processes at each step. However, the method will be explained, with the first step and the second step divided for the reader's convenience.

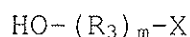
25 The method for preparing a sulfonium salt includes a

first step of adding a compound represented by the following formula (2) to a compound represented by the following formula (1) and subjecting the compounds to a transesterification reaction to produce a reaction intermediate;
 5 and a second step of adding an inorganic salt to the reaction intermediate and subjecting the compounds to a substitution reaction to produce a compound represented by the following formula (3).

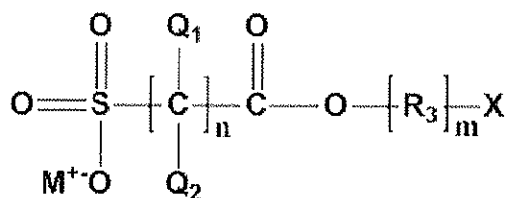
[Formula 1]



[Formula 2]



[Formula 3]



15 wherein in the formulas (1) to (3),

R₁ and R₂ each independently represent any one selected from the group consisting of a halogen atom, a hydroxyl group, a carboxyl group, a nitrile group, an aldehyde group, an epoxy group, an alkyl group, a cycloalkyl group, a

heterocycloalkyl group, an aryl group and a heteroaryl group;

R₃ represents any one selected from the group consisting of an alkylene group, a perfluoroalkylene group, a cycloalkylene group, a heterocycloalkylene group, an arylene group and a heteroarylene group;

Q₁ and Q₂ each independently represent any one selected from the group consisting of a hydrogen atom, a halogen atom and a perfluoroalkyl group;

10 X represents any one selected from the group consisting of a hydrogen atom, an alkyl group, a perfluoroalkyl group, an alkoxy group, a cycloalkyl group, an allyl group, an aryl group and a heteroaryl group;

M represents any one selected from the group consisting of Li, Na, K and Ag;

n is an integer from 1 to 10; and

m is an integer from 0 to 10.

In regard to Q₁ and Q₂, the halogen atom may be a fluorine atom.

20 In regard to X, any alkyl group may be used as long as it is an alkyl group having 1 to 30 carbon atoms, and the alkyl group may be a cycloalkyl group, or an alkyl group substituted with an aryl group, more specifically, a benzyl group. The cycloalkyl group for X may be a monocyclic or
25 polycyclic cycloalkyl group.

In regard to X, the alkyl group, alkoxy group or perfluoroalkyl group may have at least one or more hydrogen atoms substituted by any one selected from the group consisting of an ether group, an ester group, a carbonyl group, an acetal group, an epoxy group, a nitrile group, an aldehyde group and a cyano group.

Specifically, X may be a monocyclic or polycyclic hydrocarbon group having 3 to 30 carbon atoms that can be selected from the group consisting of an adamantyl group, a norbornyl group, a cycloalkyl group, a heterocycloalkyl group, an aryl group and a heteroaryl group.

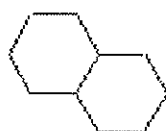
More specifically, X may be in the form of the following formulas (1-a) to (1-h):



1-a



1-b



1-c



1-d



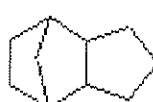
1-e



1-f



1-g



1-h

X which is represented by the formulas (1-a) to (1-h) has a form in which any one hydrogen atom at any position is bonded to the adjacent group, and at least one hydrogen atom among the hydrogen atoms constituting the ring, excluding the hydrogen atoms bonded to the adjacent group, may be substituted by any one substituent selected from the group

consisting of an alkyl group, an alkoxy group, and a hydroxyalkyl group.

Specifically, in the first step reaction, the compound represented by the formula (1) and the compound represented
5 by the formula (2) are dissolved in a solvent, and the solution is heated to reflux and stirred, to thus produce a reaction intermediate.

The solvent may be any one selected from the group consisting of an ester, an ether, a lactone, a ketone, an
10 amide, an alcohol, and combinations thereof, and any one selected from the group consisting of benzene, toluene, xylene, halogenated benzene, diethyl ether, tetrahydrofuran and combinations thereof can be preferably used, but the present invention is not intended to be limited to these.

15 The reflux and stirring can be carried out at a temperature of 50°C to 200°C for 2 to 8 hours, and preferably at a temperature of 80°C to 150°C for 3 to 6 hours. When the time and temperature for the reflux and stirring fall in the range mentioned above, the conditions are preferable to
20 carry out the trans-esterification reaction.

Simultaneously with or subsequently to the reflux and stirring, alcohol, being a reaction side product, can be removed from a reaction mixture liquid containing the compound represented by the formula (1) mixed with the
25 compound represented by the formula (2). The removal of the

side product alcohol can prevent the occurrence of a reverse reaction, and can help the reaction to proceed in the desired direction, thereby increasing the reaction yield.

The removal of alcohol may be achieved by any
5 conventional method to remove alcohol from a mixed liquid, and in general, alcohol can be removed by utilizing the low boiling point of alcohol, and preferably by using a Dean-Stark apparatus. However, the present invention is not intended to be limited to these.

10 The reaction mixture liquid from which the side product alcohol has been removed, can be heated to reflux again at a temperature of 50°C to 200°C for 8 to 18 hours, and can be heated to reflux preferably at a temperature of 80 to 150°C for 10 to 13 hours. It is preferable for the reflux to be
15 achieved at a temperature and time in the ranges mentioned above, in order to completely finish the reaction.

The contents of the compound represented by the formula (1) and the compound represented by the formula (2) can be appropriately regulated according to the reaction conditions.

20 When the compound represented by the formula (2) is used at a molar ratio of 1 to 10 relative to the compound represented by the formula (1), the yield can be enhanced.

After completing the reaction by refluxing, the solvent is removed, and an inorganic salt is added. The mixture is
25 subjected to a substitution reaction, and thus the compound

represented by the formula (3) is produced. The reaction intermediate produced at the first step easily reacts with the nucleophile of the inorganic salt, and thus forms the compound represented by the formula (3).

5 The inorganic salt may be any compound as long as it can provide a nucleophile to the reaction intermediate, and may be any one of halides, nitrates, nitrites, sulfates, sulfites, thiosulfates, phosphates, borates, oxalates, carbonates, hydrogen carbonates and acetates of the elements
10 of Group 1, Group 2, and Group 6 to Group 14 of the Periodic Table. Specific examples thereof that can be used in the present invention include lithium carbonate, sodium carbonate, potassium carbonate, silver carbonate, rubidium carbonate, cesium carbonate, calcium carbonate, strontium
15 carbonate, barium carbonate, chromium carbonate, ruthenium carbonate, cobalt carbonate, rhodium carbonate, nickel carbonate, cadmium carbonate, aluminum carbonate, gallium carbonate, tin carbonate, lithium hydrogen carbonate, sodium hydrogen carbonate, potassium hydrogen carbonate, copper
20 acetate, lead acetate, sodium citrate, and the like.

Particularly, as the inorganic salt, a carbonate or hydrogen carbonate of a metal selected from the group consisting of Li, Na, K and Ag can be preferably used. The carbonate or hydrogen carbonate of a metal selected from the
25 group consisting of Li, Na, K and Ag is used instead of NaOH

or KOH, which are both used in the methods of the related art. When these inorganic salts are used, the occurrence of any undesirable hydrolysis reaction induced by NaOH or KOH can be prevented, and it is not necessary to carry out the
5 reaction in an aqueous solution phase since NaOH or KOH is not used. Therefore, the phenomenon of the reaction product adhering to the surface of the reaction vessel after the reaction can be prevented, and thus the yield can be increased.

10 The content of the inorganic salt can be appropriately regulated in accordance with the reaction conditions. When the inorganic salt is used at a molar ratio of 1 to 5 relative to the compound represented by the formula (1), substitution of the compound into an inorganic salt form may
15 be preferably achieved.

The inorganic salt is added to the reaction intermediate produced at the first stage reaction to prepare a reaction mixture liquid, and then the mixture is stirred to allow the reaction to proceed. The stirring may be
20 carried out at a temperature of 10°C to 100°C for 2 to 9 hours, and preferably at a temperature of 40°C to 80°C for 4 to 6 hours. When the stirring is carried out within the range of temperature and time mentioned above, it is preferable from the viewpoint of enhancing the yield.

25 The reaction mixture liquid is then washed with a

washing liquid, the liquid layer is concentrated, and then an excess amount of a solvent is added to the liquid layer. The mixture is then heated and stirred, any insoluble inorganic salt is removed therefrom, and the liquid is concentrated and subjected to crystallization. Thus, the compound represented by the formula (3) produced in the reaction can be separated.

The washing liquid that can be used in the present invention may be any one selected from the group consisting of an ester, an ether, a lactone, a ketone, an amide, an alcohol and combinations thereof, and specifically, any one selected from the group consisting of hexane, heptane, benzene, toluene, xylene, halogenated benzene, ether, diethyl ether, tetrahydrofuran and combinations thereof can be used as the washing liquid. In particular, any one selected from the group consisting of hexane, ether, heptane, acetonitrile, acetone, dichloromethane and combinations thereof can be used, but the present invention is not intended to be limited to these.

The solvent that is added in excess after concentrating the liquid layer of the reaction mixture liquid, may be any one selected from the group consisting of an ester, an ether, a lactone, a ketone, an amide, an alcohol and combinations thereof, and specifically, any one selected from the group consisting of benzene, toluene, xylene, halogenated benzene,

diethyl ether, tetrahydrofuran and combinations thereof can be used as the solvent. In particular, any one selected from the group consisting of ethyl acetate, diethyl ether and combinations thereof can be used, but the present
5 invention is not intended to be limited to these.

The heating and stirring can be carried out at a temperature of 30°C to 80°C for 3 to 12 hours, and preferably at a temperature of 40°C to 60°C for 4 to 8 hours. When the heating and stirring is carried out in the range of
10 temperature and time mentioned above, it is preferable from the viewpoint that the solubility of the product increases.

Unlike the conventional methods, the method for preparing a sulfonium salt of the present invention can be simplified in the production processes by reducing the
15 reaction steps. Furthermore, unlike the conventional methods where purification processes are required at the end of each reaction step, the method of the present invention does not require purification processes in the middle of the reaction processes, and thus the problem usually occurring
20 in the conventional methods, such as that reaction intermediates adhere to the reaction vessel, causing yield drops, is solved in the method of the present invention. Thus, the production processes are simple, and also high yields may be obtained.

25 According to another embodiment of the present

arylene group and a heteroarylene group;

Q_1 and Q_2 each independently represent any one selected from the group consisting of a hydrogen atom, a halogen atom and a perfluoroalkyl group;

5 X represents any one selected from the group consisting of a hydrogen atom, an alkyl group, a perfluoroalkyl group, an alkoxy group, a cycloalkyl group, an allyl group, an aryl group and a heteroaryl group;

A^+ represents an organic counterion;

10 n is an integer from 1 to 10; and

m is an integer from 0 to 10.

The method of the present invention can prepare a sulfonium salt with a high yield, by employing simplified reaction steps, and solving the problem occurring in the
15 production processes of the conventional methods, such as that reaction intermediates adhere to the reaction vessel during the purification processes, causing a decrease in yield.

Simple variations and modifications of the present
20 invention can be easily carried out by those having ordinary skill in the art, and these variations and modifications are all regarded to be included in the scope of the present invention.

Hereinafter, Examples of the present invention will be
25 described in detail so that those skilled in the art can

easily carry out the invention. However, the present invention can be materialized in many variations and modifications which are not limited to the Examples described herein.

5

EXAMPLES

[Example 1]

600 g (3.12 mol) of methyl 2,2-difluoro-2-(fluorosulfonyl)acetate and 534.6 g of (4.68 mol) of
10 cyclohexylmethanol were dissolved in 6 L of toluene, and the mixture was heated to reflux under stirring. After 4 hours of stirring, the reaction flask was connected to a Dean-Stark apparatus, and methanol in the reaction mixture liquid was removed. Subsequently, the Dean-Stark apparatus was
15 removed, and the reaction liquid was heated to reflux for 12 hours.

When the reaction was completed, the solvent was removed, and 1.5 L (4.25 mol) of a 30% aqueous solution of sodium carbonate (Na_2CO_3) was added to the reaction
20 concentrate. The mixture was stirred for 5 hours.

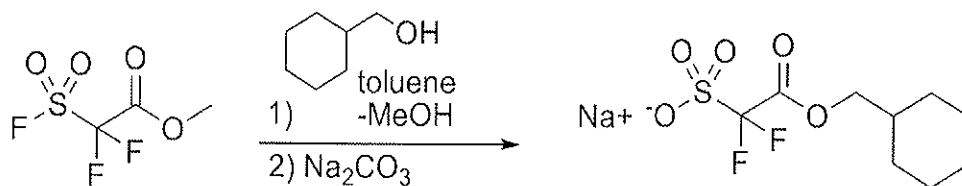
The reaction mixture liquid was washed with ether, the aqueous layer was concentrated, and then an excess amount of ethyl acetate (EA) was introduced to the concentrate. The internal temperature was raised to about 50°C, and then the
25 mixture was stirred for 6 hours. Any insoluble inorganic

salt was removed by filtration, and crystallization was induced by concentrating ethyl acetate. The solid obtained in the form of crystals was dried in a vacuum, and the structure of the solid was confirmed by ^1H -NMR.

5 The solid was subjected to drying and filtration, and thus 744 g (yield 81%) of 2-(cyclohexylmethoxy)-1,1-difluoro-2-oxoethanesulfonate was obtained.

^1H -NMR (dimethyl sulfoxide- d_6 , internal standard: tetramethylsilane): (ppm) 4.01(d, 2H), 1.66(m, 6H), 0.81-
10 1.27(m, 5H)

[Reaction scheme 1]



[Example 2]

600 g (3.12 mol) of methyl 2,2-difluoro-2-(fluorosulfonyl)acetate and 591 g (4.6 mol) of bicyclo[2.2.1]heptan-2-ylmethanol were dissolved in 6 L of toluene, and the solution was heated to reflux under stirring. After 4 hours of stirring, the reaction flask was connected to a Dean-Stark apparatus, and methanol in the
15 reaction mixture liquid was removed. Subsequently, the Dean-Stark apparatus was removed, and the reaction liquid was heated to reflux for 12 hours.

When the reaction was completed, the solvent was

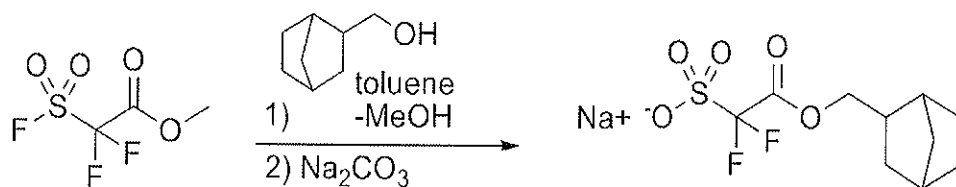
removed, and 1.5 L (4.25 mol) of a 30% aqueous solution of sodium carbonate (Na_2CO_3) was added to the reaction concentrate. The mixture was stirred for 5 hours.

The reaction mixture liquid was washed with ether, the aqueous layer was concentrated, and then an excess amount of ethyl acetate (EA) was introduced to the concentrate. The internal temperature was raised to about 50°C , and then the mixture was stirred for 6 hours. Any insoluble inorganic salt was removed by filtration, and crystallization was induced by concentrating ethyl acetate. The solid obtained in the form of crystals was dried in a vacuum, and the structure of the solid was confirmed by ^1H -NMR.

The solid was subjected to drying and filtration, and thus 784.8 g (yield 82.8%) of sodium 2-(bicyclo[2.2.1]heptan-2-ylmethoxy)-1,1-difluoro-2-oxoethanesulfonate was obtained.

^1H -NMR (CD_3CN): (ppm) 3.82-4.91(m, 2H), 0.65-2.31(m, 11H)

[Reaction scheme 2]



[Example 3]

600 g (3.12 mol) of methyl 2,2-difluoro-2-(fluorosulfonyl)acetate and 504 g (4.66 mol) of benzyl

alcohol were dissolved in 10 ml of toluene, and the solution was heated to reflux under stirring. After 4 hours of stirring, the reaction flask was connected to a Dean-Stark apparatus, and methanol in the reaction mixture liquid was removed. Subsequently, the Dean-Stark apparatus was removed, and the reaction liquid was heated to reflux for 12 hours.

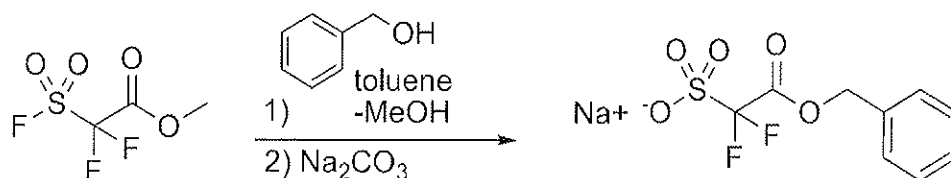
When the reaction was completed, the solvent was removed, and 1.5 L (4.25 mol) of a 30% aqueous solution of sodium carbonate (Na_2CO_3) was added to the reaction concentrate. The mixture was stirred for 5 hours.

The reaction mixture liquid was washed with ether, the aqueous layer was concentrated, and then an excess amount of ethyl acetate (EA) was introduced to the concentrate. The internal temperature was raised to about 50°C , and then the mixture was stirred for 6 hours. Any insoluble inorganic salt was removed by filtration, and crystallization was induced by concentrating ethyl acetate. The solid obtained in the form of crystals was dried in a vacuum, and the structure of the solid was confirmed by ^1H -NMR.

The solid was subjected to drying and filtration, and thus 765 g (yield 85%) of sodium 2-(benzoyloxy)-1,1-difluoro-2-oxoethanesulfonate was obtained.

^1H -NMR (dimethyl sulfoxide- d_6 , internal standard: tetramethylsilane): (ppm) 7.41(m, 5H), 4.82(s, 2H)

[Reaction Scheme 3]



[Comparative Example]

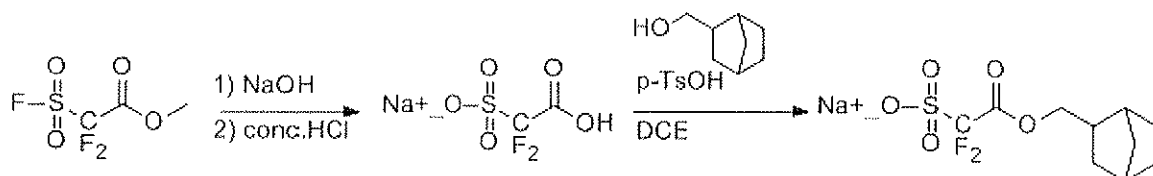
(1) 750 g of water was introduced to 300 g of methyl 2,2-difluoro-2-(fluorosulfonyl)acetate, and while the mixture was stirred, a 30% aqueous solution of sodium hydroxide was slowly added dropwise to the mixture. Subsequently, the mixture was heated to reflux for 3 hours under stirring. After the reaction mixture was cooled, the reaction mixture liquid was neutralized using concentrated hydrochloric acid, and the reaction mixture liquid was concentrated to obtain 416 g of sodium carboxydifluoromethanesulfonate (containing inorganic salts, yield: 75%, purity: 60%).

(2) 100 g of sodium carboxydifluoromethanesulfonate (purity: 60%) and 76 g of bicyclo[2.2.1]heptan-2-ylmethanol were dissolved in 0.5 L of dichloroethane (DCE), and 37 g of p-toluenesulfonic acid, p-TsOH) was added to the solution. Subsequently, the reaction mixture was heated to reflux for 5 hours.

The mixture was concentrated to remove dichloroethane, and then 0.5 L of acetonitrile was added thereto. The resulting mixture was stirred. The stirred mixture was filtered and concentrated, and thus 26 g (yield: 27%) of

sodium 2-(bicyclo[2.2.1]heptan-2-ylmethoxy)-1,1-difluoro-2-oxoethanesulfonate was obtained.

[Reaction scheme 4]



5 The yields of the sulfonium salt produced in the Examples 1 to 3 and the Comparative Example are presented in the following Table 1.

[Table 1]

	Example 1	Example 2	Example 3	Comparative Example
No. of purification processes	0	0	0	1
No. of reaction steps	1	1	1	2
Overall yield (%)	81	82.8	85	20.3
Yield at each step (%)	—	—	—	(1) 75 (2) 27

10 In the case of the Comparative Example, it can be seen that the reaction yield at the second step indicated by (2) has markedly decreased, and therefore, the overall yield of the Comparative Example has dropped to 20.3%. On the contrary, in the Examples 1 to 3 of the present invention which do not employ any purification processes, the reaction
15 process has been simplified with the number of reaction steps reduced to one-step. Thus, it can be seen that since the product does not go through purification processes, the

reaction is made simpler, and the yield is also increased.

Specifically, while the overall reaction yield is 20.3% in the Comparative Example, the overall reaction yield is as high as 81% in Example 1, 82.8% in Example 2, and 85% in
5 Example 3.

The foregoing description of preferable exemplary embodiments of the present invention has been provided in detail, but the scope of rights of the present invention is not intended to be limited to these. Many variations and
10 modifications of the present invention that may be made by those skilled in the art based on the basic concept of the invention as defined by the following claims, also belong to the scope of rights of the present invention.

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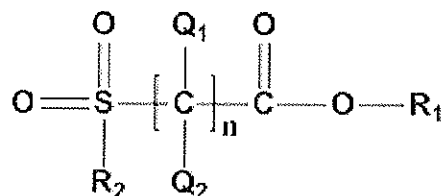
WHAT IS CLAIMED IS:

1. A method for preparing a sulfonium salt, comprising:

5 adding a compound represented by the following formula (2) to a compound represented by the following formula (1) and subjecting the compounds to a trans-esterification reaction to produce a reaction intermediate; and

adding an inorganic salt to the reaction intermediate
10 and subjecting the compounds to a substitution reaction to produce a compound represented by the following formula (3):

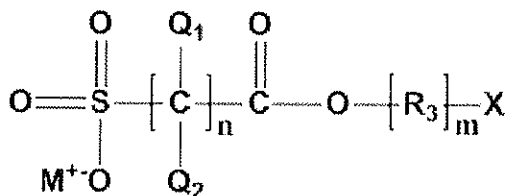
[Formula 1]



[Formula 2]

15 HO-(R₃)_m-X

[Formula 3]



wherein in the formulas (1) to (3),

R₁ and R₂ each independently represent any one selected

from the group consisting of a halogen atom, a hydroxyl group, a carboxyl group, a nitrile group, an aldehyde group, an epoxy group, an alkyl group, a cycloalkyl group, a heterocycloalkyl group, an aryl group and a heteroaryl group;

R₃ represents any one selected from the group consisting of an alkylene group, a perfluoroalkylene group, a cycloalkylene group, a heterocycloalkylene group, an arylene group and a heteroarylene group;

Q₁ and Q₂ each independently represent any one selected from the group consisting of a hydrogen atom, a halogen atom and a perfluoroalkyl group;

X represents any one selected from the group consisting of a hydrogen atom, an alkyl group, a perfluoroalkyl group, an alkoxy group, a cycloalkyl group, an allyl group, an aryl group and a heteroaryl group;

M represents any one selected from the group consisting of lithium (Li), sodium (Na), potassium (K) and silver (Ag);

n is an integer from 1 to 10; and

m is an integer from 0 to 10.

2. The method for preparing a sulfonium salt according to claim 1, wherein the alcohol produced as a side product of the trans-esterification reaction in the first reaction step is removed.

3. The method for preparing a sulfonium salt according to claim 1, wherein the inorganic salt is the carbonate or hydrogen carbonate of a metal selected from the group
5 consisting of Li, Na, K and Ag.

4. The method for preparing a sulfonium salt according to claim 1, wherein X is any one selected from the group consisting of an adamantyl group, a norbornyl group, a
10 cycloalkyl group, a heterocycloalkyl group, an aryl group and a heteroaryl group.

5. A sulfonium salt prepared by the method for preparing a sulfonium salt according to any one of claims 1
15 to 4.