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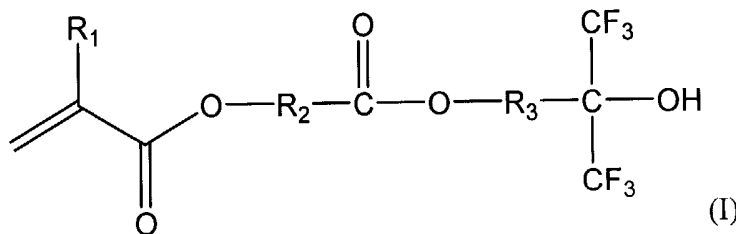
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(54) Title: NEW HEXAFLUOROALCOHOL-BASED MONOMERS AND PROCESSES OF PREPARATION THEREOF

(57) Abstract: The present invention
relates to compounds of formula (I):
wherein R₁ is H, or a C₁-C₁₀ linear,
branched or cyclic alkyl group which
is unsubstituted or substituted with
fluorine; R₂ is an alicyclic group
having 5 to 20 carbon atoms which
is unsubstituted or substituted with
fluorine; and R₃ represents a C₁-C₁₀
linear or branched alkylène which
is unsubstituted or substituted withfluorine. Processes for preparing such compounds are also disclosed. The compounds of the present invention can be used as
monomers in the fields of photolithography and semiconductor fabrication.

NEW HEXAFLUOROALCOHOL-BASED MONOMERS
AND PROCESSES OF PREPARATION THEREOF

TECHNICAL FIELD

5 The present invention is related to the fields of photolithography and semiconductor fabrication. More specifically, this invention relates to novel compounds or monomers comprising a hexafluoroalcohol moiety. These compounds are particularly useful in the preparation of base resins used for chemical amplification resist compositions suited for microfabrication.

10 **BACKGROUND OF THE INVENTION**

 Trends in the photolithography and semiconductor industry continually require higher circuit density in microelectronic substrates which are made from ultrafine pattern consisting of lines having a width of 0.25 microns or less.

15 For imaging very fine features at the submicron level in semiconductor devices, higher photoimaging resolution is necessary. In order to achieve this, photoresist material is irradiated using electromagnetic radiation in the far or extreme ultraviolet region (193 nm or less).

20 However, wavelength of 193 nm or less correspond to the absorption maximum of the aromatic rings and therefore photoresist materials containing aromatic rings so far used by industry become inadequate and useless for application within these wavelength ranges.

 Thus, with changes in the exposure wavelength, photoresist
25 compositions have to be modified and therefore new classes of compounds having different structures and photosensitivity mechanisms should be introduced.

In recent years, various resist materials having transparency to short wavelength imaging radiation with sufficient resistance to a reactive etching processing environment have been developed. Among these materials, acrylic polymers containing alicyclic structures have been
5 proposed.

These acrylic polymers attracted attention since they were easily prepared and also in view of their transparency at short wavelength (193 nm or less). They also have been found to have an interesting etch resistance essentially due to alicyclic structures such as adamantanes,
10 norbornanes, and the like.

Unfortunately, these polymers exhibit poor solubility in an alkaline aqueous solution and also poor adhesion to the substrate due to hydrophobic properties of the polymer. In order to overcome these problems, there have been some reports of polar hydroxyl- and fluorine-
15 containing norbornene materials.

However, with respect to a resist material of a sufficient transparency at wavelength of 193 nm or less and etch resistance, there is a growing need for new materials having improved performances such as superior pattern contrast (change in solubility upon irradiation) and
20 improved adhesive strength to the substrate.

Thus, there is clearly a need for novel compounds which can permit to overcome the above-mentioned drawbacks.

SUMMARY OF THE INVENTION

It is therefore an object of the present invention to provide
25 compounds that can be useful as polymerizable monomers which can be used in the preparation of polymers having a superior pattern contrast.

It is also another object of the present invention to provide compounds that can be used as polymerizable monomers in the preparation of high transparency polymers.

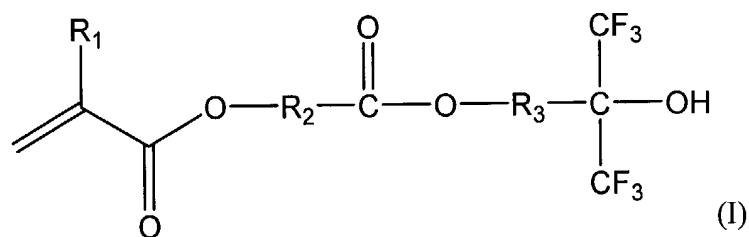
It is also another object of the present invention to provide
 5 compounds that can be used as polymerizable monomers in the preparation of polymers having a high etching resistance and an excellent resolution and sensitivity.

It is also another object of the present invention to provide compounds that can be used as polymerizable monomers in the
 10 preparation of polymers which have an improved adhesion to a substrate.

It is also another object of the present invention to provide compounds which could be produced at low costs.

It is also another object of the present invention to provide a process for preparing the previously mentioned compounds.

15 According to one aspect of the invention there is provided a compound of formula (I):



wherein

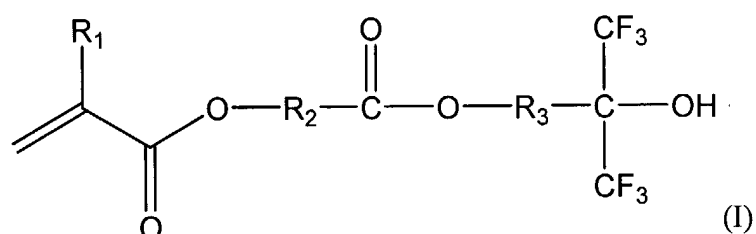
R₁ is H, or a C₁-C₁₀ linear, branched or cyclic alkyl group
 20 which is unsubstituted or substituted with fluorine;

R₂ is an alicyclic group having 5 to 20 carbon atoms which is unsubstituted or substituted with fluorine; and

R_3 represents a C_1 - C_{10} linear or branched alkylene which is unsubstituted or substituted with fluorine.

It has been found that the compounds of the present invention upon polymerization, can provide polymers of high transparency, etching resistance and excellent resolution and sensitivity.

According to another aspect of the invention there is provided a process for preparing a compound of formula (I):



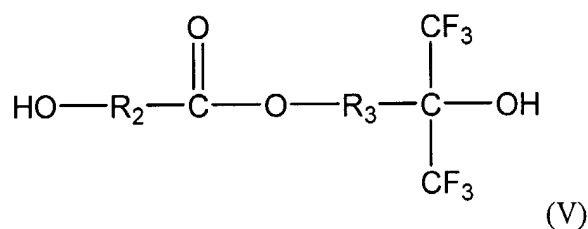
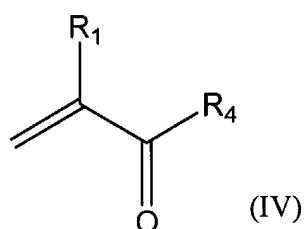
wherein

R_1 is H, or a C_1 - C_{10} linear, branched or cyclic alkyl group which is unsubstituted or substituted with fluorine;

R_2 is an alicyclic group having 5 to 20 carbon atoms which is unsubstituted, or substituted with fluorine; and

R_3 represents a C_1 - C_{10} linear or branched alkylene which is unsubstituted or substituted with fluorine,

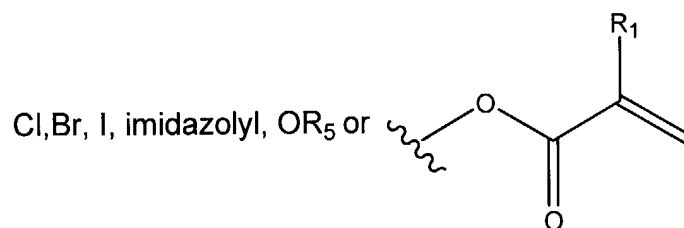
comprising the step of reacting together a compound of formula (IV) and a compound of formula (V):



wherein

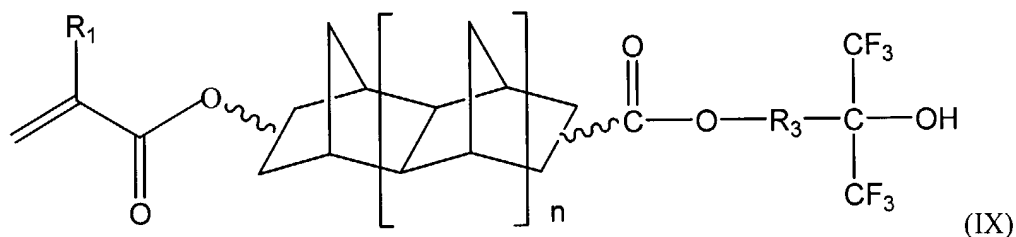
R_1 , R_2 , and R_3 are as previously defined; and

R_4 is



5 and wherein R_5 is H, or a C_1 - C_6 branched or linear alkyl.

According to another aspect of the invention there is provided a process for preparing a compound of formula (IX):



wherein

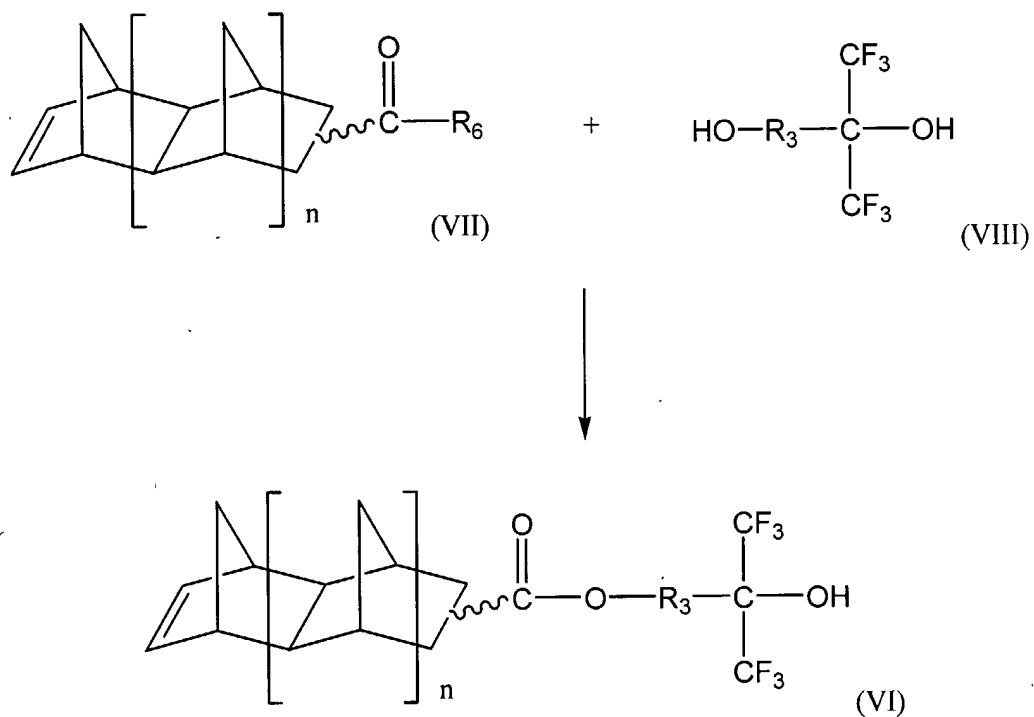
10 R_1 is H, or a C_1 - C_{10} a linear, branched or cyclic alkyl group which is unsubstituted or substituted with fluorine.

R_3 represents a C_1 - C_{10} linear or branched alkylene which is unsubstituted or substituted with fluorine.

n has a value of 0 or 1,

15 comprising the steps of

a) reacting together a compound of formula (VII) and a compound of formula (VIII) so as to obtain a compound of formula (VI):



5

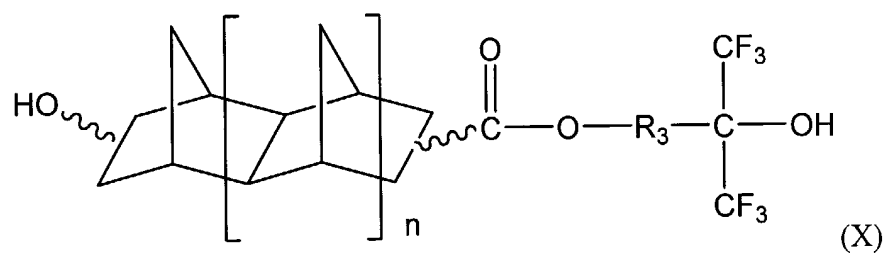
wherein

n and R₃ are as previously defined;

R₆ is Cl, Br, I, imidazolyl or OR₇, R₇ being H, a C₁-C₆ branched or linear alkyl

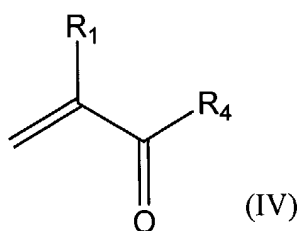
10

b) hydroxylating the compound of formula (VI) so as to obtain a compound of formula (X);



wherein n and R₃ are as previously defined

c) reacting the compound of formula (X) together with a compound of formula (IV)

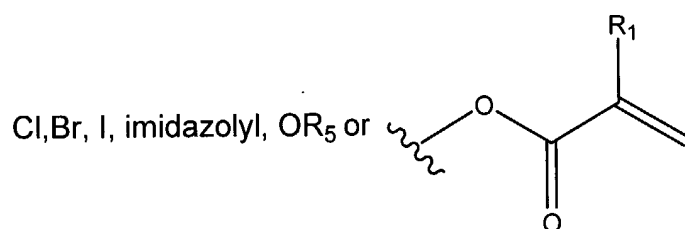


5

wherein

R₁ is as previously defined;

R₄ is



10

wherein

R₁ is as previously defined;

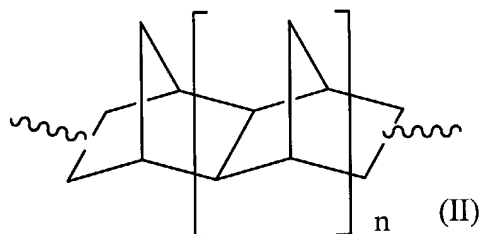
R₅ is a C₁-C₆ branched or linear alkyl,

so as to obtain said compound of formula (IX).

It has been found that the processes of the present invention permit to efficiently and economically prepare the previous mentioned compounds. It has also been found that these processes can
5 be applied to large or industrial scale.

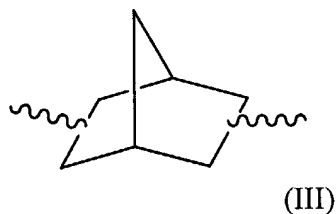
The expression "alicyclic group having 5 to 20 carbon atoms" as used herein refers to a C₅-C₂₀ cycloaliphatic group which is monocyclic or polycyclic. The cycloaliphatic monocyclic group is preferably cyclopentyl or cyclohexyl. The cycloaliphatic polycyclic group is
10 preferably norbornyl, adamantyl or tricyclo[5.2.1.0]decanyl.

In the compounds and processes of the present invention R₁ is preferably H or CH₃. R₂ is preferably a group of formula (II):

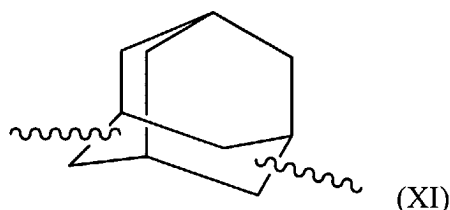


wherein n has a value of 0 or 1, and wherein said R₂ group is
15 unsubstituted or substituted with fluorine. The person skilled in the art will understand from formula (II) that the latter can be substituted by one or more fluorine atoms at the positions where there is a hydrogen atom.

Alternatively, R₂ can be a group of formula (III):



R₂ can also be of formula (XI):



The compounds of formulas (III) and (XI) can also be substituted by a fluorine atom as previously indicated for formula (II).

5 In the compounds and processes of the present invention R₃ is preferably an unsubstituted C₃-C₇ linear or branched alkylene.

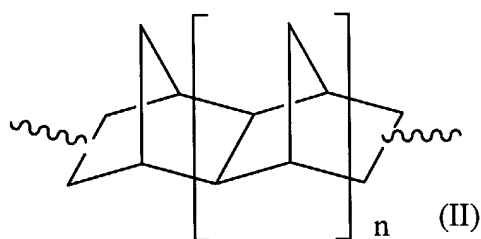
 In the process for preparing a compound of formula (I), the compounds of formulas (IV) and (V) are preferably reacted together in the presence of a base and/or a coupling reagent. Similarly, in the process for preparing a compound of formula (IX), the compounds of formulas (VII) and (VIII) are preferably reacted together in the presence of a base and/or a coupling reagent. The base can be triethylamine, EtN-iPr₂, 4-dimethylaminopyridine, NaHCO₃, Na₂CO₃, KHCO₃, K₂CO₃, Cs₂CO₃, 2,6-lutidine, 1,8-diazabicyclo[5.4.0]undec-7-ene (DBU), Li₂CO₃ etc. The

10 coupling reagent can be 1,3-dicyclohexylcarbodiimide (DCC), 1-cyclohexyl-3-(2-morpholinoethyl)carbodiimide metho-p-toluenesulfonate, 1-ethyl-3-(3'-dimethylaminopropyl)carbodiimide hydrochloride (EDCI), (CH₃)₃SiCl, (CH₃)₂SiCl₂, CH₃SiCl₃, SiCl₄, isopropenyl chloroformate, TiCl₄, AgClO₄, benzotriazol-1-yloxytris(dimethylamino)phosphonium

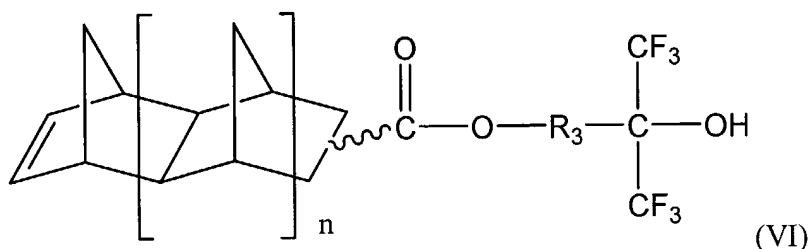
15 Hexafluorophosphate (BOP), O-benzotriazol-1-yl-N,N,N',N'-tetramethyluronium hexafluoro-phosphate (HBTU), bis(2-oxo-3-oxazolidinyl)phosphinic chloride (BOP-Cl) etc.

20

 In the process for preparing a compound of formula (I), R₂ is preferably a group of formula (II):



where n has a value of 0 or 1, and wherein said compound of formula (V) can be prepared by hydroxylating a compound of formula (VI):

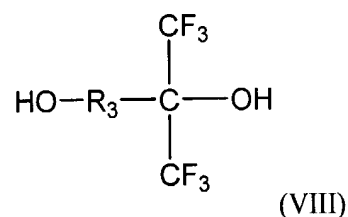
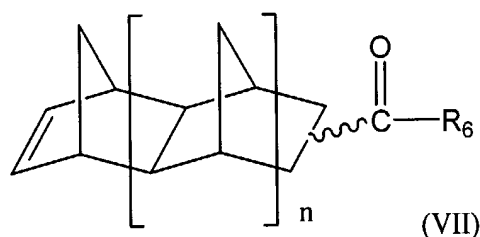


5

n and R_3 being as previously defined.

Preferably, the hydroxylation is carried out using a borane-based reagent and an oxidizer. The borane-based reagent can be BH_3 , disiamylborane, 9-borabicyclo[3.3.1]nonane, catecholborane, 10 thexylborane, thexylchloroborane, dibromoborane, diisopinocampheylborane etc. The oxidizer can be $NaOH / H_2O_2$, trimethylamine N-oxide etc. These preferred embodiments concerning the hydroxylation are also suitable for the process for preparing the compound of formula (IX).

15 The compound of formula (VI) can be prepared by reacting together a compound of formula (VII) and a compound of formula (VIII)



wherein

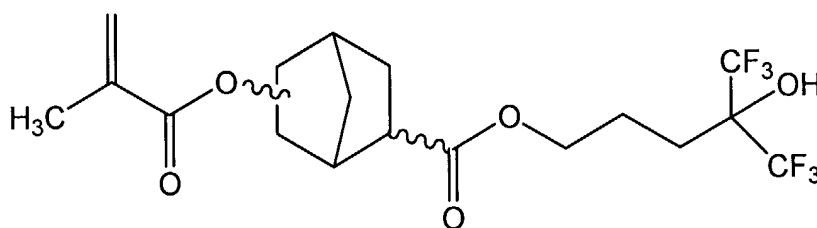
n and R_3 are as previously defined; and

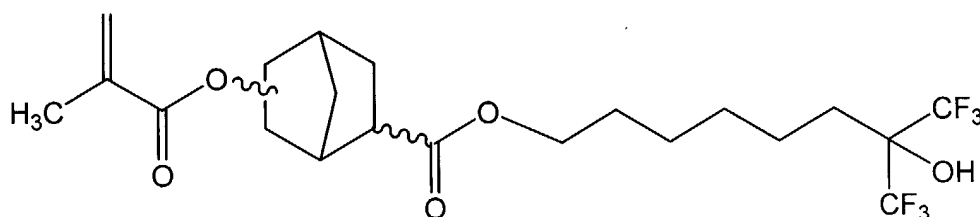
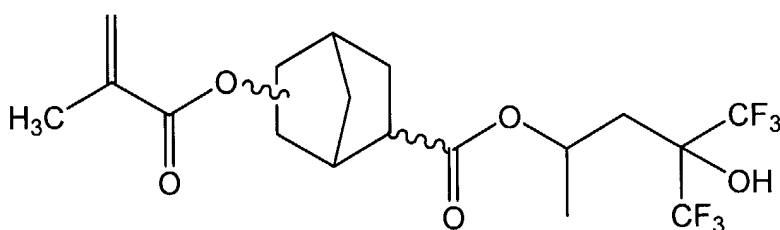
R_6 is Cl, Br, I, imidazolyl or OR_7 , R_7 being H, a C_1 - C_6 branched or linear alkyl.

The compounds of formulas (VII) and (VIII) are preferably reacted together in the presence of a base and/or a coupling reagent. The base or the coupling reagent are preferably the same than those previously mentioned.

In the process for preparing a compound of formula (IX), step (a) and/or step (c) can be carried out in the presence of at least one of a base and a coupling agent. The base or the coupling reagent are preferably the same than those previously mentioned.

The following examples are three compounds which are particularly preferred in the compounds and processes of the invention.





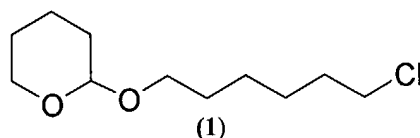
DESCRIPTION OF PREFERRED EMBODIMENTS

5 Further features and advantages of the invention will become more readily apparent from the following description of preferred embodiments as illustrated by way of examples.

The following non-limiting examples further illustrate the invention. In particular, some preferred embodiments concerning the
 10 compounds and processes of the invention are more specifically described.

Example 1

Preparation of 2-(6-Chloro-hexyloxy)-tetrahydro-pyran (**1**).

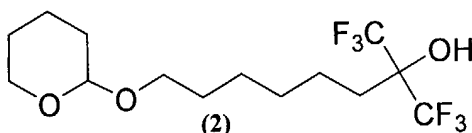


15 A mixture of 6-chlorohexan-1-ol (180g, 1.32 mol), *p*-toluenesulfonic acid monohydrate (12.5g, 0.08 mol) and dichloromethane (600g) was stirred for 30 minutes. The 3,4-dihydro-2*H*-

pyran (133g, 1.58 mol) was added in 35 minutes. The solution was stirred for 15 hours at room temperature. The dark yellow solution was washed with 10% aqueous NaOH (2 x 200 mL) and with water (2 x 150 mL). The solvent was evaporated. The dark oil was purified by distillation under
5 reduced pressure to give 217g of colorless oil (yield = 74%) .

Example 2

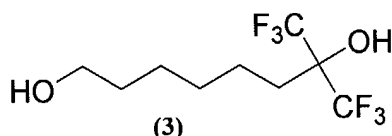
Preparation of 1,1,1-Trifluoro-8-(tetrahydro-pyran-2-yloxy)-2-trifluoromethyl-octan-2-ol (**2**).



10 A flame dried 250 mL flask was charged with magnesium turnings (9.51g, 0.39 mol) and anhydrous THF (100 mL). Red-Al® 65+ wt. % solution was added (2mL). 2-(6-Chloro-hexyloxy)-tetrahydro-pyran 1 was added in 1 hour. The mixture was refluxed during 3 hours and cooled at room temperature. Hexafluoroacetone (47.25g, 0.28 mol) was
15 condensed with Dewar type condenser (Acetone/ Dry ice) in a 500 mL round bottom flask cooled at -78°C. Anhydrous THF (200 mL) was added to hexafluoroacetone containing flask. The Grignard's reagent solution was added slowly to the cold hexafluoroacetone solution. The mixture was sticky and the cooling bath was removed. The solution was
20 stirred overnight at room temperature. The mixture was acidified to obtain pH = 6. The aqueous layer was extracted with MTBE (methyl tert-butyl ether) (3 x 50 mL). The MTBE layer was washed with 5% NaHCO₃ (2 x 50mL) and with water (100 mL), dried (MgSO₄) and concentrated. The residue was purified by chromatography on silica gel (Ethyl
25 Acetate/Hexane 1/9 v/v) to give 57g (yield = 58%) of clear oil.

Example 3

Preparation of 8,8,8-Trifluoro-7-trifluoromethyl-octane-1,7-diol **(3)**.

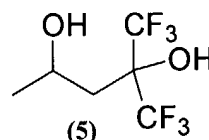
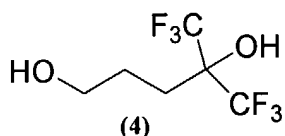


5

A 500 mL flask was charged with 1,1,1-Trifluoro-8-(tetrahydro-pyran-2-yloxy)-2-trifluoromethyl-octan-2-ol **(2)** (17.4g, 49.39 mmol), *p*-toluenesulfonic acid monohydrate (0.76g, 4.00 mmol) and methanol (380 mL). The solution was heated at 45°C for 3 hours and
 10 cooled at room temperature. Water (1000 mL) was added. The solution was extracted with MTBE (3 x 250 mL). The ether layer was washed with brine, dried (MgSO₄) and concentrated to give 13g (yield = 98%) of yellowish oil. The product was used without purification.

Example 4

15 Preparation of 5,5,5-Trifluoro-4-trifluoromethyl-pentane-1,4-diol **(4)** and 1,1,1-Trifluoro-2-trifluoromethyl-pentane-2,4-diol **(5)**.

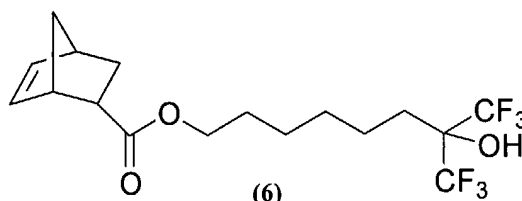


To a stirred and cooled solution of 1,1,1-Trifluoro-2-trifluoromethyl-pent-4-en-2-ol (15g, 72 mmol) in dry tetrahydrofuran (150 mL), Borane-tetrahydrofuran complex (1.0M solution in tetrahydrofuran, 120mL, 120-mmol) was added dropwise under nitrogen atmosphere. The
 20 mixture was then stirred at room temperature for 30 minutes and then cooled to 0-5°C. A solution of sodium hydroxide (3.0M, 70 mL) was added

dropwise over 30 minutes period followed by addition of hydrogen peroxide (30%, 27 mL) over a period of 20-30 minutes. The resulting mixture was stirred at room temperature for another 1.0 hour and water (100mL) was added. The mixture was acidified to PH 4-5 and the product
5 was extracted with methylene chloride (3x200mL). The methylene chloride extract was dried with magnesium sulfate, filtered and evaporated under reduced pressure to yield 14g of the mixture of products (4) and (5). The resulting crude product was purified by chromatography on silica gel (tetrahydrofuran/Hexane 3/6 v/v) to give 6g
10 of (4) and 7g of (5) as colorless oils.

Example 5

Preparation of Bicyclo[2.2.1]hept-5-ene-2-carboxylic acid 8,8,8-trifluoro-7-hydroxy-7-trifluoromethyl-octyl ester (6).

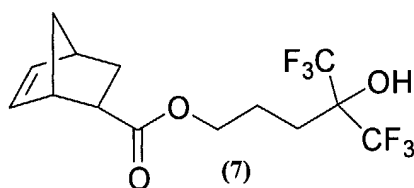


15 To a solution of 5-norbornene-2-carboxylic acid (3.72g, 26.95mmol) and dichloromethane (30g), oxalyl chloride (4.45g, 35.04mmol) was added dropwise under nitrogen atmosphere at room temperature. The mixture was stirred at this temperature for two hours and the volatiles were then removed under reduced pressure. To the
20 resulting oil, a solution of 8,8,8-Trifluoro-7-trifluoromethyl-octane-1,7-diol 3 (6.0g, 22.37mmol) and dichloromethane (60g) was added and the mixture was cooled to 0°C. A solution of triethylamine (2.72g, 26.95mmol), 4-(dimethylamino)pyridine (0.53g, 4,34mmol) in dichloromethane (10g) was then added over a 15 minutes period. The resulting mixture was stirred at
25 room temperature for 1.0 hour, acidified to pH 4-5, washed with water

(3x100mL), dried over magnesium sulfate and filtered. After removal of dichloromethane under reduced pressure, 7.9g of colourless oil was obtained. The resulting oil was purified by chromatography on silica gel (Ethyl acetate/Hexane 2/8 v/v) to give 7g of colorless oil.

5 **Example 6**

Preparation of Bicyclo[2.2.1]hept-5-ene-2-carboxylic acid 5,5,5-trifluoro-4-hydroxy-4-trifluoromethyl-pentyl ester (7).

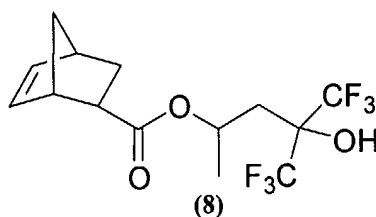


10 This product was prepared from the alcohol (4) of example 4 using the same procedure described in example 5. The product was used without purification.

Example 7

Preparation of Bicyclo[2.2.1]hept-5-ene-2-carboxylic acid 4,4,4-trifluoro-3-hydroxy-1-methyl-3-trifluoromethyl-butyl ester (8).

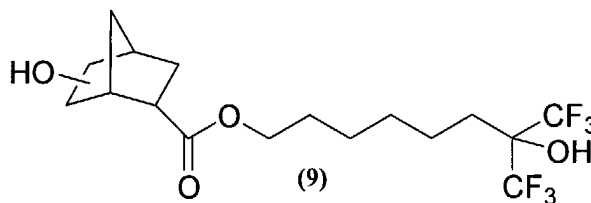
15



This product was prepared from the alcohol (5) of example 4 using the same procedure described in example 5. The product was purified on silica gel (ethyl acetate/Hexane 1/9 v/v) to give a colorless oil.

Example 8

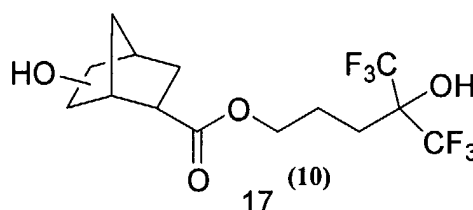
Preparation of compound (9).



To a cooled (0°C) and stirred solution of Bicyclo[2.2.1]hept-5-ene-2-carboxylic acid 8,8,8-trifluoro-7-hydroxy-7-(trifluoromethyl)octyl ester (6) (22.3g, 53.0mmol) and tetrahydrofuran (250mL), borane-tetrahydrofuran complex (1.0M solution in tetrahydrofuran, 160mL, 160 mmol) was added dropwise under nitrogen atmosphere. The resulting mixture was then stirred at room temperature for 1.0 hour. The solution was cooled again to 0°C and a solution of sodium hydroxide (3.0M, 52 mL) was added dropwise over 30 minutes period followed by addition of hydrogen peroxide (30%, 48 mL) over a period of 20-30 minutes. The resulting mixture was stirred at room temperature for another 2.0 hours and water (100mL) was added. The mixture was acidified to PH 4-5 and the product was extracted with methylene chloride (3x200mL). The methylene chloride extract was dried with magnesium sulfate, filtered and evaporated to yield 21.7g of oil. The resulting crude product was purified by chromatography on silica gel (Ethyl acetate/Hexane 1/9 v/v) to give 12.5g of (9) as colorless oil.

Example 9

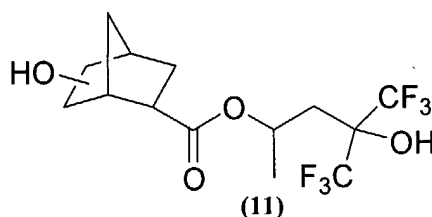
Preparation of compound (10).



This product was prepared from the alcohol (7) of example 6 using the same procedure described in example 8. The thus obtained colorless oil was used without purification.

Example 10

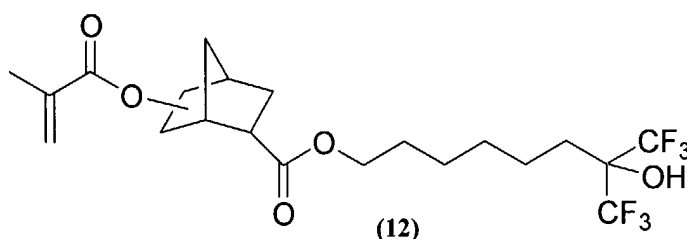
5 Preparation of compound (11).



This product was prepared from the alcohol (8) of example 7 using the same procedure described in example 8. The thus obtained colorless oil was used without purification.

10 **Example 11**

Preparation of compound (12).

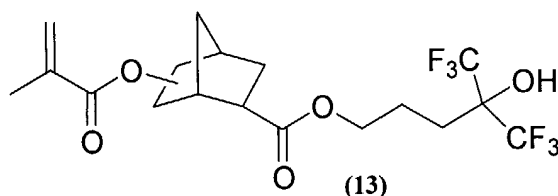


To a stirred solution of (9) (9.26, 23.0 mmol), methacrylic anhydride (4.2g, 27 mmol) and tetrahydrofuran (44g), was added a solution of 4-(dimethylamino) pyridine (3.3g, 27 mmol) in tetrahydrofuran (20g) over a period of 30 minutes under nitrogen atmosphere. The

resulting mixture was stirred for a further 2.0 hours at room temperature. The mixture was then acidified, extracted with dichloromethane (500mL), washed, dried over magnesium sulfate and filtered. After removal of dichloromethane under reduced pressure, the resulting crude product was
5 purified by chromatography on silica gel (Ethyl acetate/Hexane) to give 5.5g of **(12)** as colorless oil.

Example 12

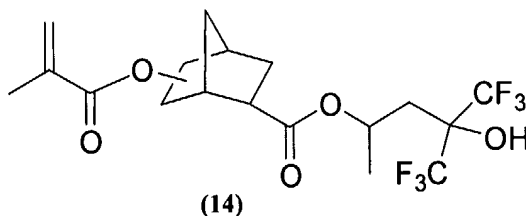
Preparation of compound **(13)**.



10 This product was prepared from the alcohol **(10)** of example 9 using the same procedure described in example 11. The product was purified by chromatography on silica gel (MTBE/Hexane) to provide a colorless oil.

Example 13

15 Preparation of compound **(14)**.

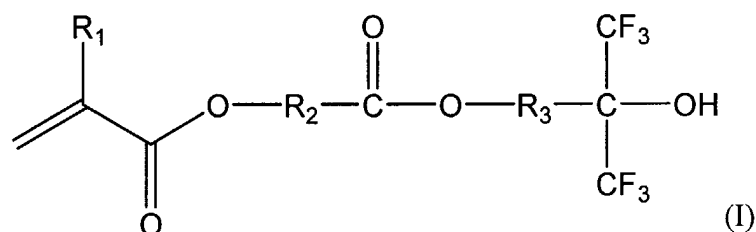


This product was prepared from the alcohol **(11)** of example 10 using the same procedure described in example 11. The product was purified by chromatography on silica gel (MTBE/Hexane) to provide a colorless oil.

5 While the invention has been described in connection with specific embodiments thereof, it will be understood that it is capable of further modifications and this application is intended to cover any variations, uses, or adaptations of the invention following, in general, the principles of the invention and including such departures from the present
10 disclosure as come within known or customary practice within the art to which the invention pertains and as may be applied to the essential features hereinbefore set forth, and as follows in the scope of the appended claims.

WHAT IS CLAIMED IS:

1. A compound of formula (I):



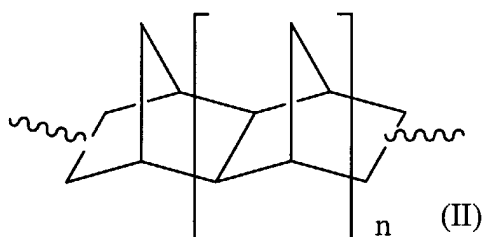
wherein

- 5 R_1 is H, or a $\text{C}_1\text{-C}_{10}$ linear, branched or cyclic alkyl group which is unsubstituted or substituted with fluorine;

R_2 is an alicyclic group having 5 to 20 carbon atoms which is unsubstituted or substituted with fluorine; and

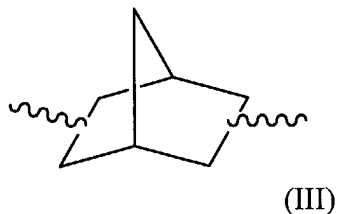
- 10 R_3 represents a $\text{C}_1\text{-C}_{10}$ linear or branched alkylene which is unsubstituted or substituted with fluorine.

2. The compound of claim 1, wherein R_1 is H or CH_3 .
3. The compound of claim 1, wherein R_2 is a group of formula (II):



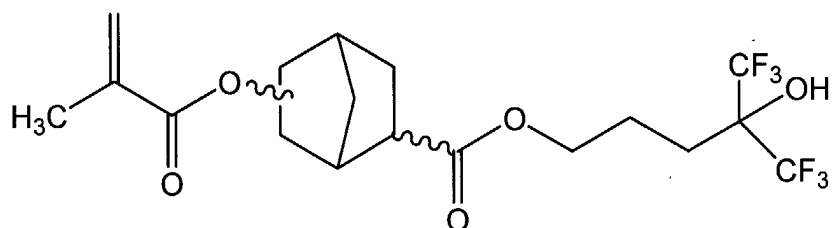
- 15 wherein n has a value of 0 or 1, and wherein said R_2 group is unsubstituted or substituted with fluorine.

4. The compound of claim 1, wherein R_2 is unsubstituted and represents a group of formula (III):

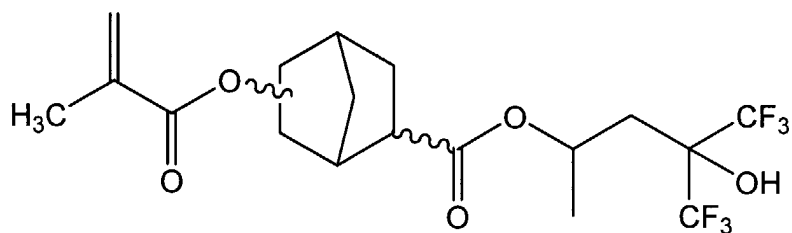


5. The compound of claim 1, wherein R_3 is an unsubstituted C_3 - C_7 linear or branched alkylene.

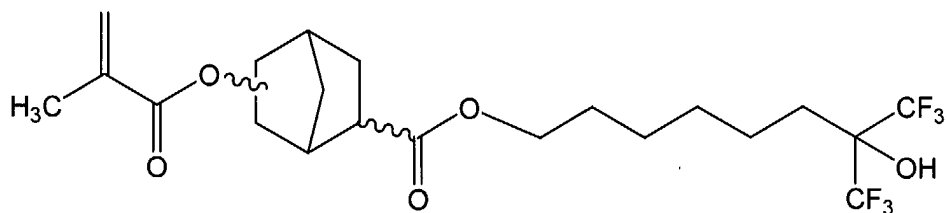
6. The compound of claim 1 having the following formula:



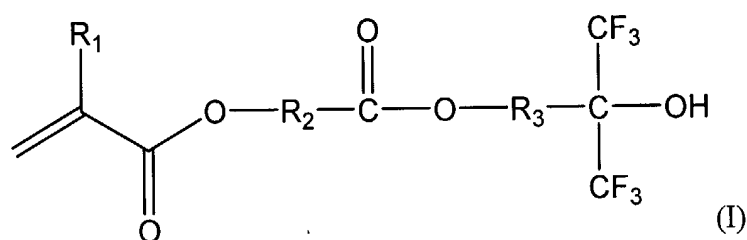
7. The compound of claim 1 having the following formula:



- 10 8. The compound of claim 1 having the following formula:



9. A process for preparing a compound of formula (I):



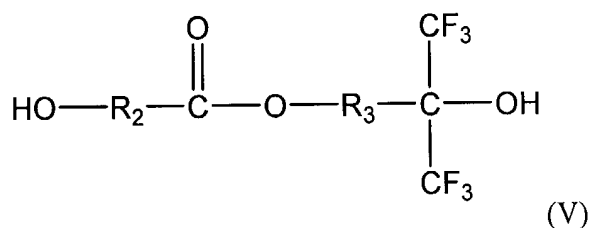
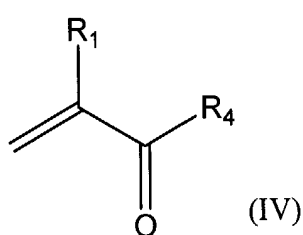
wherein

- 5 R_1 is H, or a C_1 - C_{10} linear, branched or cyclic alkyl group which is unsubstituted or substituted with fluorine;

R_2 is an alicyclic group having 5 to 20 carbon atoms which is unsubstituted, or substituted with fluorine ; and

R_3 represents a C_1 - C_{10} linear or branched alkylene which is unsubstituted or substituted with fluorine,

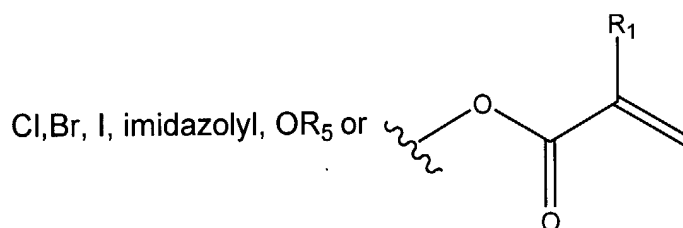
- 10 comprising the step of reacting together a compound of formula (IV) and a compound of formula (V):



wherein

- 15 R_1 , R_2 , and R_3 are as previously defined; and

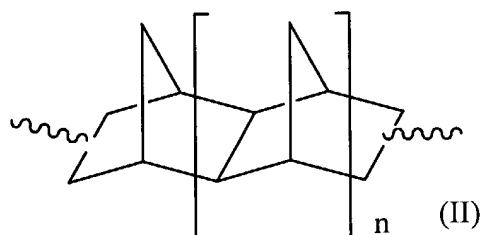
R_4 is



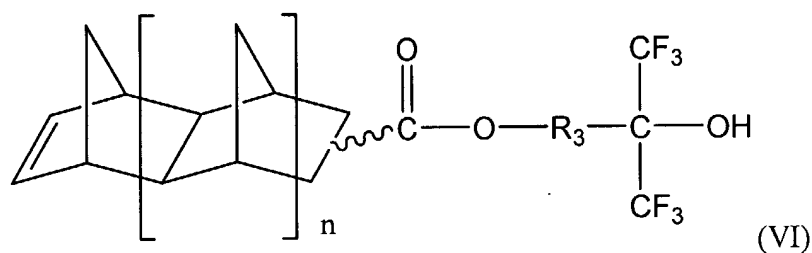
and wherein R₅ is H, a C₁-C₆ branched or linear alkyl.

10. The process of claim 9, wherein the compounds of formulas (IV) and (V) are reacted together in the presence of a base and/or a coupling reagent.

11. The process of claim 9, wherein R₂ is a group of formula (II):



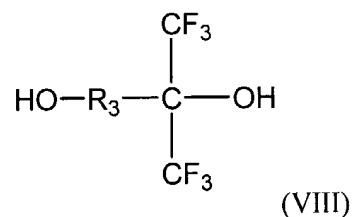
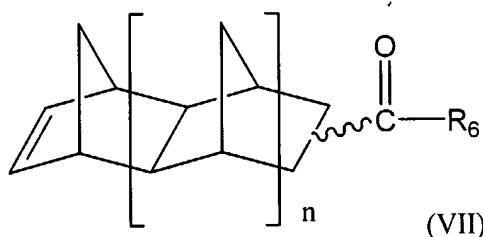
where n has a value of 0 or 1, and wherein said compound of formula (V) is prepared by hydroxylating a compound of formula (VI):



n and R₃ being as previously defined.

12. The process of claim 11, wherein said hydroxylation is carried out using a borane-based reagent and an oxidizer.

13. The process of claim 12, wherein said borane-based reagent is BH_3 , disiamylborane, 9-borabicyclo[3.3.1]nonane, 9-borabicyclo[3.3.1]nonane, catecholborane, thexylborane, thexylchloroborane, dibromoborane or diisopinocampheylborane.
14. The process of claim 12, wherein said oxidizer is $\text{NaOH} / \text{H}_2\text{O}_2$ or trimethylamine N-oxide.
15. The process of claim 11, wherein said compound of formula (VI) is prepared by reacting together a compound of formula (VII) and a compound of formula (VIII):

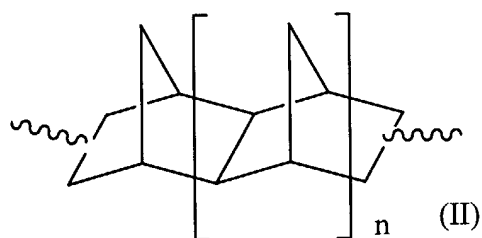


wherein

n and R_3 are as previously defined; and

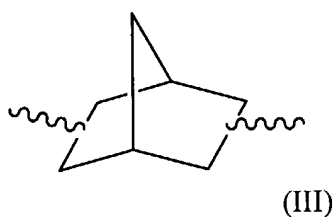
- 15 R_6 is Cl, Br, I, imidazolyl or OR_7 , R_7 being H, a $\text{C}_1\text{-C}_6$ branched or linear alkyl.
16. The process of claim 15, wherein compounds of formulas (VII) and (VIII) are reacted together in the presence of a base and/or a coupling reagent.
- 20 17. The process of claim 9, wherein R_1 is H or CH_3 .

18. The process of claim 9, wherein R_2 is a group of formula (II):



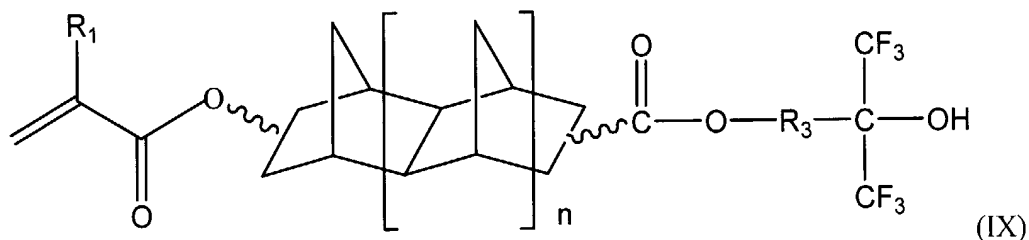
wherein n has a value of 0 or 1, and wherein said R_2 group is unsubstituted or substituted with fluorine.

- 5 19. The process of claim 9, wherein R_2 is unsubstituted and represents a group of formula (III):



20. The process of claim 9, wherein R_3 is an unsubstituted C_3 - C_7 linear or branched alkylene.

- 10 21. A process for preparing a compound of formula (IX):



wherein

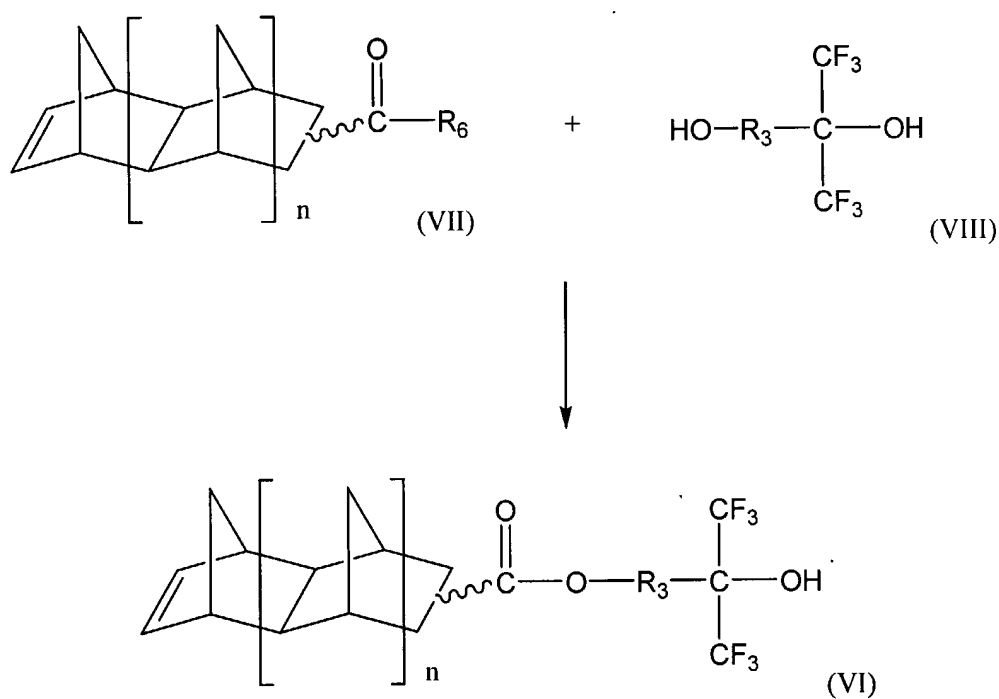
R_1 is H, or a C_1 - C_{10} a linear, branched or cyclic alkyl group which is unsubstituted or substituted with fluorine;

R_3 represents a C_1 - C_{10} linear or branched alkylene which is unsubstituted or substituted with fluorine; and

5 n has a value of 0 or 1,

comprising the steps of

a) reacting together a compound of formula (VII) and a compound of formula (VIII) so as to obtain a compound of formula (VI):



10

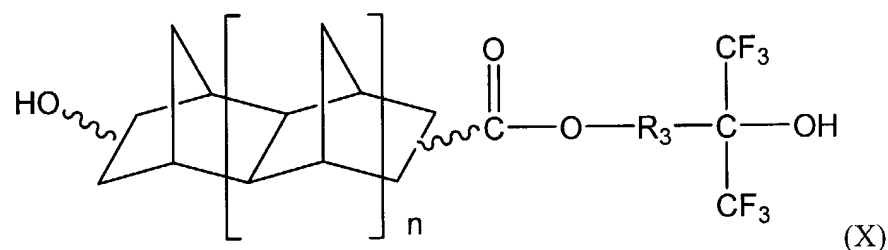
wherein

n and R_3 are as previously defined; and

R_6 is Cl, Br, I, imidazolyl or OR_7 , R_7 being H, a C_1 - C_6 branched or linear alkyl

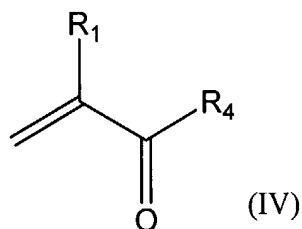
b) hydroxylating the compound of formula (VI) so as to obtain a compound of formula (X);

5



wherein n and R_3 are as previously defined

c) reacting the compound of formula (X) together with a compound of formula (IV)

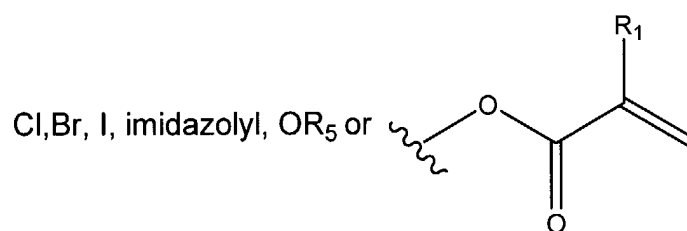


10

wherein

R_1 is as previously defined; and

R_4 is



wherein

R₁ is as previously defined; and

R₅ is a C₁-C₆ branched or linear alkyl,

5 so as to obtain said compound of formula (IX).

22. The process of claim 21, wherein step (a) is carried out in the presence of at least one of a base and a coupling agent.
23. The process of claim 21, wherein step (c) is carried out in the presence of at least one of a base and a coupling agent.

INTERNATIONAL SEARCH REPORT

International application No.
PCT/CA2005/001728

A. CLASSIFICATION OF SUBJECT MATTER
IPC: C07C 69/74 (2006.01), G03F 7/20 (2006.01), H01L 21/308 (2006.01)

According to International Patent Classification (IPC) or to both national classification and IPC

B. FIELDS SEARCHED

Minimum documentation searched (classification system followed by classification symbols)
IPC(7): C07C 69/74, G03F 7/20, H01L 21/308

Documentation searched other than minimum documentation to the extent that such documents are included in the fields searched

Electronic database(s) consulted during the international search (name of database(s) and, where practicable, search terms used)
STN, Delphion, Canadian Patent Database, PubMed (search terms: "hexafluoroalcohol", "high transparency polymers", "lithography" and "photolithography").

C. DOCUMENTS CONSIDERED TO BE RELEVANT

Category*	Citation of document, with indication, where appropriate, of the relevant passages	Relevant to claim No.
A	US 6806026 (INTERNATIONAL BUSINESS MACHINES CORP.) 19 October, 2004 (19-10-2004) see entire document	1-23
P, A	US 2005/0170279 A1 (INFINEON TECHNOLOGIES AG) 4 August, 2005 (04-08-2005) see entire document	1-23

☐ Further documents are listed in the continuation of Box C.

☒ See patent family annex.

* Special categories of cited documents :	"T" later document published after the international filing date or priority date and not in conflict with the application but cited to understand the principle or theory underlying the invention
"A" document defining the general state of the art which is not considered to be of particular relevance	"X" document of particular relevance; the claimed invention cannot be considered novel or cannot be considered to involve an inventive step when the document is taken alone
"E" earlier application or patent but published on or after the international filing date	"Y" document of particular relevance; the claimed invention cannot be considered to involve an inventive step when the document is combined with one or more other such documents, such combination being obvious to a person skilled in the art
"L" document which may throw doubts on priority claim(s) or which is cited to establish the publication date of another citation or other special reason (as specified)	"&" document member of the same patent family
"O" document referring to an oral disclosure, use, exhibition or other means	
"P" document published prior to the international filing date but later than the priority date claimed	

Date of the actual completion of the international search
19 January 2006 (19-01-2006)

Date of mailing of the international search report
21 February 2006 (21-02-2006)

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INTERNATIONAL SEARCH REPORT

International application No.
PCT/CA2005/001728

Patent Document Cited in Search Report	Publication Date	Patent Family Member(s)	Publication Date
US2005170279	04-08-2005	DE10350685 A1	16-06-2005
US6806026	19-10-2004	JP2004046098 A US2005019696 A1 US2003224283 A1	12-02-2004 27-01-2005 04-12-2003