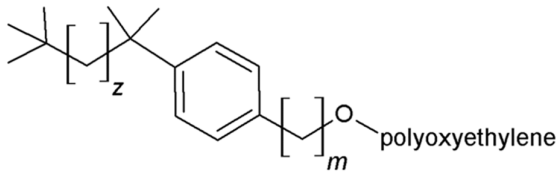
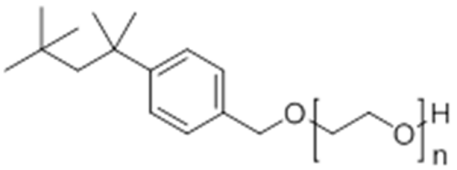
CLAIMS

1. A compound which is the following compound:



wherein m equals 1 and z is an integer selected from the following group:
z = 1 to 5.

2. The compound of claim 1 wherein the compound is the following compound:



wherein n is an integer between 4 and 16, preferably wherein n is equal to 9 or 10.

3. A method for inactivating a virus having a lipid envelope, the method comprising the following steps:
    a) Adding a detergent to a liquid to prepare a mixture of said detergent and said liquid; and
    b) Incubating said mixture to inactivate said virus;

    wherein said detergent is a polyoxyethylene ether, wherein said detergent is a non-phenolic detergent, and wherein said detergent is the compound of any of claims 1 to 2.

4. The method of claim 3, wherein said detergent is environmentally compatible.

5. The method of any of claims 3 to 4, wherein step a) further comprises adding a solvent to said liquid, and wherein in step a), a solvent/detergent mixture for inactivation of said virus is prepared by adding said detergent and said solvent to said liquid.

6. The method of claim 5, wherein said solvent is an organic solvent and wherein said solvent is optionally Tri-n-butyl phosphate.

7. The method of any of claims 3 to 6, wherein said liquid comprises a biological medicinal product and/or a biopharmaceutical drug.

8. The method of claim 7, wherein said biopharmaceutical drug is:
    (a) a blood factor, immunoglobulin such as monoclonal antibody, replacement enzyme, vaccine, gene therapy vector, growth factor or a growth factor receptor;

(b) a therapeutic protein;

(c) a blood factor, and wherein said blood factor is factor I (fibrinogen), factor II (prothrombin), Tissue factor, factor V, factor VII or VIIa, factor VIII, factor IX, factor X, factor XI, factor XII, factor XIII, von Willebrand Factor (VWF), prekallikrein, high-molecular-weight kininogen (HMWK), fibronectin, antithrombin III, heparin cofactor II, protein C, protein S, protein Z, plasminogen, alpha 2-antiplasmin, tissue plasminogen activator (tPA), urokinase, plasminogen activator inhibitor- 1 (PAI1), or plasminogen activator inhibitor-2 (PAI2); and/or

(d) factor VIII, preferably recombinant human factor VIII.

9. The method of any of claims 3 to 8, wherein:

(a) prior to step a) or between step a) and step b), said method further comprises a step of filtering said liquid or mixture with a depth filter;

(b) in step b), said mixture is incubated for at least 1 hour; and/or

(c) in step b), said mixture is incubated at a temperature of between 0°C and 10°C, or wherein said mixture is incubated at a temperature of between 16°C and 25°C.

10. The method of any of claims 7 to 9, further comprising, after step b), a step of

c) Purifying said biopharmaceutical drug;

and wherein:

(i) said purifying comprises separating said biopharmaceutical drug from said detergent;

(ii) said purifying comprises separating said biopharmaceutical drug from said further detergent; and/or

(iii) said purifying of said biopharmaceutical drug comprises purifying said biopharmaceutical drug by at least one chromatographic purification and said at least one chromatographic purification is optionally by anion exchange chromatography and/or by cation exchange chromatography.

11. A method for preparing a biopharmaceutical drug, said method comprising the method according to any one of claims 7 to 10, wherein said biopharmaceutical drug is as defined in any one of said claims 7 to 10.

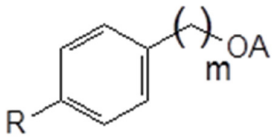
12. The method of claim 11, further comprising, after said method of any one of claims 7 to 10, a step of preparing a pharmaceutical formulation comprising said biopharmaceutical drug.

13. Use of a detergent in a method for the inactivation of a virus having a lipid envelope, wherein the detergent is the compound of any of claims 1 to 2.

14. The use of claim 13, wherein said method for said inactivation of said virus is a method using a solvent/detergent treatment, said solvent/detergent treatment comprising the use of said detergent which is the compound of any of claims 1 to 2.

15. The use of any of claims 13 to 14, wherein said virus inactivation is an inactivation of virus in a liquid comprising a biopharmaceutical drug as defined in any one of claims 7 to 8.

16. A composition comprising a detergent, wherein the detergent is the compound of any of claims 1 to 2.
17. The composition of claim 16, further comprising an organic solvent as defined in claim 6.
18. A method for synthesizing a compound of the following general Formula (VIII),



Formula (VIII)

wherein

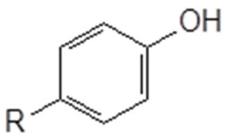
R represents a hydrocarbon group having a linear chain of 2 to 12 carbon atoms and one or more methyl groups as substituents on said linear chain,

m equals 1, and

A represents a polyoxyethylene residue,

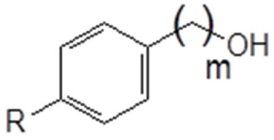
wherein the method comprises the steps of

A) Converting a phenol of the following general Formula (IX) wherein R is as defined above



Formula (IX)

into an alcohol of the of the following general Formula (X) wherein R and m are as defined above

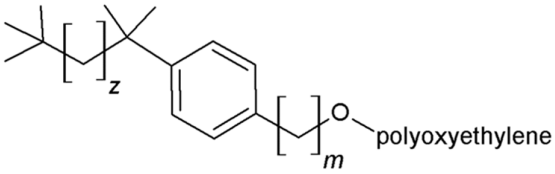


Formula (X)

and

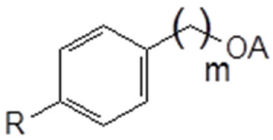
(B) converting the alcohol of the general Formula (X) into a polyoxyethylene ether of the general Formula (VIII) as defined above;

wherein the compound of Formula (VIII) is the following compound:



wherein m equals 1 and z is an integer selected from the following group:
z = 1 to 5.

19. A method for synthesizing a compound of the following general Formula (VIII),



Formula (VIII)

wherein

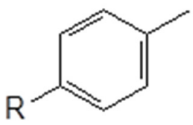
R represents a hydrocarbon group having a linear chain of 2 to 12 carbon atoms and one or more methyl groups as substituents on said linear chain,

m equals 1, and

A represents a polyoxyethylene residue,

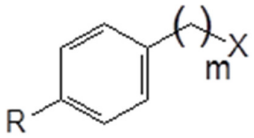
wherein the method comprises the steps of

(1) reacting toluene so as to obtain a substituted toluene of the following general Formula (XI) wherein R is as defined above



Formula (XI)

(2) converting the substituted toluene of the general Formula (XI) into a compound of the following general Formula (XII), wherein R and m are as defined above and X is selected from the group comprising a hydroxyl group, a bromine atom, an iodine atom and a chlorine atom

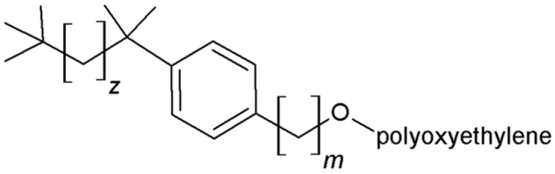


Formula (XII)

and

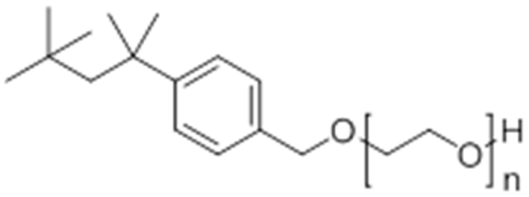
(3) converting the compound of the general Formula (XII) into a polyoxyethylene ether of the general Formula (VIII) as defined above;

wherein the compound of Formula (VIII) is the following compound:



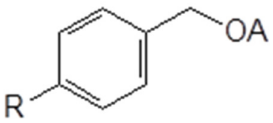
wherein m equals 1 and z is an integer selected from the following group:
z = 1 to 5.

20. The method of any of claims 18 to 19 wherein the compound of Formula (VIII) is the following compound:



wherein n is an integer between 4 and 16, preferably wherein n is equal to 9 or 10.

21. A method for synthesizing a compound of the following general Formula (VIIIa),



Formula (VIIIa)

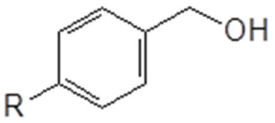
wherein

R represents a hydrocarbon group having a linear chain of 2 to 12 carbon atoms and one or more methyl groups as substituents on said linear chain, and

A represents a polyoxyethylene residue,

wherein the method comprises the steps of

(I) converting benzyl alcohol into a compound of the following general Formula (XIII), wherein R is as defined above

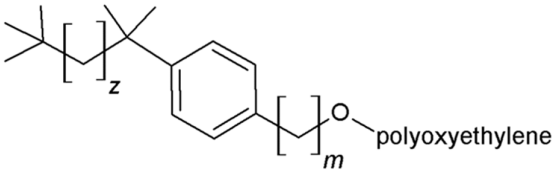


Formula (XIII)

and

(II) converting the compound of the general Formula (XIII) into a polyoxyethylene ether of the general Formula (VIIIa) as defined above;

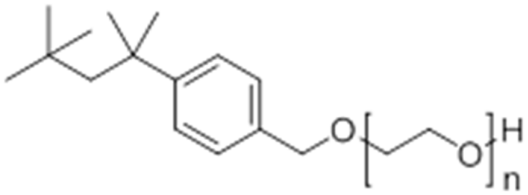
wherein the compound of Formula (VIIIa) is the following compound:



wherein m equals 1 and z is an integer selected from the following group:

z = 1 to 5.

22. The method of claim 21 wherein the compound of Formula (VIIIa) is the following compound:



wherein n is an integer between 4 and 16, preferably wherein n is equal to 9 or 10.

23. The method of any of claims 19 and 20, wherein:

(i) the converting in step (2) is a radical reaction using AIBN (Azobis(isobutyronitrile) as a radical initiator; and/or

(ii) X is a bromine atom.

24. The method of any of claims 19, 20 and 23, wherein

(a) the converting in step (2) uses N-bromosuccinimide (NBS) as a reagent;

(b) the converting in step (3) uses TBME (methyl-tert-butylether) as a solvent;

(c) the converting in step (3) takes place for at least 2 hours, preferably at ambient temperature;

(d) the converting in step (3) takes place for not more than 5 hours, preferably at ambient temperature; and/or

(e) the converting in step (3) takes place for 3 hours, preferably at ambient temperature.