CLAIMS

{Claim 1}

Use of a compound having a spreading coefficient of 15 mN/m or more to a liquid having surface tension of 50 mN/m, and a water solubility of 0 g or more and 0.025 g or less, for liquid film cleavage.

{Claim 2}

The use of a compound for liquid film cleavage according to Claim 1, wherein the compound has an interfacial tension of 20 mN/m or less to the liquid having surface tension of 50 mN/m.

{Claim 3}

The use of a compound for liquid film cleavage according to Claim 1 or 2, wherein the compound has at least one kind structure selected from the group consisting of the following structures X, X-Y and Y-X-Y:

wherein the structure X designates a siloxane chain having a structure in which any of basic structures of >C(A)- (C designates a carbon atom, moreover, <, > and - each designates a bonding hand, hereinafter, the same applies.), -$C(A)_2$-, -C(A)(B)-, >C(A)-$C(R^1)$<, >$C(R^1)$-, -$C(R^1)(R^2)$-, -$C(R^1)_2$-, >C<, -$Si(R^1)_2O$- and -$Si(R^1)(R^2)O$ is repeated, or two or more kinds thereof are combined; or a mixed chain thereof; the structure X has, in an end of the structure X, a hydrogen atom or at least one kind of group selected from the group consisting of -$C(A)_3$, -$C(A)_2B$, -$C(A)(B)_2$, -$C(A)_2$-$C(R^1)_3$, -$C(R^1)_2A$, -$C(R^1)_3$, -$OSi(R^1)_3$, -$OSi(R^1)_2(R^2)$, -$Si(R^1)_3$ and -$Si(R^1)_2(R^2)$;

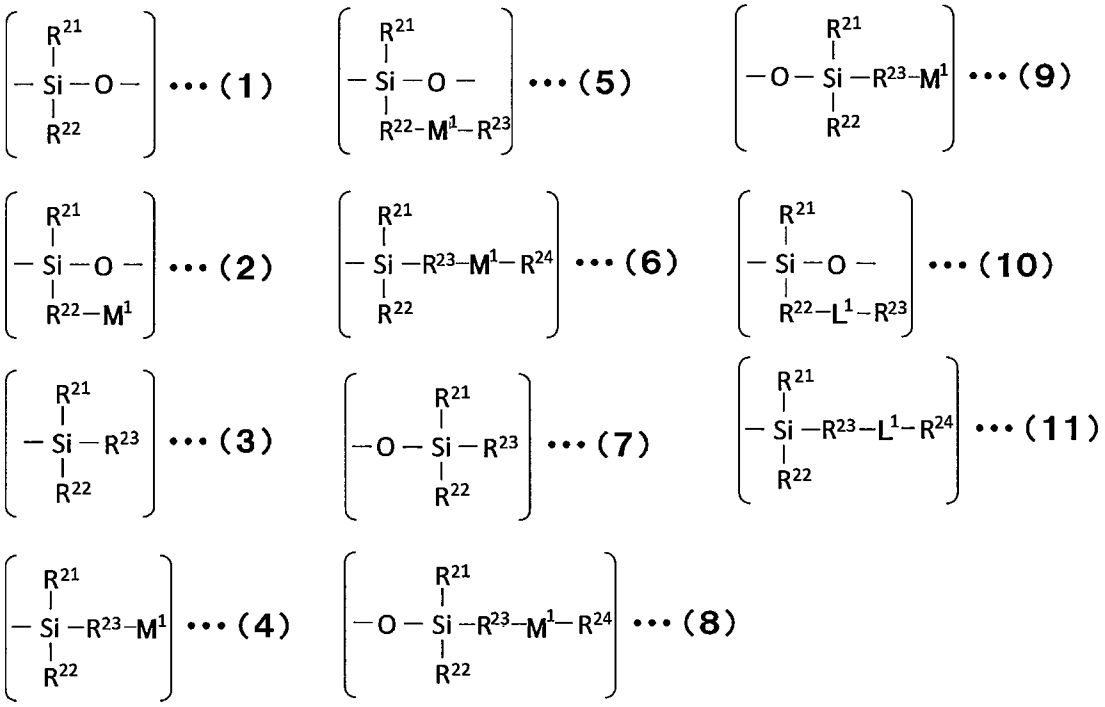
wherein R^1 and R^2 each independently designate a hydrogen atom, an alkyl group, an alkoxy group, an aryl group, or a halogen atom; A and B each independently designate a substituent having an oxygen atom or a nitrogen atom;

when a plurality of R^1, R^2, A and B exist for each in the structure X, these may be identical to or different from each other; and

wherein Y designates a hydrophilic group having hydrophilicity, the group containing an atom selected from a hydrogen atom, a carbon atom, an oxygen atom, a nitrogen atom, a phosphorus atom or a sulphur atom; and when a plurality of Y exist, these groups may be identical to or different from each other.

{Claim 4}

The use of a compound for liquid film cleavage according to any one of Claims 1 to 3, wherein the compound is composed of a siloxane chain in which structures represented by any one of the following formulas (1) to (11) are arbitrarily combined:



wherein, in Formulas (1) to (11), M^1, L^1, R^{21} and R^{22} designate the following monovalent or polyvalent (divalent or more valent) group; R^{23} and R^{24}

designate the following monovalent or polyvalent (divalent or more valent) group or a single bond;

M^1 designates a polyoxyethylene group, a polyoxypropylene group, a polyoxybutylene group, a group having a polyoxyalkylene group in combination therewith, an erythritol group, a xylitol group, a sorbitol group, a glycerol group or an ethylene glycol group, a hydroxyl group, a carboxylic acid group, a mercapto group, an alkoxy group, an amino group, an amide group, an imino group, a phenol group, a sulphonic acid group, a quaternary ammonium group, a sulphobetaine group, a hydroxysulphobetaine group, a phosphobetaine group, an imidazolium betaine group, a carbobetaine group, an epoxy group, a carbinol group, a (meth)acrylic group or a functional group in combination therewith; when M^1 is a polyvalent group, M^1 designates a group formed by further removing one or more hydrogen atoms from each of the groups or the functional group;

L^1 designates a linking group of an ether group, an amino group (the amino group adoptable as L^1 is represented by $>NR^C$ (R^C is a hydrogen atom or a monovalent group).), an amide group, an ester group, a carbonyl group or a carbonate group; and

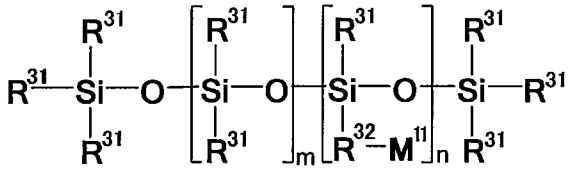
R^{21}, R^{22}, R^{23} and R^{24} each independently designate an alkyl group, an alkoxy group, an aryl group, a fluoroalkyl group, an aralkyl group, a hydrocarbon group in combination therewith, or a halogen atom.

{Claim 5}

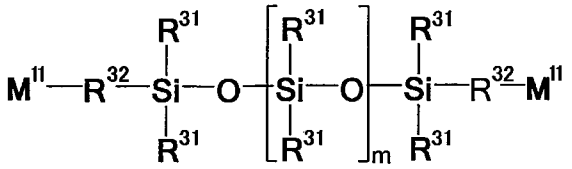
The use of a compound for liquid film cleavage according to any one of Claims 1 to 4, wherein the compound comprises a modified silicone having a structure having at least one oxygen atom in a modifying group.

{Claim 6}

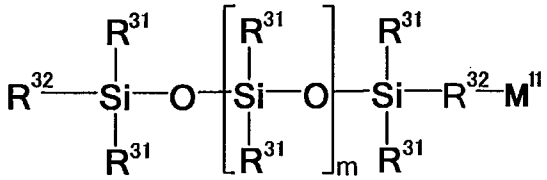
Use of a compound having a structure represented by any one of Formulas [I] to [IV], and a water solubility of 0 g or more and 0.025 g or less, for liquid film cleavage:



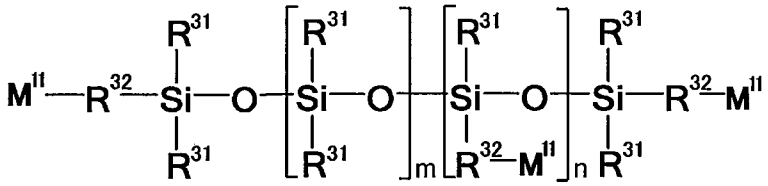
[I]



[II]



[III]



[IV]

wherein R^{31} designates an alkyl group; R^{32} designates a single bond or an alkylene group; a plurality of R^{31} and a plurality of R^{32} may be each identical to or different from each other; M^{11} designates a group having a polyoxyalkylene group; as the polyoxyalkylene group, a polyoxyethylene group, a polyoxypropylene group, a polyoxybutylene group and a material in which constituent monomers thereof are copolymerised or the like are taken; and m and n each are independently an integer of 1 or more.

{Claim 7}

Use of a compound having a spreading coefficient of more than 0 mN/m to a liquid having surface tension of 50 mN/m, a water solubility of 0 g or more and 0.025 g or less, and an interfacial tension of 20 mN/m or less to the liquid having surface tension of 50 mN/m, for liquid film cleavage.

{Claim 8}

The use of a compound for liquid film cleavage according to Claim 7, wherein the compound has at least one kind structure selected from the group consisting of the following structures Z, Z-Y and Y-Z-Y:

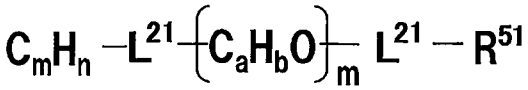
wherein the structure Z designates a hydrocarbon chain having a structure in which any of basic structures of >C(A)- (C: carbon atom), $-C(A)_2-$, -C(A)(B)-, >C(A)-C(R^3)<, >C(R^3)-, -C(R^3)(R^4)-, $-C(R^3)_2-$ and >C< is repeated, or two or more kinds thereof are combined; the structure Z has, at an end thereof, a hydrogen atom or at least one kind of group selected from the group consisting of $-C(A)_3$, $-C(A)_2B$, $-C(A)(B)_2$, $-C(A)_2-C(R^3)_3$, $-C(R^3)_2A$ and $-C(R^3)_3$;

the R^3 and R^4 each independently designate a hydrogen atom, an alkyl group, an alkoxy group, an aryl group, a fluoroalkyl group, or an aralkyl group, or a hydrocarbon group in combination therewith, or a fluorine atom; A and B each independently designates a substituent containing an oxygen atom or a nitrogen atom;

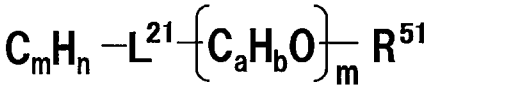
Y designates a hydrophilic group having hydrophilicity, the hydrophilic group containing an atom selected from a hydrogen atom, a carbon atom, an oxygen atom, a nitrogen atom, a phosphorus atom and a sulphur atom; and when Y is plural, the plurality may be identical to or different from each other.

{Claim 9}

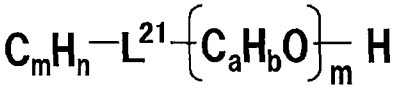
The use of a compound for liquid film cleavage according to Claim 7 or 8, wherein the compound is polyoxyalkylene alkyl (POA) ether represented by any of formulas in Formula [V]; or any of polyoxyalkylene glycol, Steareth, Beheneth, PPG myristyl ether, PPG stearyl ether and PPG behenyl ether, which are represented by any of formulas in Formula [VI] and have a mass average molecular weight of 1000 or more:



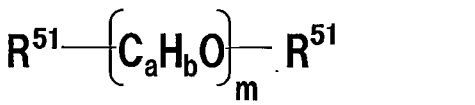
or



or



[V]



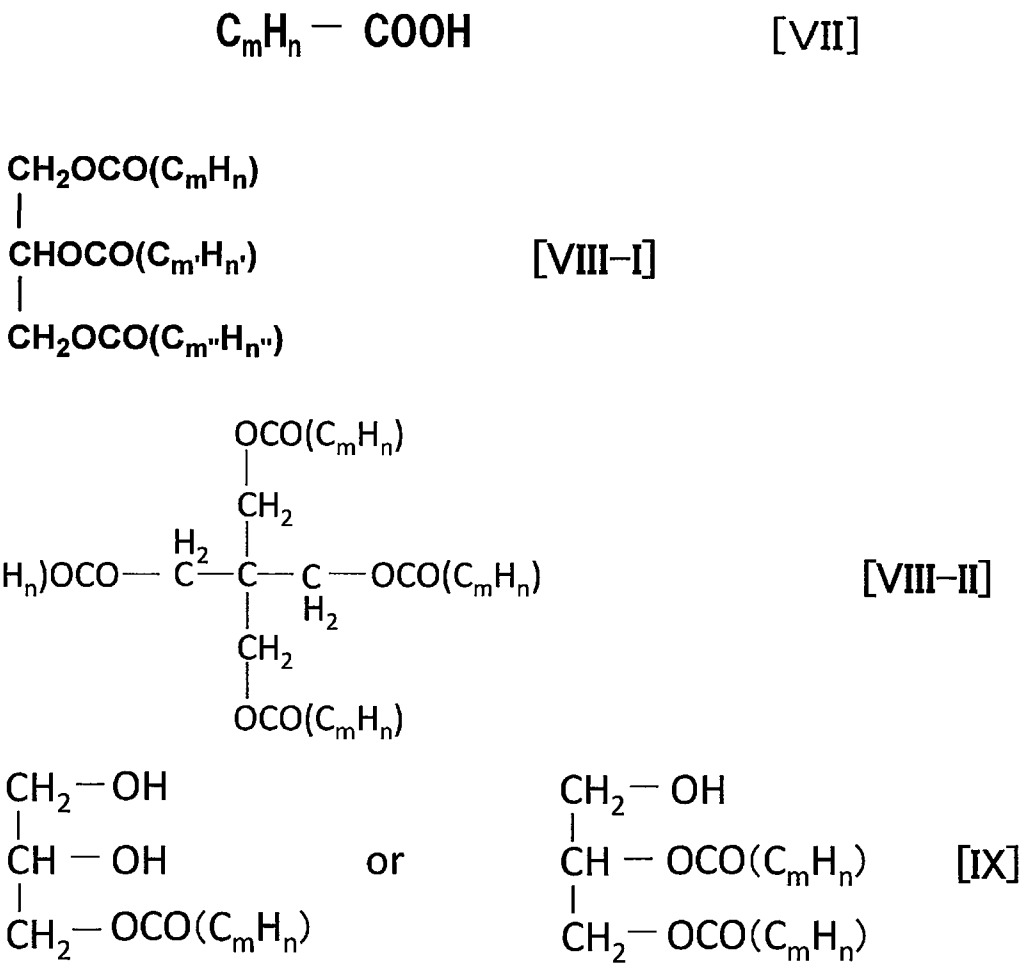
[VI]

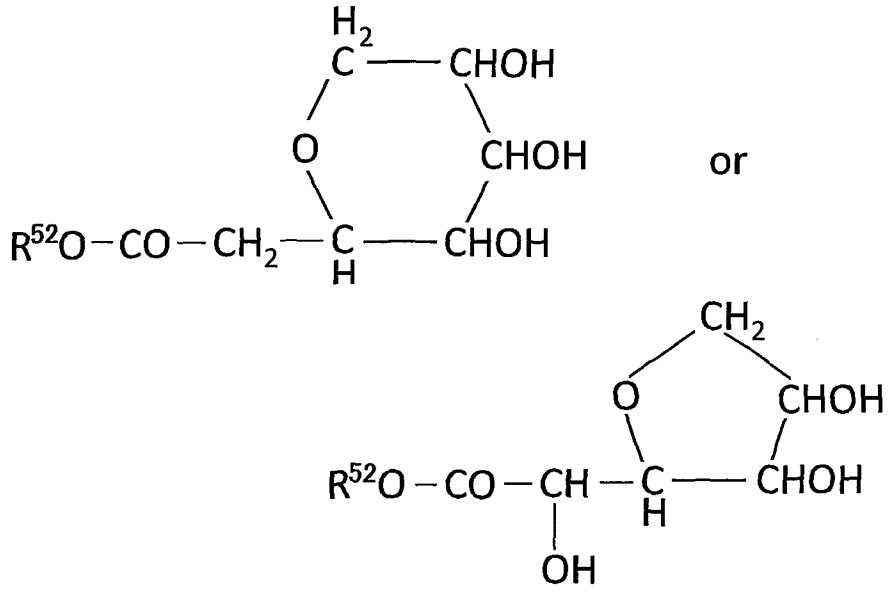
wherein L^{21} designates an ether group, an amino group, an amide group, an ester group, a carbonyl group, a carbonate group, a polyoxyethylene group, a polyoxypropylene group, a polyoxybutylene group, or a polyoxyalkylene group in combination therewith; R^{51} designate a substitute of a hydrogen atom, a methyl group, an ethyl group, a propyl group, an isopropyl group, a butyl group, a pentyl group, a hexyl group, a heptyl group, 2-ethylhexyl group, a nonyl group, a decyl group, a methoxy group, an ethoxy group, a phenyl group, a fluoroalkyl group, an aralkyl group, a hydrocarbon group in combination therewith, or a fluorine atom; a, b, m and n each independently are an integer of 1 or more; C_mH_n herein designates an alkyl group (n = 2m + 1), and C_aH_b designates an alkylene group (a = 2b); the number of carbon atoms and the number of hydrogen atoms are

each independently determined in each of Formulas (V) and (VI), and do not always represent an identical integer, and may be different from each other; "m" in $-(C_aH_bO)_m-$ is an integer of 1 or more; and values of the repeating units are each independently determined in each of Formulas (V) and (VI), and do not always represent an identical integer, and may be different from each other.

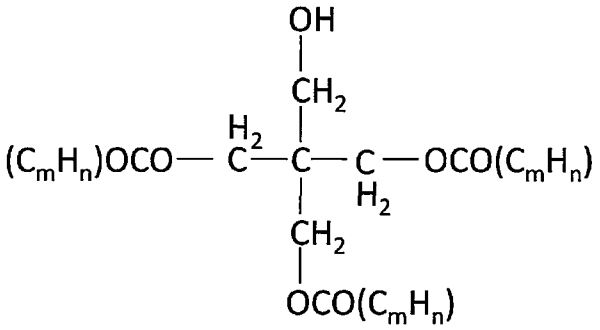
{Claim 10}

The use of a compound for liquid film cleavage according to any one of Claims 7 to 9, wherein the compound is represented by any one of Formulas [VII] to [XV]:



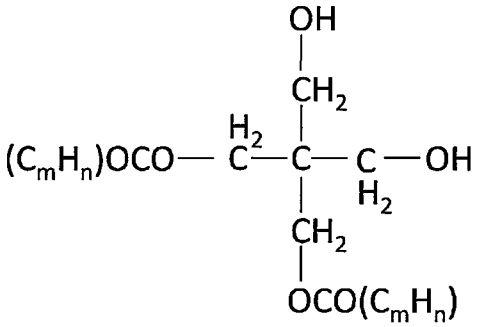

H2
C
CHOH
O
CHOH
R52O–CO–CH2–C–CHOH
H
or
CH2
O
CHOH
R52O–CO–CH–C–CHOH
H
OH

[X]

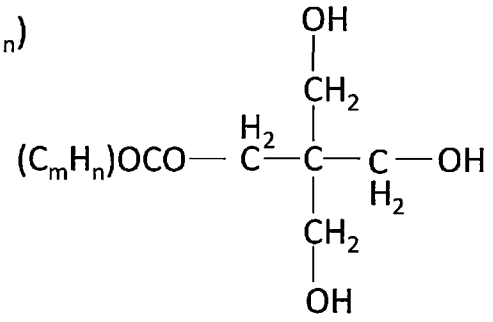


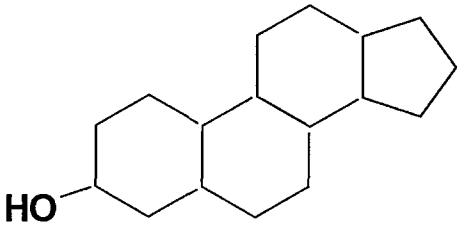
[XI]

or



or





[XII]

$C_mH_n - OH$ [XIII]

$C_mH_n - COO - C_mH_n$ [XIV]

C_mH_n [XV]

wherein, in Formulas [VII] to [XV], m, m', m", n, n' and n" each independently are an integer of 1 or more; a plurality of m or a plurality of n each may be identical to or different from each other; and in Formula [X], R^{52} designates a straight-chain or branched-chain, or saturated or unsaturated hydrocarbon group having 2 or more and 22 or less carbon atoms.

{Claim 11}

The use of a compound for liquid film cleavage according to any one of Claims 1 to 10, wherein the compound has a surface tension of 32 mN/m or less.

{Claim 12}

The use of a compound for liquid film cleavage according to any one of Claims 1 to 11, wherein the compound has a mass average molecular of 500 or more.

{Claim 13}

Use of a fibre treating agent for giving a liquid film cleavage property to a fibre, containing the compound according to any one of Claims 1 to 12 in an amount of 5 mass% or more and 50 mass% or less.

{Claim 14}

The use of a fibre treating agent for giving a liquid film cleavage property to a fibre according to Claim 13, wherein the fibre treating agent further contains a phosphoric acid ester type anionic surfactant.

{Claim 15}

The use of a fibre treating agent for giving a liquid film cleavage property to a fibre according to Claim 14, wherein a content ratio of the compound to the phosphoric acid ester type anionic surfactant in the fibre treating agent is preferably (1:1) to (19:1) in terms of a mass ratio.

{Claim 16}

A nonwoven fabric containing a compound having a spreading coefficient of 15 mN/m or more to a liquid having surface tension of 50 mN/m, and a water solubility of 0 g or more and 0.025 g or less; and a phosphoric acid ester type anionic surfactant.

{Claim 17}

A nonwoven fabric containing a compound having a spreading coefficient of 15 mN/m or more to a liquid having surface tension of 50 mN/m, and a water solubility of 0 g or more and 0.025 g or less, wherein the fineness of the fibres in the nonwoven fabric is 3.3 dtex or less.

{Claim 18}

A nonwoven fabric containing a compound having a spreading coefficient of 15 mN/m or more to a liquid having surface tension of 50 mN/m, and a water solubility of 0 g or more and 0.025 g or less, wherein the interfibre distance in the nonwoven fabric is 150 μm or less.

{Claim 19}

A nonwoven fabric containing a compound having a spreading coefficient of 15 mN/m or more to a liquid having surface tension of 50 mN/m, and a water

solubility of 0 g or more and 0.025 g or less, wherein the compound is attached to the surface of the fibres in the nonwoven fabric.

{Claim 20}

The nonwoven fabric according to any one of Claims 16 to 19, wherein the compound has an interfacial tension of 20 mN/m or less to the liquid having surface tension of 50 mN/m.

{Claim 21}

The nonwoven fabric according to any one of Claims 16 to 20, wherein the compound has at least one kind structure selected from the group consisting of the following structures X, X-Y and Y-X-Y:

wherein the structure X designates a siloxane chain having a structure in which any of basic structures of >C(A)- (C designates a carbon atom, moreover, <, > and - each designate a bonding hand, hereinafter, the same applies), $-C(A)_2-$, -C(A)(B)-, >C(A)-C(R^1)<, >C(R^1)-, -C(R^1)(R^2)-, $-C(R^1)_2-$, >C<, $-Si(R^1)_2O-$ and -Si(R^1)(R^2)O- is repeated, or two or more kinds thereof are combined, or a mixed chain thereof; the structure X has, in an end of the structure X, a hydrogen atom or at least one kind of group selected from the group consisting of $-C(A)_3$, $-C(A)_2B$, $-C(A)(B)_2$, $-C(A)_2-C(R^1)_3$, $-C(R^1)_2A$, $-C(R^1)_3$, $-OSi(R^1)_3$, $-OSi(R^1)_2(R^2)$, $-Si(R^1)_3$ and $-Si(R^1)_2(R^2)$;

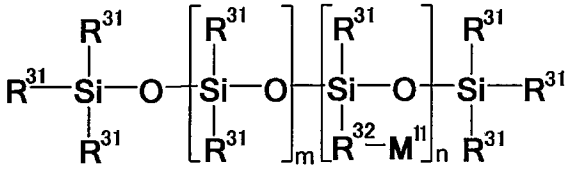
wherein R^1 and R^2 each independently designate a hydrogen atom, an alkyl group, an alkoxy group, an aryl group, or a halogen atom; A and B each independently designate a substituent having an oxygen atom or a nitrogen atom; when a plurality of R^1, R^2, A and B exist for each in the structure X, these may be identical to or different from each other; and

wherein Y designates a hydrophilic group having hydrophilicity, the group containing an atom selected from a hydrogen atom, a carbon atom, an oxygen

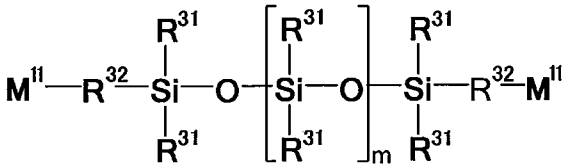
atom, a nitrogen atom, a phosphorus atom or a sulphur atom; and when a plurality of Y exist, these groups may be identical to or different from each other.

{Claim 22}

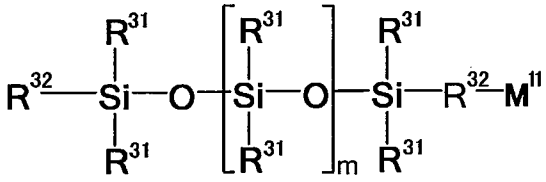
A nonwoven fabric containing a compound having a structure represented by any one of the following Formulas [I] to [IV], and a water solubility of 0 g or more and 0.025 g or less, for liquid film cleavage:



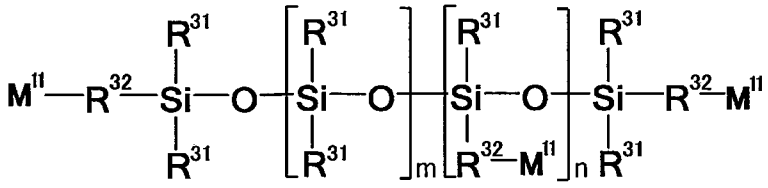
[I]



[II]



[III]



[IV]

wherein R^{31} designates an alkyl group; R^{32} designates a single bond or an alkylene group; a plurality of R^{31} and a plurality of R^{32} may be each identical to or different from each other; M^{11} designates a group having a polyoxyalkylene group; as the polyoxyalkylene group, a polyoxyethylene group, a polyoxypropylene group, a polyoxybutylene group and a material in which

constituent monomers thereof are copolymerised or the like are taken; and m and n each are independently an integer of 1 or more.

{Claim 23}

The nonwoven fabric according to any one of Claims 16 to 22, wherein the compound comprises a modified silicone having a structure having at least one oxygen atom in a modifying group.

{Claim 24}

A nonwoven fabric containing a phosphoric acid ester type anionic surfactant, and a compound having a spreading coefficient of more than 0 mN/m to a liquid having surface tension of 50 mN/m, a water solubility of 0 g or more and 0.025 g or less, and an interfacial tension of 20 mN/m or less to the liquid having surface tension of 50 mN/m, for liquid film cleavage.

{Claim 25}

A nonwoven fabric containing a compound having a spreading coefficient of more than 0 mN/m to a liquid having surface tension of 50 mN/m, a water solubility of 0 g or more and 0.025 g or less, and an interfacial tension of 20 mN/m or less to the liquid having surface tension of 50 mN/m, wherein the fineness of the fibres in the nonwoven fabric is 3.3 dtex or less.

{Claim 26}

A nonwoven fabric containing a compound having a spreading coefficient of more than 0 mN/m to a liquid having surface tension of 50 mN/m, a water solubility of 0 g or more and 0.025 g or less, and an interfacial tension of 20

mN/m or less to the liquid having surface tension of 50 mN/m, wherein the interfibre distance in the nonwoven fabric is 150 μm or less.

{Claim 27}

A nonwoven fabric containing a compound having a spreading coefficient of more than 0 mN/m to a liquid having surface tension of 50 mN/m, a water solubility of 0 g or more and 0.025 g or less, and an interfacial tension of 20 mN/m or less to the liquid having surface tension of 50 mN/m, wherein the compound is attached to the surface of the fibres in the nonwoven fabric.

{Claim 28}

The nonwoven fabric according to any one of Claims 24 to 27, wherein the compound has at least one kind structure selected from the group consisting of the following structures Z, Z-Y and Y-Z-Y:

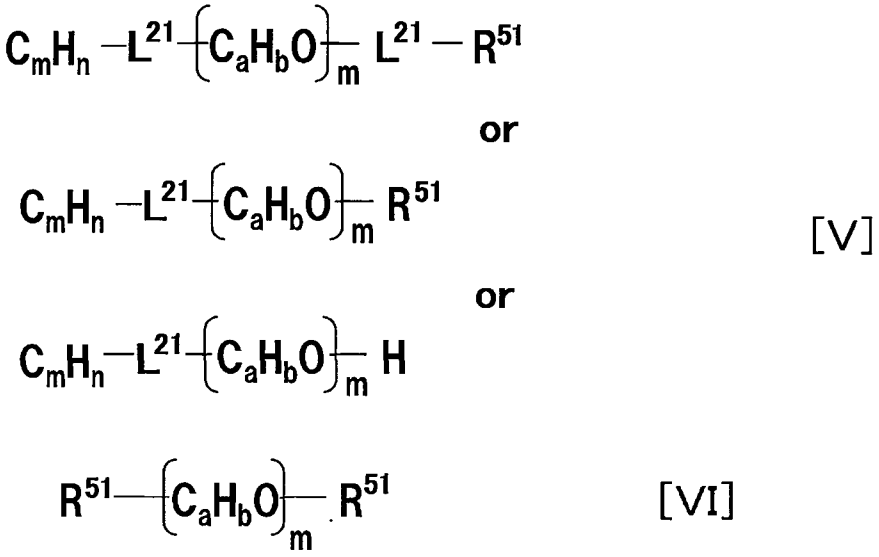
wherein the structure Z designates a hydrocarbon chain having a structure in which any of basic structures of >C(A)- (C: carbon atom), $-C(A)_2-$, -C(A)(B)-, >C(A)-C(R^3)<, >C(R^3)-, -C(R^3)(R^4)-, $-C(R^3)_2-$ and >C< is repeated, or two or more kinds thereof are combined; the structure Z has, at an end thereof, a hydrogen atom or at least one kind of group selected from the group consisting of $-C(A)_3$, $-C(A)_2B$, $-C(A)(B)_2$, $-C(A)_2-C(R^3)_3$, $-C(R^3)_2A$ and $-C(R^3)_3$,

the R^3 and R^4 each independently designate a hydrogen atom, an alkyl group, an alkoxy group, an aryl group, a fluoroalkyl group, or an aralkyl group, or a hydrocarbon group in combination therewith, or a fluorine atom; A and B each independently designate a substituent containing an oxygen atom or a nitrogen atom;

Y designates a hydrophilic group having hydrophilicity, the hydrophilic group containing an atom selected from a hydrogen atom, a carbon atom, an oxygen atom, a nitrogen atom, a phosphorus atom and a sulphur atom; and when Y is plural, the plurality may be identical to or different from each other.

{Claim 29}

The nonwoven fabric according to any one of Claims 24 to 28, wherein the compound is polyoxyalkylene alkyl ether represented by any one of Formulas in Formula [V]; or any of polyoxyalkylene glycol, Steareth, Beheneth, PPG myristyl ether, PPG stearyl ether and PPG behenyl ether, which are represented by Formula [VI] and have a molecular weight of 1000 or more:



[V]

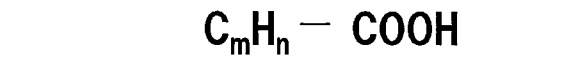
[VI]

wherein L^{21} designates an ether group, an amino group, an amide group, an ester group, a carbonyl group, a carbonate group, a polyoxyethylene group, a polyoxypropylene group, a polyoxybutylene group, or a polyoxyalkylene group in combination therewith; R^{51} designate a substitute of a hydrogen atom, a methyl group, an ethyl group, a propyl group, an isopropyl group, a butyl group, a pentyl group, a hexyl group, a heptyl group, 2-ethylhexyl group, a nonyl group, a decyl group, a methoxy group, an ethoxy group, a phenyl group, a fluoroalkyl group, an aralkyl group, a hydrocarbon group in combination therewith, or a fluorine atom; a, b, m and n each independently are an integer of 1 or more; C_mH_n herein designates an alkyl group (n = 2m + 1), and C_aH_b designates an alkylene group (a = 2b); the number of carbon atoms and the number of hydrogen atoms are

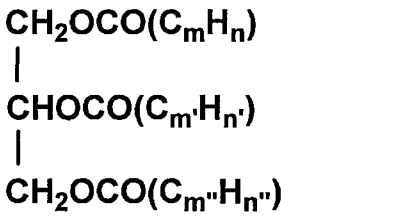
each independently determined in each of Formulas (V) and (VI), and do not always represent an identical integer, and may be different from each other; "m" in $-(C_aH_bO)_m-$ is an integer of 1 or more; and values of the repeating units are each independently determined in each of Formulas (V) and (VI), and do not always represent an identical integer, and may be different from each other.

{Claim 30}

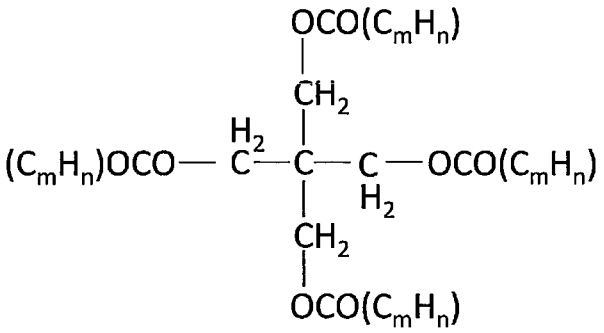
The nonwoven fabric according to any one of Claims 24 to 29, wherein the compound is represented by any one of Formulas [VII] to [XV]:



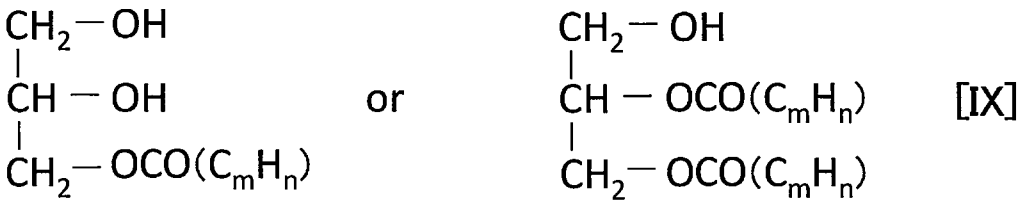
[VII]



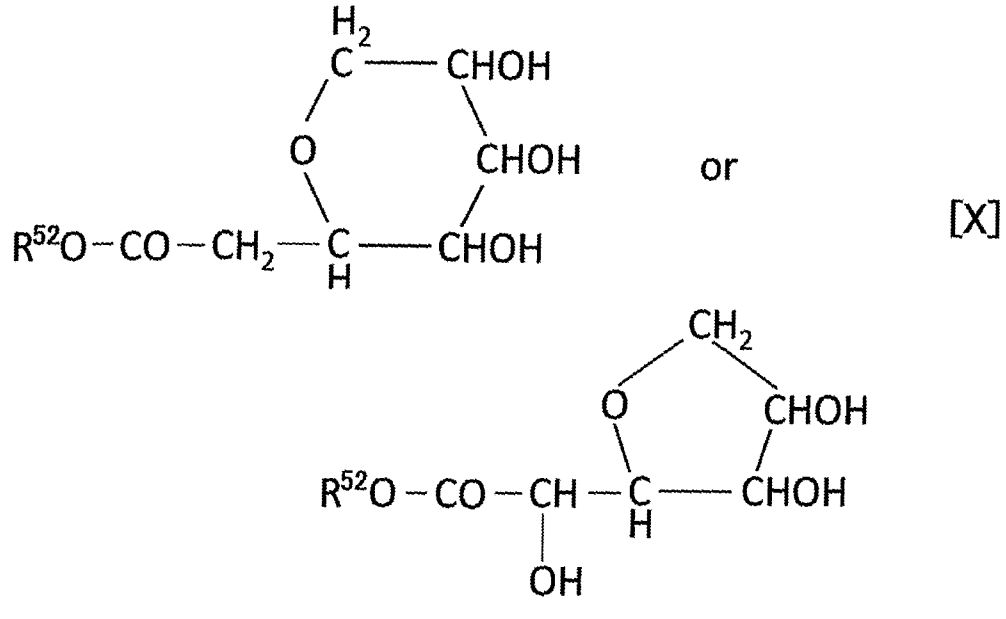
[VIII-I]



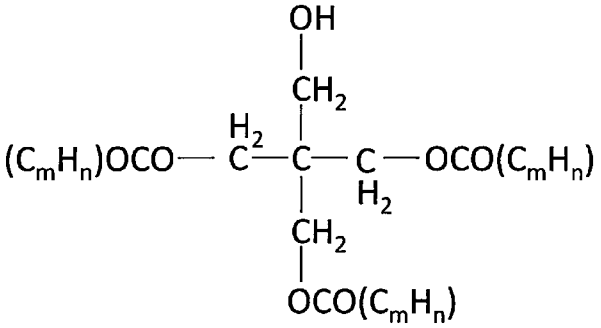
[VIII-II]



[IX]

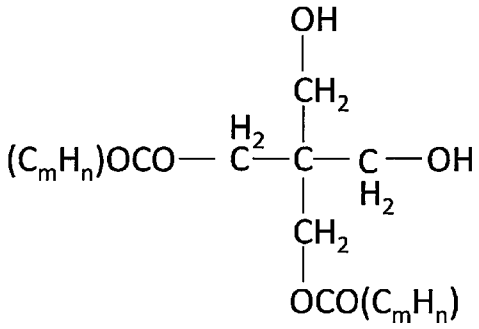

H2
C
CHOH
O
CHOH
R52O – CO – CH2 – C – CHOH
H
or
CH2
O
CHOH
R52O – CO – CH – C – CHOH
H
OH

[X]

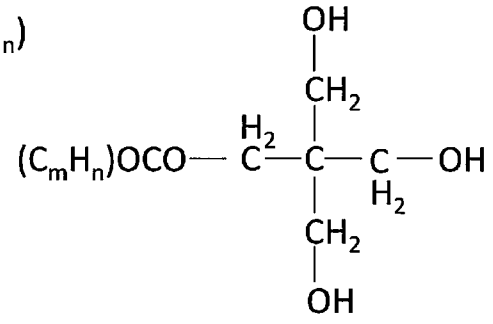


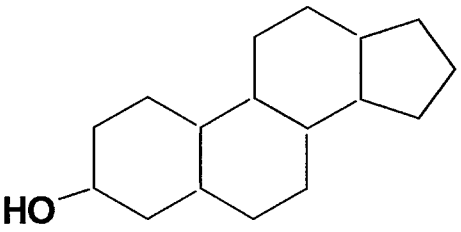
[XI]

or



or





[XII]

$C_mH_n - OH$ [XIII]

$C_mH_n - COO - C_mH_n$ [XIV]

$$C_mH_n \qquad [XV]$$

wherein, in Formulas [VII] to [XV], m, m', m", n, n' and n" each independently are an integer of 1 or more; a plurality of m or a plurality of n each are identical to or different from each other; and in Formula [X], R^{52} designates a straight-chain or branched-chain, or saturated or unsaturated hydrocarbon group having 2 or more and 22 or less carbon atoms.

{Claim 31}

The nonwoven fabric according to any one of Claims 16 to 30, wherein the compound has a surface tension of 32 mN/m or less.

{Claim 32}

The nonwoven fabric according to any one of Claims 16 to 30, wherein the compound has a mass average molecular weight of 500 or more.

{Claim 33}

The nonwoven fabric according to to any one of Claims 16 to 32, wherein the compound is partially localised at least around part of the points that fibres are entangled to each other or the points that fibres are fusion bonded to each other.

{Claim 34}

The nonwoven fabric according to any one of Claim 16 to 33, wherein the nonwoven fabric contains a phosphoric acid ester type anionic surfactant, and a content ratio of the compound to the phosphoric acid ester type anionic surfactant is (1:1) to (19:1) in terms of a mass ratio.

{Claim 35}

The nonwoven fabric according to any one of Claims 16 to 34, wherein the contact angle of constituent fibres of the nonwoven fabric is 90 degrees or less.

{Claim 36}

A concavo-convex nonwoven fabric, which is the nonwoven fabric according to any one of Claims 16 to 35, comprising thermoplastic fibres and having a first surface and a second surface positioned on the side opposite thereto, wherein the nonwoven fabric, at least in the first surface, has a concavo-convex shape having a plurality of convex portions projecting on a side of the first surface and concave portions positioned among the convex portions.

{Claim 37}

An absorbent article, employing the nonwoven fabric according to any one of Claims 16 to 35 or the concavo-convex nonwoven fabric according to Claim 36.

{Claim 38}

An absorbent article, employing the nonwoven fabric according to any one of Claims 16 to 35 or the concavo-convex nonwoven fabric according to Claim 36 as a topsheet.