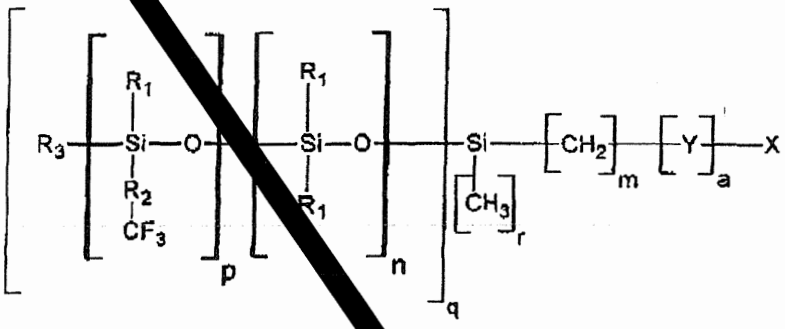
Claims

1. A method of making a contact lens comprising the steps of:

a) reacting in a mould a polymerisable formulation comprising:

(i) at least one fluorine-containing silicone monomer having the formula



where X is a polymerisable group, each R_1 is independently a C_{1-6} alkyl group or an R_4-CF_3 group, wherein R_4 is independently a C_{1-6} alkenyl group, each R_2 is independently a C_{1-6} alkenyl group, or a fluorine-containing C_{1-6} alkenyl group, R_3 is a monovalent linear or branched alkyl group, a siloxane chain comprising from 1 to 30 Si-O units, a phenyl group, a benzyl group, a linear or branched heteroatom containing group or a combination thereof, m is 1 to 6, n is 0 to 14, and p is 1 to 14, and n + p is ≤15, Y is a divalent linking group and a is 0 or 1, wherein q is from 1 to 3 and r is 3-q;

(ii) at least one non-fluorine-containing silicone monomer and

(iii) at least one hydrophilic monomer

to form a contact lens

b) subjecting the contact lens to one or more solvent extraction steps to remove impurities, oligomers and unreacted monomers and hydrate the contact lens, wherein all of the solvent extraction steps are undertaken using an aqueous solvent.

2. A method as claimed in Claim 1, wherein the total amount of component (i) is at least 20 weight percent of the total formulation and the total amount of components (i) and (ii) is less than 50 weight percent of the total formulation.

3. A method as claimed in Claim 1 or Claim 2 additionally comprising at least one cross-linker.

4. A method as claimed in any one of Claims 1 to 3 additionally comprising a non-silicon containing hydrophobic monomer.

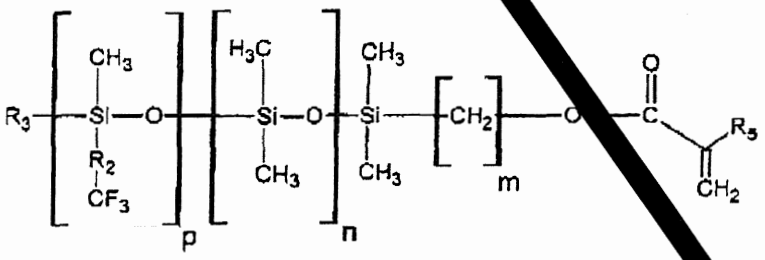
5. A method as claimed in any one of the preceding claims, wherein the hydrophilic monomer comprises one or more of N-vinyl pyrrolidone, N-methyl-N-vinyl acetamide, N,N-dimethylacrylamide and 2-hydroxyethylmethacrylate.

6. A method as claimed in any one of the preceding claims, wherein N,N-dimethylacrylamide is present in an amount of from 3 to 10 weight percent.

7. A method as claimed in any one of the preceding claims, wherein the non-fluorine containing silicone monomer comprises tris(trimethylsilyloxy)silylpropylmethacrylate.

8. A method as claimed in any one of the preceding claims, wherein q is 1 or 2.

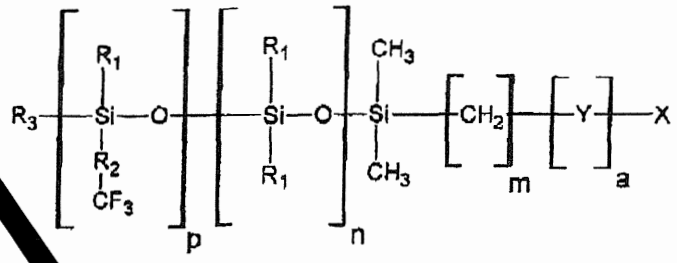
9. A method as claimed in any one of the preceding claims, wherein the fluorine containing silicone monomer comprises:



wherein each R_2 is independently a C_{1-6} alkenyl group or a fluorine containing C_{1-6} alkenyl group, R_3 is a monovalent alkyl group, R_5 is H or CH_3, m is 1 to 6, n is 0 to 14, and p is 1 to 14, and $n + p$ is ≤ 15.

10. A solvent-free polymerisable formulation, the formulation comprising

(i) at least one fluorine-containing silicone monomer having the formula



wher X is a polymerisable group, each R_1 is independently a C_{1-6} alkyl group or an R_4-CF_3 gro wherein R_4 is independently a C_{1-6} alkenyl group, each R_2 is independently a C_{1-6} alkeny roup, or a fluorine-containing C_{1-6} alkenyl group, R_3 is a monovalent linear or branched a l group, a siloxane chain comprising from 1 to 30 Si-O units, a phenyl group, a benzyl g up, a linear or branched heteroatom containing group or a combination thereo m is 1 to 6, n is 0 to 14, and p is 1 to 14, and n + p is ≤15, Y is a divalent linking group d a is 0 or 1;

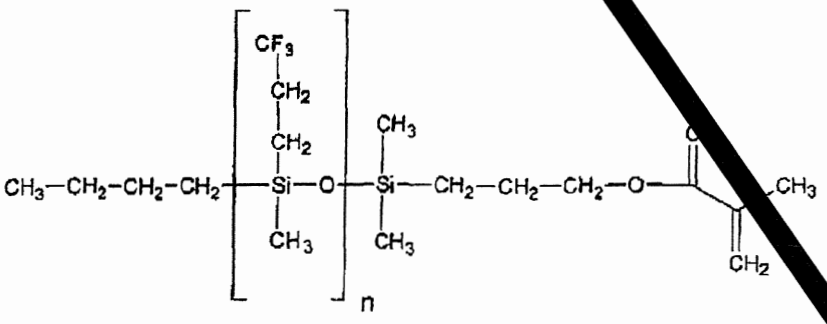
(ii) at least one non-fl ine-containing silicone monomer; and

(iii) at least one hydrophi monomer

wherein the total amount of com nent (i) is at least 20 weight percent of the total formulation and the total amount o components (i) and (ii) is less than 50 weight percent of the total formulation.

11. A polymerisable formulation compr ng:

(i) from 20 to 35 weight percent of at least one uorine-containing silicone monomer having the formula:



wherein n is from 1 to 10;

(ii) from 15 to 35 weight percent of at least one non-fluorine containing silicone

monomer;

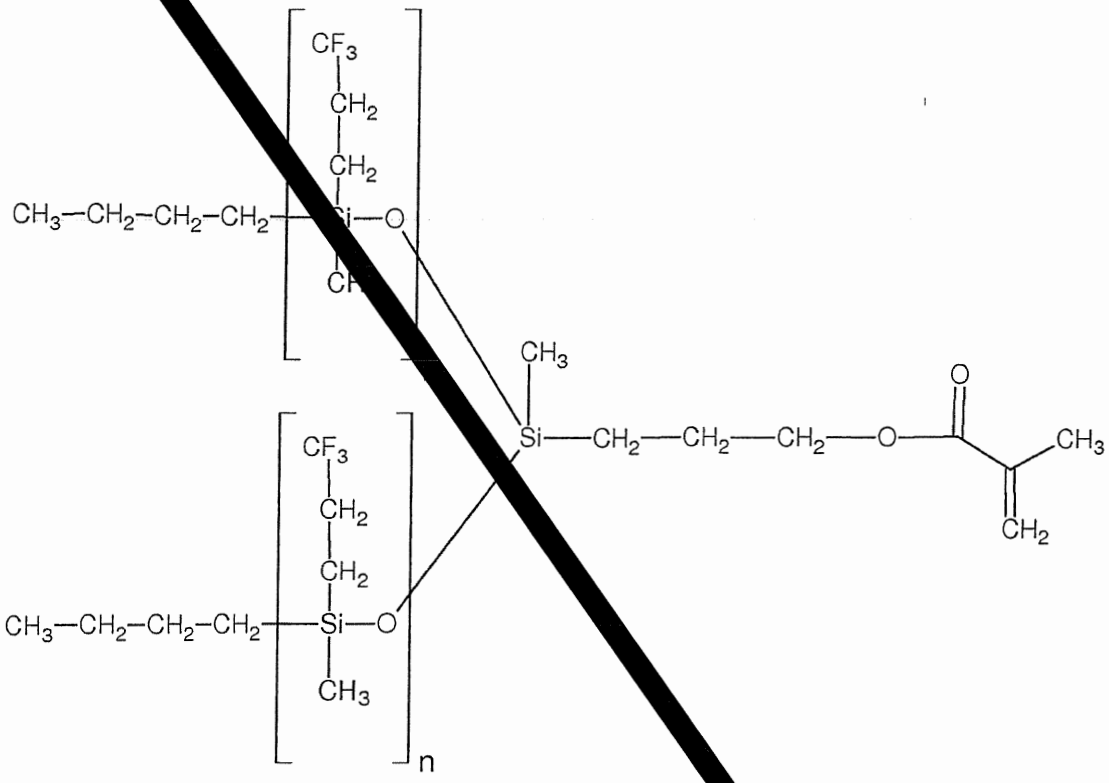
(iii) from 25 to 60 weight percent N-vinyl pyrrolidone or N-methyl-N-vinyl acetamide;

(iv) from 2 to 10 weight percent 2-hydroxyethyl methacrylate,

wherein the total amount of components (i) and (ii) is less than 50 weight percent.

A polymerisable formulation comprising:

(i) from 20 to 35 weight percent of at least one fluorine-containing silicone monomer having the formula:



wherein each n is independently from 1 to 10;

(ii) from 8 to 35 weight percent of at least one non-fluorine containing silicone monomer;

(iii) from 25 to 60 weight percent N-vinyl pyrrolidone or N-methyl-N-vinyl acetamide;

(iv) from 2 to 10 weight percent 2-hydroxyethyl methacrylate,

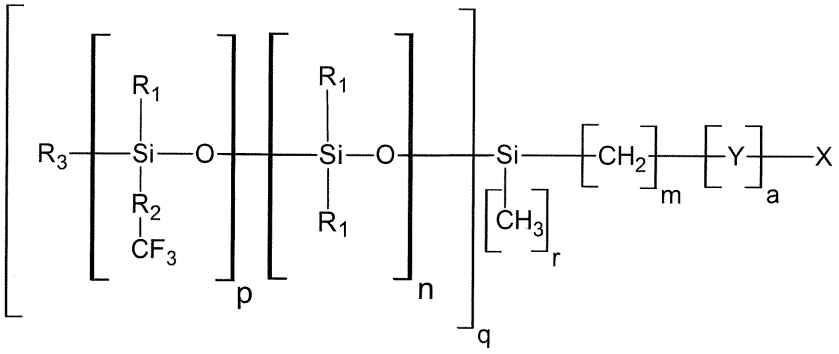
wherein the total amount of components (i) and (ii) is less than 55 weight percent.

Claims

1. A method of making a contact lens comprising the steps of:

a) reacting in a mould a polymerisable formulation comprising:

(i) at least one fluorine-containing silicone monomer having the formula



where X is a polymerisable group, each R_1 is independently a C_{1-6} alkyl group or an R_4-CF_3 group, wherein R_4 is independently a C_{1-6} alkenyl group, each R_2 is independently a C_{1-6} alkenyl group, or a fluorine-containing C_{1-6} alkenyl group, R_3 is a monovalent linear or branched alkyl group, a siloxane chain comprising from 1 to 30 Si-O units, a phenyl group, a benzyl group, a linear or branched heteroatom containing group or a combination thereof, m is 1 to 6, n is 0 to 14, and p is 1 to 14, and n + p is ≤ 15, Y is a divalent linking group and a is 0 or 1, wherein q is from 1 to 3 and r is 3-q;

(ii) at least one non-fluorine-containing silicone monomer; and

(iii) at least one hydrophilic monomer to form a contact lens; and

b) subjecting the contact lens to one or more solvent extraction steps to remove impurities, oligomers and unreacted monomers and hydrate the contact lens, wherein all of the solvent extraction steps are undertaken using an aqueous solvent.

2. A method as claimed in Claim 1, wherein the total amount of component (i) is at least 20 weight percent of the total formulation and the total amount of components (i) and (ii) is less than 50 weight percent of the total formulation.

3. A method as claimed in Claim 1 additionally comprising at least one cross-linker.

4. A method as claimed in Claim 1 additionally comprising a non-silicon containing hydrophobic monomer.

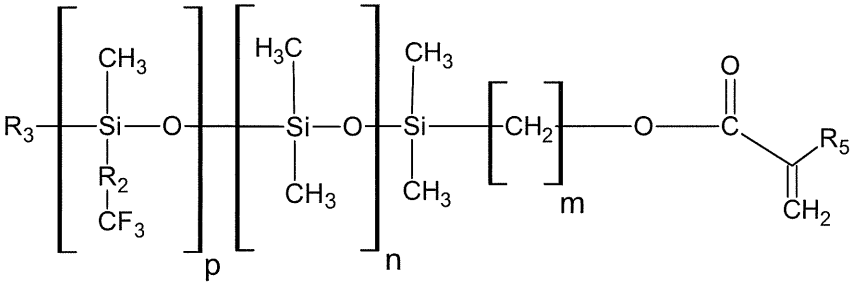
5. A method as claimed in Claim1, wherein the hydrophilic monomer comprises one or more of N-vinyl pyrrolidone, N-methyl-N-vinyl acetamide, N,N-dimethylacrylamide and 2-hydroxyethylmethacrylate.

6. A method as claimed in Claim 1, wherein N,N-dimethylacrylamide is present in an amount of from 3 to 10 weight percent.

7. A method as claimed in Claim 1, wherein the non-fluorine containing silicone monomer comprises tris(trimethylsilyloxy)silylpropylmethacrylate.

8. A method as claimed in Claim 1, wherein q is 1 or 2.

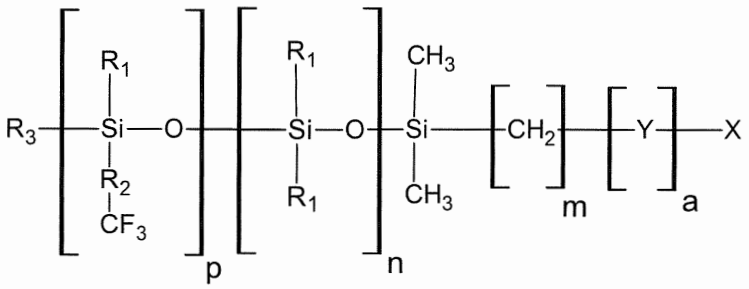
9. A method as claimed in Claim 1, wherein the fluorine containing silicone monomer comprises:



wherein each R_2 is independently a $C_{1\text{-}6}$ alkenyl group or a fluorine containing $C_{1\text{-}6}$ alkenyl group, R_3 is a monovalent alkyl group, R_5 is H or CH_3, m is 1 to 6, n is 0 to 14, and p is 1 to 14, and n + p is $\trianglelefteq 5$.

10. A solvent-free polymerisable formulation, the formulation comprising:

(i) at least one fluorine-containing silicone monomer having the formula



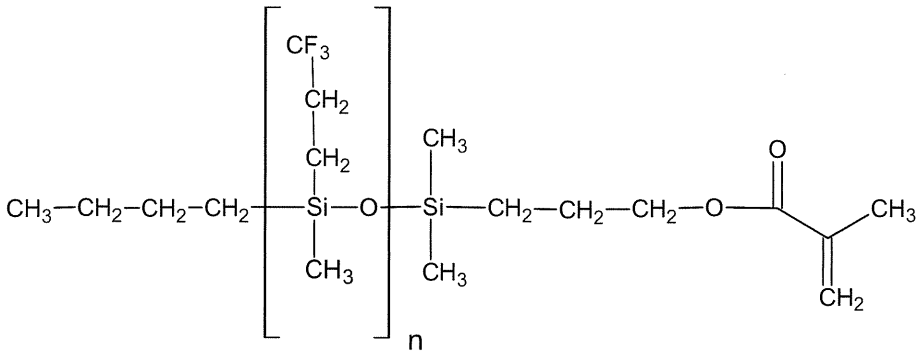
where X is a polymerisable group, each R_1 is independently a C_{1-6} alkyl group or an R_4-CF_3 group, wherein R_4 is independently a C_{1-6} alkenyl group, each R_2 is independently a C_{1-6} alkenyl group, or a fluorine-containing C_{1-6} alkenyl group, R_3 is a monovalent linear or branched alkyl group, a siloxane chain comprising from 1 to 30 Si-O units, a phenyl group, a benzyl group, a linear or branched heteroatom containing group or a combination thereof, m is 1 to 6, n is 0 to 14, and p is 1 to 14, and n + p is $\leq$5, Y is a divalent linking group and a is 0 or 1;

(ii) at least one non-fluorine-containing silicone monomer; and

(iii) at least one hydrophilic monomer, wherein the total amount of component (i) is at least 20 weight percent of the total formulation and the total amount of components (i) and (ii) is less than 50 weight percent of the total formulation.

11. A polymerisable formulation comprising:

(i) from 20 to 35 weight percent of at least one fluorine-containing silicone monomer having the formula:



wherein n is from 1 to 10;

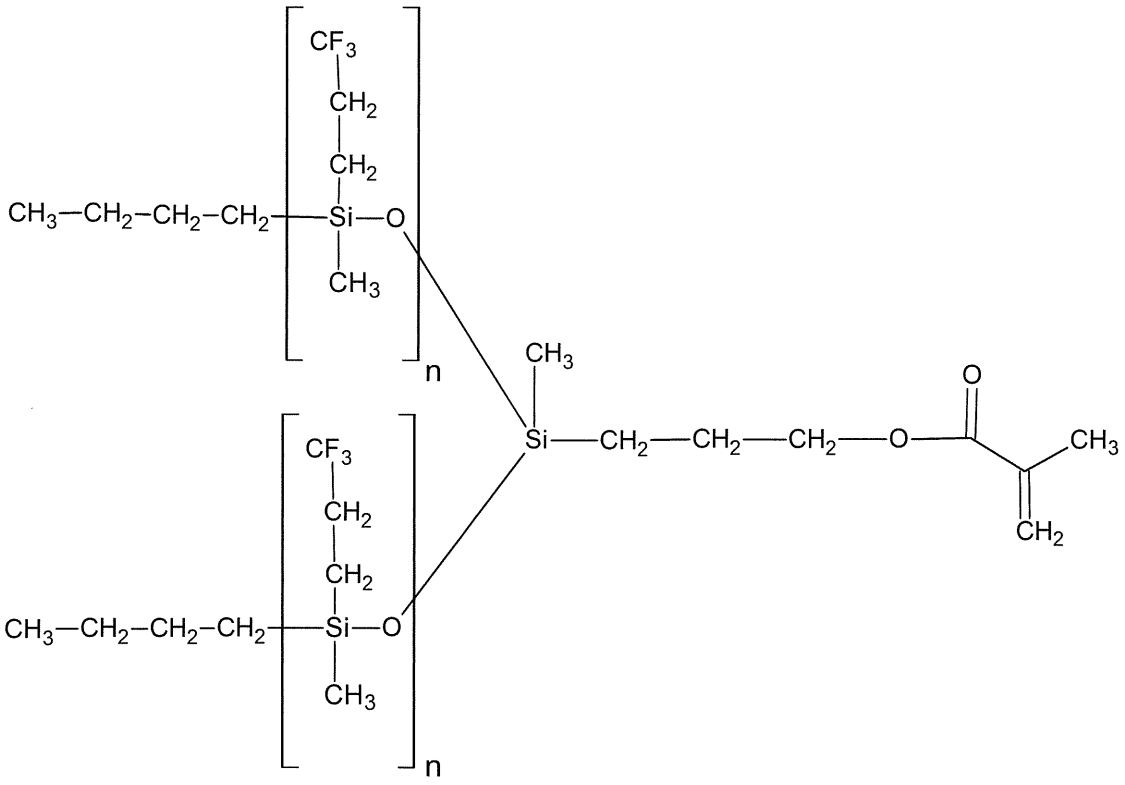
(ii) from 15 to 35 weight percent of at least one non-fluorine containing silicone monomer;

(iii) from 25 to 60 weight percent N-vinyl pyrrolidone or N-methyl-N-vinyl acetamide; and

(iv) from 2 to 10 weight percent 2-hydroxyethyl methacrylate, wherein the total amount of components (i) and (ii) is less than 50 weight percent.

12. A polymerisable formulation comprising:

(i) from 20 to 35 weight percent of at least one fluorine-containing silicone monomer having the formula:



wherein each n is independently from 1 to 10;

(ii) from 8 to 35 weight percent of at least one non-fluorine containing silicone monomer;

(iii) from 25 to 60 weight percent N-vinyl pyrrolidone or N-methyl-N-vinyl acetamide; and

(iv) from 2 to 10 weight percent 2-hydroxyethyl methacrylate,

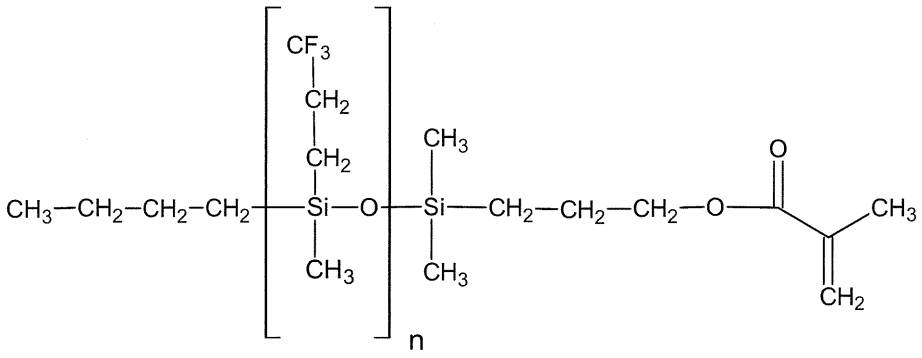
wherein the total amount of components (i) and (ii) is less than 55 weight percent.

13. A method as claimed in Claim 1, wherein X is selected from the group consisting of an acrylate, methacrylate, acrylamide and a methacrylamide, each R_1 is independently a C_{1-6} alkyl group, each R_2 is independently a C_{1-6} alkenyl group, R_3 is a monovalent linear or branched alkyl group or a siloxane chain comprising from 1 to 30 Si-O units, n is 0 to 7, and p is 1 to 10, and a is 0 and q is 1.

14. A method as claimed in Claim 1, wherein X is selected from the group consisting of an acrylate, methacrylate, acrylamide, and a methacrylamide, each R_1 is independently a C_{1-6} alkyl group, each R_2 is independently a C_{1-6} alkenyl group, or a fluorine-containing C_{1-6} alkenyl group, R_3 is a monovalent linear or branched alkyl group or a siloxane chain comprising from 1 to 30 Si-O units, m is 1 to 6, n is 0 to 14, and p is 1 to 14, and n + p is ≤ 15, Y is a divalent linking group and a is 0 or 1, wherein q is from 1 to 3 and r is 3-q.

15. A method as claimed in Claim 1, wherein the polymerisable formulation comprises:

(i) from 20 to 35 weight percent of at least one fluorine-containing silicone monomer having the formula:



wherein n is from 1 to 10;

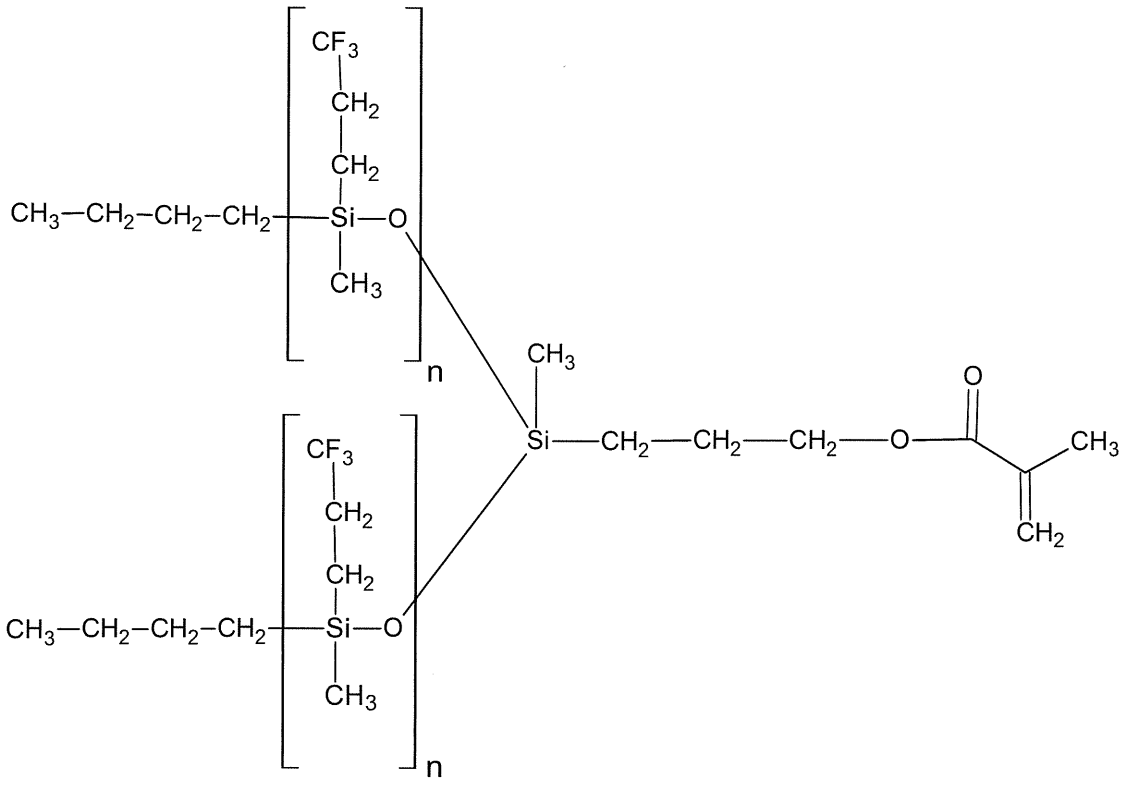
(ii) from 15 to 35 weight percent of at least one non-fluorine containing silicone monomer;

(iii) from 25 to 60 weight percent N-vinyl pyrrolidone or N-methyl-N-vinyl acetamide; and

(iv) from 2 to 10 weight percent 2-hydroxyethyl methacrylate, wherein the total amount of components (i) and (ii) is less than 50 weight percent.

16. A method as claimed in Claim 1, wherein the polymerisable formulation comprises:

(i) from 20 to 35 weight percent of at least one fluorine-containing silicone monomer having the formula:



wherein each n is independently from 1 to 10;

(ii) from 8 to 35 weight percent of at least one non-fluorine containing silicone monomer;

(iii) from 25 to 60 weight percent N-vinyl pyrrolidone or N-methyl-N-vinyl acetamide; and

(iv) from 2 to 10 weight percent 2-hydroxyethyl methacrylate,

wherein the total amount of components (i) and (ii) is less than 55 weight percent.