CLAIMS

What is claimed is:

1. A water-dispersible or water-soluble composition comprising one or more water-dispersible or water-soluble urethane polymers, wherein the one or more polymers comprise:

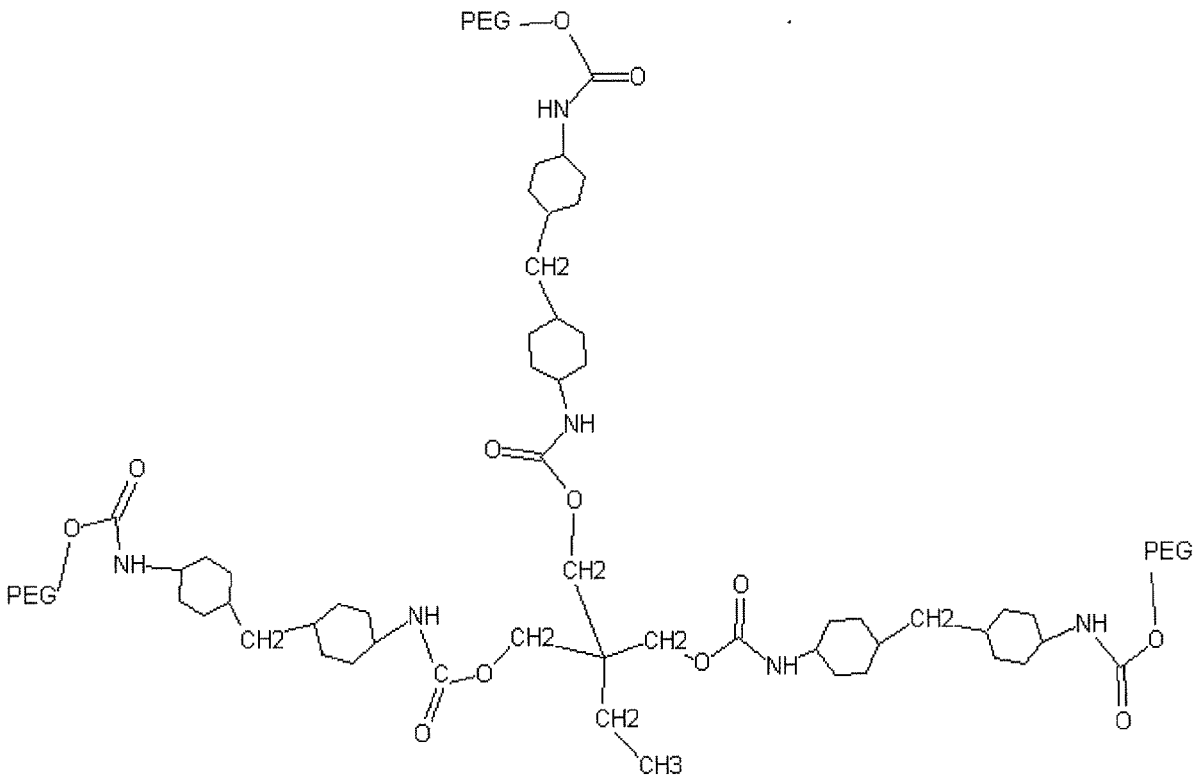
(a) a core comprising C1-6 linear, branched, or cyclic hydrocarbon having at least one reactive group;

(b) one or more arms radiating out from the core, each arm having the following Formula 1:

$$-[O-C(=O)-N(H)-R1-N(H)-C(=O)-O-(CH2CH2-O)_n]-H$$

wherein n=4-12, R1 is the same or different and is dicyclohexylmethane, diphenylmethane, or toluene.

2. The water-dispersible or water-soluble composition of claim 1, wherein the one or more water-dispersible or water soluble polymers comprise a polymer having the following formulation:



wherein PEG is polyethylene glycol.

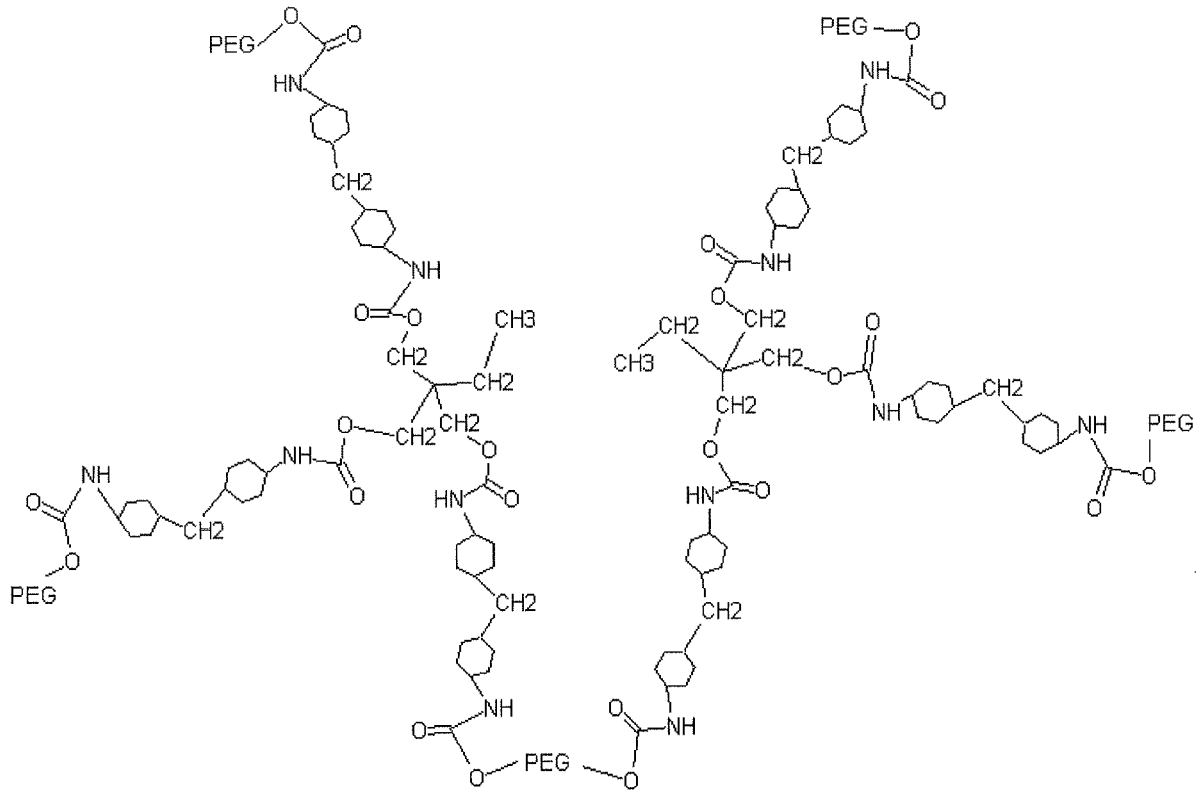
3. A water-dispersible or water-soluble composition comprising one or more water-dispensible or water-soluble urethane polymers, wherein the one or more water-dispersible or water-soluble polymers comprise:

(a) a core comprising C1-6 linear, branched, or cyclic hydrocarbon having at least one reaction group;

(b) one or more arms radiating out from the core, each arm having at least some crosslinking, wherein at least one arm has at least one hydrophilizing molecule containing at least 2 hydrophillic groups per molecule to provide the crosslinking between polymers.

4. The water-dispersible or water-soluble composition of claim 3, wherein the at least one hydrophilizing molecule comprises polyethylene glycol.

5. The water-dispersible or water-soluble composition of claim 4, wherein the one or more water-dispersible or water-soluble polymer comprises a polymer having the following formulation:



wherein PEG is polyethylene glycol.

6. The water-dispersible or water-soluble composition of claim 1, wherein the core is at least one of trimethylolpropane, glycerol, propylene glycol, 1,3-propandiol, and glucose.

7. The water-dispersible or water-soluble composition of claims 1 or 6, wherein the polymer has from 1 to 6 arms, preferably from 1 to 3 arms.

8. The composition of any of the preceding claims, wherein the composition further comprises water.

9. A composition comprising at least one water-soluble or water-dispersible polymer, wherein the water-soluble or water-dispersible polymer is the reaction product of the reaction of at least one dicyclohexylmethane-4, 4'-diisocyanate with a polyol core to form a pre-polymer, followed by reaction of the pre-polymer with a hydrophilic polyol.

10. The composition of claim 9, wherein the polyol core is trimethylolpropane.

11. The composition of claim 10, wherein the hydrophilic polyol is polyethylene glycol, polyglycerol or glucose.

12. A cleaning composition comprising about 0.01% to about 50% by weight of at least one water-dispersible or water-soluble composition of any one of claims 1-11.

13. The cleaning composition of claim 12, wherein the cleaning composition comprises about 0.01% to about 10% by weight of the at least one water-dispersible or water-soluble composition.

14. The cleaning composition of claim 12, wherein the cleaning composition comprises about 0.01% to about 1% by weight of the at least one water-dispersible or water-soluble composition.

15. The cleaning composition of claim 12, wherein the cleaning composition comprises about 0.01% to about 0.1% by weight of the at least one water-dispersible or water-soluble composition.

16. The cleaning compositions of any of claims 12-15, wherein the cleaning composition is used as a bathroom or kitchen cleaner.

17. A light duty liquid detergent composition comprising about 0.01% to about 10% of the water-dispersible or water-soluble composition of any one of claims 1-11.

18. The light duty liquid detergent composition of claim 17, wherein the composition comprises about 0.01% to about 1.0% of the water-dispersible or water soluble composition.

19. The light duty liquid detergent composition of claim 17 or 18, wherein the detergent composition has an increased foam performance as compared with the detergent composition not containing the at least one water-dispersible or water soluble composition, wherein the foam milage is measured by the Automated Mixed Soil Gram Test.

20. The light duty liquid detergent of any of claims 17-19, wherein the composition provides enhanced soil release as compared to a composition not containing the at least one water-dispersible or water soluble composition.

21. The cleaning composition of any one of claims 12-16, wherein the composition provides enhanced soil release as compared to a composition not containing the at least one water-dispersible or water soluble composition.

22. A glass cleaner composition comprising about 0.01% to about 0.1% of the water-dispersible or water soluble compositions of any one of claims 1-11.

23. The glass cleaner composition of claim 22, wherein the glass cleaner does not contain a surfactant or solvent.

24. The composition of any of the preceding claims 1-11, wherein the composition comprises an additional hydrophilic additive.

25. The composition of claim 24, wherein the additional hydrophilic additive is diglycolamine.

26. A cleaning composition comprising about 0.01% to about 0.1% of the at least one water-dispersible or water-soluble composition of any one of claims 1-11, wherein the cleaning composition has an increased foam performance as compared with the cleaning composition not containing the at least one water-dispersible or water soluble composition, wherein the foam milage is measured by the Automated Mixed Soil Gram Test.

27. The method of making a water-dispersible or water-soluble polymer composition, the method comprising the steps of:

a) reacting a dicyclohexylmethane-4, 4'-diisocyanate with a polyol core at a temperature of about 60 °C to about 100 °C for a sufficient time to form a pre-polymer; and

b) reacting the pre-polymer with a hydrophilic polyol at a temperature of about 60 °C to about 120 °C for a sufficient amount of time to produce a polymer substantially soluble or dispersible into water.

CLAIMS

What is claimed is:

1. A water-dispersible or water-soluble composition comprising one or more water-dispersible or water-soluble star polymers, wherein the one or more star polymers comprises:

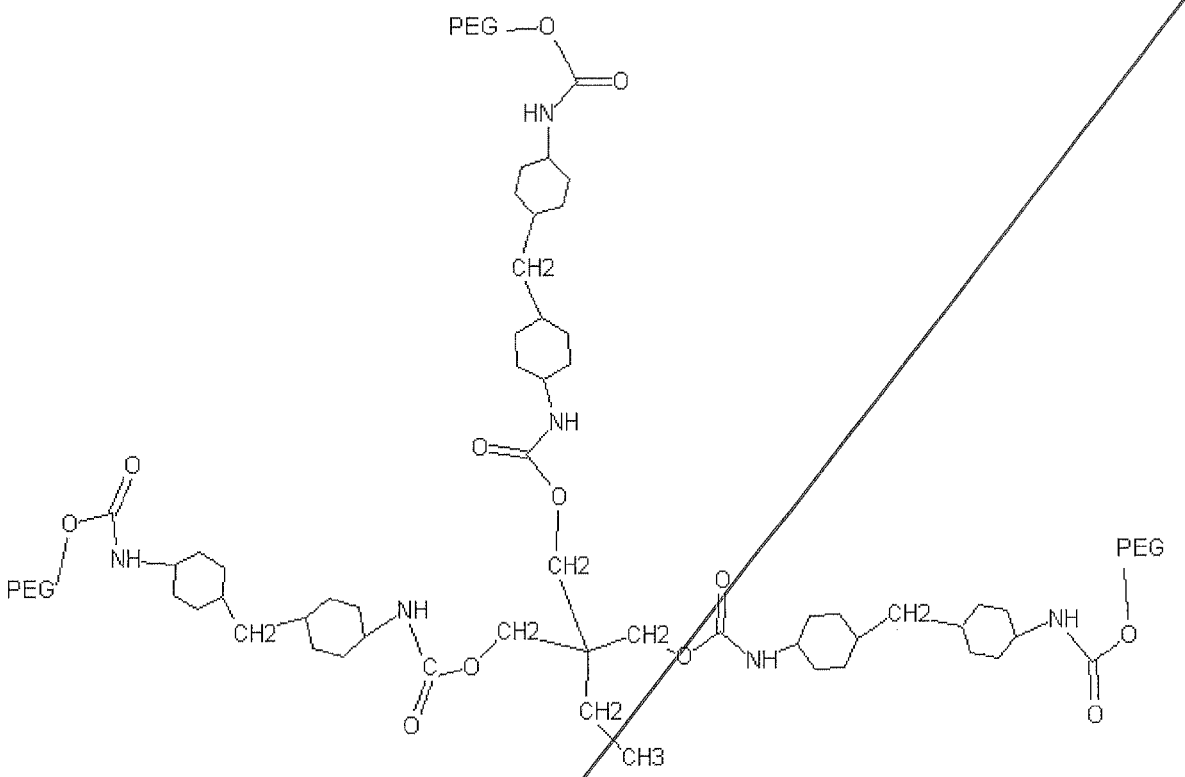
(a) a core comprising C1-6 linear, branched, cyclic or other hydrocarbon having at least one reactive group;

(b) one or more arms radiating out from the core, each arm having the following Formula 1:

$$-[O-C(=O)-N(H)-R1-N(H)-C(=O)-O-(CH2CH2-O)_n]-H$$

wherein n=4-12, R1 is the same or different and is dicyclohexylmethane, diphenylmethane, or toluene.

2. The water-dispersible or water-soluble composition of claim 1, wherein the one or more water-dispersible or water soluble star polymers comprises a star polymer having the following formulation:

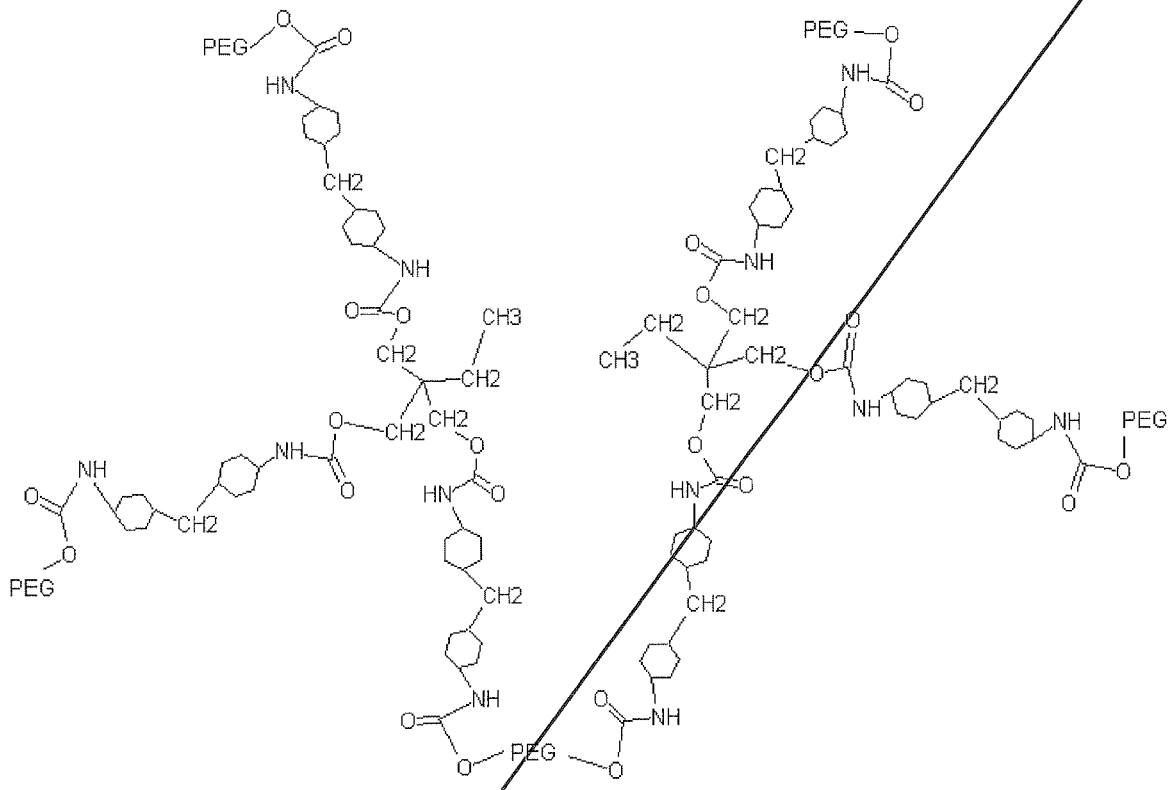


wherein PEG is polyethylene glycol.

3. The water-dispersible or water-soluble composition of claim 1, wherein the one or more water-dispersible or water-soluble polymers have at least some crosslinking, wherein an isocyanate group on each arm bonds with at least one hydrophilizing molecule containing at least 2 hydrophobic groups per molecule to provide the crosslinking between star polymers.

4. The water-dispersible or water-soluble composition of claim 3 wherein the at least one hydrophilizing molecule is polyethylene glycol.

5. The water-dispersible or water-soluble composition of claim 4, wherein the one or more water-dispersible or water-soluble polymer comprises a star polymer having the following formulation:



wherein PEG is polyethylene glycol.

6. The water-dispersible or water-soluble composition of claim 1, wherein the core is selected from the group consisting of trimethylolpropane, glycerol, propylene glycol, 1,3-propandiol, and glucose.

7. The water-dispersible or water-soluble composition of claims 1 or 6, wherein the star polymer has from 1 to 6 arms, preferably from about 1 to 3 arms.

8. The composition of any of the preceeding claims, wherein the composition further comprises water.

9. A composition comprising at least one water-soluble or water-dispersible polymer, wherein the water-soluble or water-dispersible polymer is the reaction product

of the reaction of at least one diisocyanate with a polyol core to form a pre-polymer, followed by reaction of the pre-polymer with a hydrophilic polyol.

10. The composition of claim 9, wherein the polyol core is trimethylolpropane and the diisocyanate is dicyclohexylmethane-4,4'-diisocyanate.

11. The composition of claim 10, wherein the hydrophilic polyol is polyethylene glycol, polyglycerol or glucose.

12. A cleaning composition comprising about 0.01% to about 50% by weight of at least one water-dispersible or water-soluble composition of any one of claims 1-11.

13. The cleaning composition of claim 12, wherein the cleaning composition comprises about 0.01% to about 10% by weight of the at least one water-dispersible or water-soluble composition.

14. The cleaning composition of claim 12, wherein the cleaning composition comprises about 0.01% to about 1% by weight of the at least one water-dispersible or water-soluble composition.

15. The cleaning composition of claim 12, wherein the cleaning composition comprises about 0.01% to about 0.1% by weight of the at least one water-dispersible or water-soluble composition.

16. The cleaning compositions of any of claims 12-15, wherein the cleaning composition is used as a bathroom or kitchen cleaner.

17. A light duty liquid detergent composition comprising about 0.01% to about 10% of the water-dispersible or water-soluble composition of any one of claims 1-11.

18. The light duty liquid detergent composition of claim 17, wherein the composition comprises about 0.01% to about 1.0% of the water-dispersible or water soluble composition.

19. The light duty liquid detergent composition of claim 17 or 18, wherein the detergent composition has an increased foam performance as compared with the detergent composition not containing the at least one water-dispersible or water soluble composition, wherein the foam milage is measured by the Automated Mixed Soil Gram Test.

20. The light duty liquid detergent of any of claims 17-19, wherein the composition provides enhanced soil release as compared to a composition not containing the at least one water-dispersible or water soluble composition.

21. The cleaning composition of any one of claims 12-16, wherein the composition provides enhanced soil release as compared to a composition not containing the at least one water-dispersible or water soluble composition.

22. A glass cleaner composition comprising about 0.01% to about 0.1% of the water-dispersible or water soluble compositions of any one of claims 1-11.

23. The glass cleaner composition of claim 22, wherein the glass cleaner does not contain a surfactant or solvent.

24. The composition of any of the preceeding claims 1-11, wherein the composition comprises an additional hydrophilic additive added at any step of the polymerization process to react with the diisocyanate.

25. The composition of claim 24, wherein the additional hydrophilic additive is diglycolamine.

26. A cleaning composition comprising about 0.01% to about 0.1% of the at least one water-dispersible or water-soluble composition of any one of claims 1-11, wherein the cleaning composition has an increased foam performance as compared with the cleaning composition not containing the at least one water-dispersible or water soluble composition, wherein the foam milage is measured by the Automated Mixed Soil Gram Test.

27. The method of making a water-dispersible or water-soluble polymer composition, the method comprising the steps of:

a) reacting a diisocyanate with a polyol core at a temperature of about 60 °C to about 100 °C for a sufficient time to form a pre-polymer; and

b) reacting the pre-polymer with a hydrophilic polyol at a temperature of about 60 °C to about 120 °C for a sufficient amount of time to produce a polymer substantially soluble or dispersible into water.