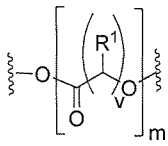
Claims

1. A polymer comprising a polyester block and a polyacrylate block~~at least one polyhedral oligomeric silsesquioxane~~, wherein the polyester block is capable of forming a stereocomplex with a polymer comprising a complimentary polyester, and wherein the polyacrylate block comprises at least one polyhedral oligomeric silsesquioxane.

2. The polymer of claim 1, wherein the polyester block comprises a polymer of Formula 1:



Formula 1

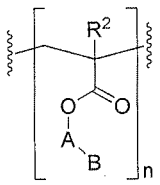
wherein m is a whole number selected from 2 to 350; v is a whole number selected from 1 to 10; and R^1 is independently selected from the group consisting of hydrogen, alkyl, alkenyl, alkynyl, aralkyl, cycloalkyl, cycloalkenyl, heterocycloalkyl, and heterocycloalkenyl.

3. The polymer of claim 2, the polyester block comprises a substantially enantiomerically pure aliphatic polyester.

4. The polymer of claim 2, wherein the polyester block comprises one of substantially pure poly(D-lactic acid) or poly(L-lactic acid).

5. The polymer of claim 1, wherein the ~~polymer~~ polyacrylate block comprises ~~about~~ 1-20 polyhedral oligomeric silsesquioxanes.

6. The polymer of claim 1, wherein the ~~polymer~~polyacrylate block comprises a polymer of Formula 2:



Formula 2

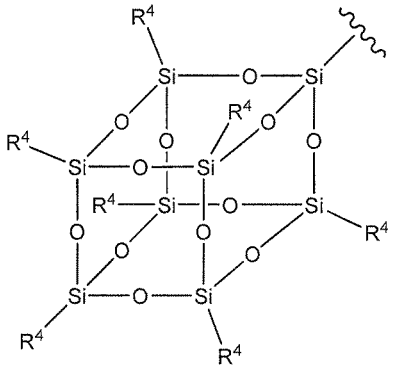
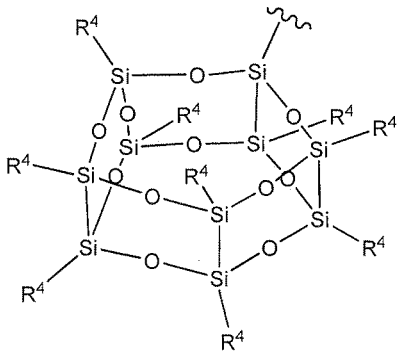
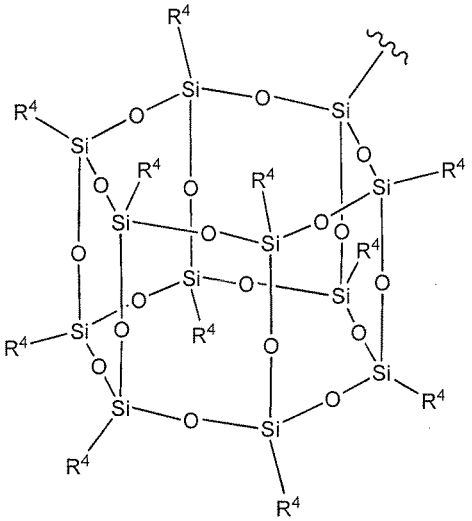
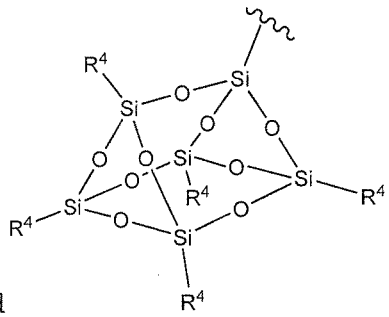
wherein

aralkyl, cycloalkyl, cycloalkenyl, heterocycloalkyl, and heterocycloalkenyl;

R^3 is independently selected from the group consisting of hydrogen, alkyl, alkenyl, alkynyl, aralkyl, cycloalkyl, cycloalkenyl, heterocycloalkyl, and heterocycloalkenyl; and

R^4 is independently selected from the group consisting of hydrogen, alkyl, aralkyl, cycloalkyl, and aryl.

8. The polymer of claim 1 or 7, wherein the polyhedral oligomeric silsesquioxaneis selected from the group consisting of:


,

,

, and


wherein R^4 is hydrogen, alkyl, alkenyl, alkynyl, aralkyl, cycloalkyl, cycloalkenyl, heterocycloalkyl, and heterocycloalkenyl.

9. The polymer of claim 7, wherein the polyester block is terminated with a moiety selected from the group

14. A composite comprising a stereocomplex and at least one matrix polymer, wherein the stereocomplex comprises at least one polymer of claim 1.

15. The composite of claim 14, wherein the stereocomplex further comprises a second polymer of claim 1 or the matrix polymer.

16. The composite of claim 14, wherein the polymer of claim 1 comprises ~~about~~ 1% to ~~about~~ 10% by weight of the composite.

17. The composite of claim 14, wherein the matrix polymer is a polyester.

18. The composite of claim 17, wherein the polyester is poly(D-lactic acid) or poly(L-lactic acid).

19. The composite of claim 14, wherein the composite is prepared by melt compounding.

20. The composite of claim 14, wherein the polymer of claim 1 is present in crystalline form.

21. A method comprising the steps of contacting a polymer of claim 1 with a polymer comprising a complimentary polyester under conditions that favor stereocomplexation, thereby forming a stereocomplex comprising the polymer of claim 1 and the polymer comprising a complimentary polyester.

22. The method of claim 21, wherein the polymer comprising a complimentary polyester comprises substantially pure poly(D-lactic acid) or poly(L-lactic acid).

23. The method of claim 22, wherein the complimentary polyester is a polymer of claim 1, poly(D-lactic acid), or poly(L-lactic acid).

24. The method of claim 21, further comprising the step of melt mixing the stereocomplex with at least one matrix polymer.

25. The method of claim 21, wherein the melt mixing takes place at a temperature less than ~~about~~ 200° C.

26. The method of claim 21, wherein the matrix polymer is poly(D-lactic acid) or poly(L-lactic acid).