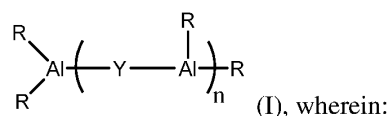


What is claimed is:

1. A composition of formula (I):



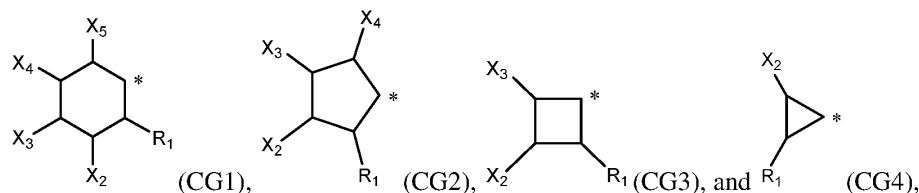
n is a number from 1 to 100;

Y is a linking group composed of a linear, branched, or cyclic C₄ to C₁₀₀ hydrocarbylene group that optionally includes at least one heteroatom and that is aliphatic or aromatic, wherein Y comprises two points of attachment to Al atoms and at least one of the two points of attachment is $\text{---CH}_2\text{---}$;

each R group is independently a substituted or unsubstituted aryl group or a substituted or unsubstituted cyclic alkyl group containing, optionally, at least one heteroatom; and

two R groups attached to the same Al can be optionally covalently linked together.

2. The composition of Claim 1, wherein each R group is independently selected from the group consisting of the following structures CG1 to CG4:



wherein:

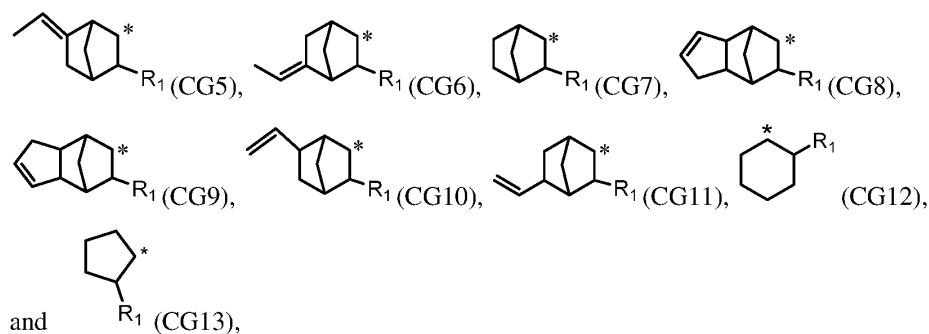
each R₁ is independently hydrogen or a C₁ to C₂₀ alkyl group;

each X₂, X₃, X₄, and X₅ is independently hydrogen, a substituted or unsubstituted C₁ to C₂₀ alkyl, alkylene or alkylidene group, or a substituted or unsubstituted C₆ to C₂₀ aryl group;

each X₂, X₃, X₄, and X₅ optionally includes at least one heteroatom; and

in each of structures CG1 to CG3, two of the groups selected from X₂, X₃, X₄, and X₅ may optionally join to form cyclic structures.

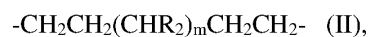
3. The composition of Claim 1 or 2, wherein each R group is independently selected from the group consisting of the following structures CG5 to CG13:



wherein each R₁ is independently hydrogen or a C₁ to C₂₀ alkyl group.

4. The composition of any of the preceding claims, wherein each R group is CG5 or CG12.

5. The composition of any of the preceding claims, wherein Y has the formula (II):



wherein:

R₂ is hydrogen or a C₁ to C₂₀ alkyl or aryl group; and

m is a number from 0 to 20.

6. The composition of any of claims 1-4, wherein Y has the formula (III):



wherein:

Z is a C₄ to C₁₀₀ hydrocarbylene group comprising at least one aliphatic or aromatic ring and, optionally, includes at least one heteroatom.

7. The composition of any of the preceding claims, wherein Y is a derivative of a linking agent selected from the group consisting of 1,9-decadiene, 1,4-pentadiene, divinylbenzene, divinylidiphenylsilane, divinylidimethylsilane, 1,4-bis(dimethyl(vinyl)silyl)benzene, 1,5-bis(dimethyl(vinyl)silyl)pentane, and 1,3-divinylcyclopentane.

8. The composition of any of the preceding claims, wherein n is a number from 1 to 10.

9. The composition of claim 8, wherein n is a number from 1 to 3.

10. A process for preparing a composition, the process comprising:

(a) combining an aluminum compound, a linking agent, a capping agent, and an optional solvent at a temperature of from 50 °C to 200 °C for a time from 30 minutes to 200 hours, and

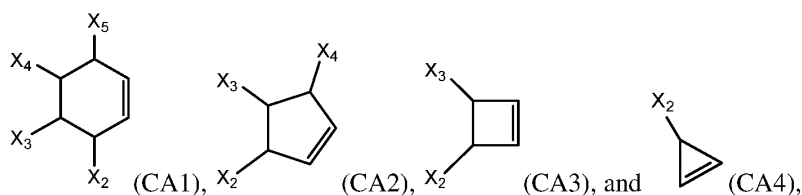
(b) obtaining the composition, wherein:

the aluminum compound has the formula $Al(J)_3$, wherein each J group is independently hydrogen, a substituted or unsubstituted alkyl group, or a substituted or unsubstituted aryl or heteroaryl group, wherein at least one J group is a hydrogen or an acyclic alkyl group and, optionally, two J groups can be covalently linked together;

the linking agent is a C_4 to C_{100} hydrocarbon comprising either at least two vinyl groups or a vinyl group and a cyclic olefin group and, optionally, includes at least one heteroatom; and

the capping agent is a substituted or unsubstituted cyclic olefin.

11. The process of Claim 10, wherein the capping agent is selected from the group consisting of the following structures CA1 to CA4:



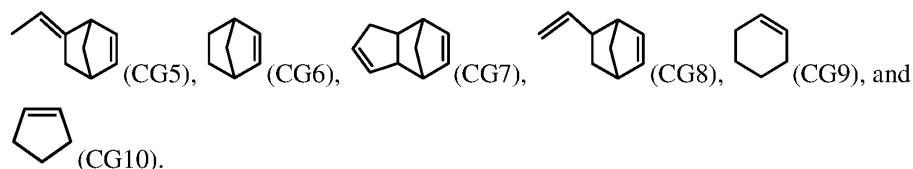
wherein:

each X_2 , X_3 , X_4 , and X_5 is independently hydrogen, a substituted or unsubstituted C_1 to C_{20} alkyl, alkylene or alkylidene group, or a substituted or unsubstituted C_6 to C_{20} aryl group;

each X_2 , X_3 , X_4 , and X_5 optionally includes at least one heteroatom; and

in each of structure CA1 to CA3, two of the groups selected from X₂, X₃, X₄, and X₅ may optionally join to form cyclic structures.

12. The process of claim 11, wherein the capping agent is selected from the group consisting of the following structures CG5 to CG10:



13. The process of claim 12, wherein the capping agent is CG5 or CG9.

14. The process of any of claims 10-13, wherein the aluminum compound is triisobutylaluminum or diisobutylaluminum hydride.

15. The process of any of claims 10-14, wherein the linking agent is selected from the group consisting of 1,9-decadiene, 1,4-pentadiene, divinylbenzene, divinyl diphenylsilane, divinyl dimethylsilane, 1,4-bis(dimethyl(vinyl)silyl)benzene, 1,5-bis(dimethyl(vinyl)silyl)pentane, and 1,3-divinylcyclopentane

16. A composition comprising the reaction product of: an aluminum compound, a linking agent, a capping agent, and an optional solvent, wherein:

the aluminum compound has the formula Al(J)₃, wherein each J group is independently hydrogen, a substituted or unsubstituted alkyl group, or a substituted or unsubstituted aryl or heteroaryl group, wherein at least one J group is a hydrogen or an acyclic alkyl group, and optionally, two J groups can be covalently linked together;

the linking agent is a C₄ to C₁₀₀ hydrocarbon comprising either at least two vinyl groups or a vinyl group and a cyclic olefin group and, optionally, includes at least one heteroatom; and

the capping agent is a substituted or unsubstituted cyclic olefin.

17. A polymerization process for preparing a polymer composition, the process comprising: (a) contacting at least one olefin monomer with a catalyst composition, wherein the catalyst composition comprises the reaction product of at least one catalyst precursor, at least one co-catalyst, and the composition of Claim 1, and (b) obtaining the polymer composition.

18. A polymer composition prepared by the process of Claim 17, wherein the polymer composition comprises two aluminum termini.

19. A process for preparing a polymer or a polymer mixture by converting polymer-Al bonds of the polymer composition of Claim 18 using either a chemical reagent or high temperature.