CLAIMS

What is claimed is:

1. A process for producing a catalyst composition comprisingconsisting of:

(a) mixing, in a non-polar solvent including aromatic hydrocarbon, a catalyst compound having a transition metal atom, a support, and optionally an activator, to form a supported catalyst mixture; and

(b) drying the supported catalyst mixture at a pressure of about 10 kPa or less and a temperature of about 60 °C or greater for a period of about 6 hours or less, wherein aliphatic hydrocarbon is not introduced to the supported catalyst mixture after drying; and

(c) obtaining the catalyst composition having 1.5 wt% or less aromatic hydrocarbon based on the total weight of the catalyst composition.

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2. The process of claim 1, consisting of: (a) mixing the catalyst compound, the support, and optional activator to form the supported catalyst mixture; (b) drying the supported catalyst mixture; and (c) obtaining the catalyst composition.

3. A catalyst composition comprising:

a catalyst compound having a transition metal atom;

an aluminum activator; and

a support,

wherein the catalyst composition has from about 0.5 wt% to about 1.5 wt% aromatic hydrocarbon; and

wherein the catalyst composition has less than 1 wt% of aliphatic hydrocarbon.

4. The catalyst composition of claim 3, wherein the catalyst composition is made by a process comprising:

mixing a catalyst compound having a transition metal atom, a support, and optionally an activator, to form a supported catalyst mixture; and

obtaining the catalyst composition by drying the supported catalyst mixture at a pressure of about 10 kPa or less and a temperature of about 60°C or greater for a period of about 6 hours or less, wherein aliphatic hydrocarbon is not introduced to the catalyst compound after drying.

5. A process for producing polyolefins, the process comprising:

introducing a catalyst composition and at least one olefin to a polymerization reactor,

wherein the catalyst composition comprises:

a catalyst compound having a transition metal atom,

an aluminum activator, and

a support;

wherein the catalyst composition has:

about 0.5 wt% to about 1.5 wt% aromatic hydrocarbon content, and

less than 1 wt% of aliphatic hydrocarbon content; and

obtaining a polyolefin having about 300 ppb or less aromatic hydrocarbon.

6. The process of claim 5, wherein the catalyst composition has about 1.2 wt% or less toluene.

7. The process of claim 5 or claim 6, wherein the catalyst composition has about 1.2 wt% or less aromatic hydrocarbon content.

8. The process of claim 7, wherein the catalyst composition has about 0.8 wt % to about 1.2 wt% aromatic hydrocarbon content.

9. The process of any one of laims 5-8, wherein the polyolefin has one or both of: an aluminum content of about 1 ppm to about 5 ppm, and a silica content of about 50 ppm or greater.

10. The process of claim 5, further comprising extruding the polyolefin to form a polyolefin film having one or both of: a toluene concentration of about 0.05 mg/m^2 or less; and a weight percent of aluminum of about 0.01 wt% or greater.

11. The process of any one of claims 5-10, wherein the catalyst compound is selected from the group consisting of:

bis(1-methyl, 3-n-butyl cyclopentadienyl) zirconium dichloride;

dimethylsilyl bis(tetrahydroindenyl) zirconium dichloride;

bis(n-propylcyclopentadienyl) hafnium dimethyl;
dimethylsilyl (tetramethylcyclopentadienyl)(cyclododecylamido)titanium dimethyl;
dimethylsilyl (tetramethylcyclopentadienyl)(cyclododecylamido)titanium dichloride;
dimethylsilyl (tetramethylcyclopentadienyl)(t-butylamido)titanium dimethyl;
dimethylsilyl (tetramethylcyclopentadienyl)(t-butylamido)titanium dichloride;
μ-$(CH_3)_2$Si(cyclopentadienyl)(1-adamantylamido)M$(R)_2$;
μ-$(CH_3)_2$Si(3-tertbutylcyclopentadienyl)(1-adamantylamido)M$(R)_2$;
μ-$(CH_3)_2$(tetramethylcyclopentadienyl)(1-adamantylamido)M$(R)_2$;
μ-$(CH_3)_2$Si(tetramethylcyclopentadienyl)(1-adamantylamido)M$(R)_2$;
μ-$(CH_3)_2$C(tetramethylcyclopentadienyl)(1-adamantylamido)M$(R)_2$;
μ-$(CH_3)_2$Si(tetramethylcyclopentadienyl)(1-tertbutylamido)M$(R)_2$;
μ-$(CH_3)_2$Si(fluorenyl)(1-tertbutylamido)M$(R)_2$;
μ-$(CH_3)_2$Si(tetramethylcyclopentadienyl)(1-cyclododecylamido)M$(R)_2$;
μ-$(C_6H_5)_2$C(tetramethylcyclopentadienyl)(1-cyclododecylamido)M$(R)_2$; and
μ-$(CH_3)_2$Si(η^5-2,6,6-trimethyl-1,5,6,7-tetrahydro-*s*-indacen-1-yl)(tertbutylamido)M$(R)_2$;

wherein M is selected from Ti, Zr, and Hf; and R is selected from halogen or C1 to C5 alkyl.

12. The process of claim 11, wherein the activator is selected from the group consisting of N,N-dimethylanilinium tetra(perfluorophenyl)borate, N,N-dimethylanilinium tetrakis(perfluoronaphthyl)borate, N,N-dimethylanilinium tetrakis(perfluorobiphenyl)borate, N,N-dimethylanilinium tetrakis(3,5-bis(trifluoromethyl)phenyl)borate, triphenylcarbenium tetrakis(perfluoronaphthyl)borate, triphenylcarbenium tetrakis(perfluorobiphenyl)borate, triphenylcarbenium tetrakis(3,5-bis(trifluoromethyl)phenyl)borate, triphenylcarbenium tetra(perfluorophenyl)borate, trimethylammonium tetrakis(perfluoronaphthyl)borate, triethylammonium tetrakis(perfluoronaphthyl)borate, tripropylammonium tetrakis(perfluoronaphthyl)borate, tri(n-butyl)ammonium tetrakis(perfluoronaphthyl)borate, tri(t-butyl)ammonium tetrakis(perfluoronaphthyl)borate, N,N-diethylanilinium tetrakis(perfluoronaphthyl)borate, N,N-dimethyl-(2,4,6-trimethylanilinium) tetrakis(perfluoronaphthyl)borate, and tropillium tetrakis(perfluoronaphthyl)borate.

13. The process of claim 12, wherein the support is selected from the group consisting of Al_2O_3, ZrO_2, SiO_2, SiO_2/Al_2O_2, silica clay, and mixture(s) thereof.

14. The process of any one of claims 5-13, wherein the at least one olefin comprises ethylene, and the polymerization reactor is a gas phase polymerization reactor.

15. The process of claim 14, wherein the polyolefin has a silica content of about 200 ppm or less.

16. The process of any one of claims 5-15, further comprising obtaining a polyethylene resin having:

a toluene content of about 300 ppb or less;
an aluminum content of about 5 ppm or greater;
a silica content of about 50 ppm or greater;
a Mw of from about 15,000 g/mol to about 2,000,000 g/mol;
a Mn of from about 2,500 g/mol to about 2,500,00 g/mol;
a MI of from about 0.2 g/10min to about 1.5 g/10min (190°C/2.16 kg);
a PDI of from about 1 to about 3;
a g'vis of about 0.85 or greater; and
a density of from about 0.91 to about 0.93.

17. A polyethylene resin having:

a toluene content of about 300 ppb or less;
an aluminum content of about 5 ppm or greater; and
a silica content of about 50 ppm or greater.

18. The polyethylene resin of claim 17, further comprising:

a Mw of from about 15,000 g/mol to about 2,000,000 g/mol;
a Mn of from about 2,500 g/mol to about 2,500,00 g/mol;
a MI of from about 0.2 g/10min to about 1.5 g/10min (190°C/2.16 kg);
a PDI of from about 1 to about 3;
a g'vis of about 0.85 or greater; and
a density of from about 0.91 to about 0.93.

19. The polyethylene resin of claim 17 or claim 18, wherein the polyethylene resin is made

by a process according to any one of claims 5 to 15.