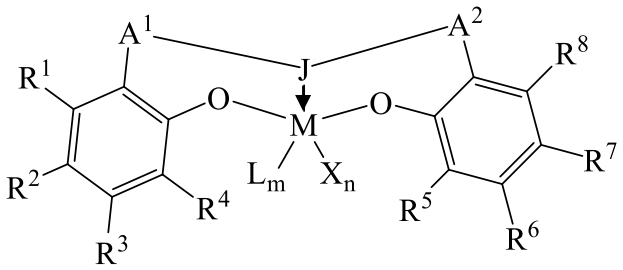
CLAIMS

What is claimed is:

1. A catalyst compound represented by Formula (**I**):



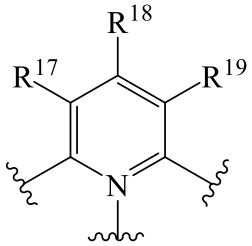
(**I**)

wherein:

M is a group 3, 4, or 5 metal;

A^1 and A^2 are independently an aromatic group;

J is represented by the formula:



wherein ≀ indicates a connection to the catalyst compound, and

each of R^{17}, R^{18}, and R^{19} is independently hydrogen, C_1-C_{40} hydrocarbyl, C_1-C_{40} substituted hydrocarbyl, a heteroatom or a heteroatom-containing group, or one or more of R^{17} and R^{18}, R^{18} and R^{19}, or R^{17} and R^{19} may be joined to form one or more substituted hydrocarbyl rings, unsubstituted hydrocarbyl rings, substituted heterocyclic rings, or unsubstituted heterocyclic rings each having 5, 6, 7, or 8 ring atoms;

L is a Lewis base;

X is an anionic ligand;

n is 1, 2 or 3;

m is 0, 1, or 2;

n+m is not greater than 4;

each of R^1, R^2, R^3, , R^6, R^7, and R^8 is independently hydrogen, C_1-C_{40} hydrocarbyl, C_1-C_{40} substituted hydrocarbyl, a heteroatom or a heteroatom-containing group, or one or more of R^1 and R^2, R^2 and R^3, R^6 and R^7, or R^7 and R^8 may be joined to form one or more substituted

hydrocarbyl rings, unsubstituted hydrocarbyl rings, substituted heterocyclic rings, or unsubstituted heterocyclic rings each having 5, 6, 7, or 8 ring atoms, and where substitutions on the ring can join to form additional rings;

each of R^4 and R^5 is independently C_1-C_{40} hydrocarbyl, C_1-C_{40} substituted hydrocarbyl, a heteroatom or a heteroatom-containing group, or one or more of R^3 and R^4 or R^5 and R^6 may be joined to form one or more substituted hydrocarbyl rings, unsubstituted hydrocarbyl rings, substituted heterocyclic rings, or unsubstituted heterocyclic rings each having 5, 6, 7, or 8 ring atoms, and where substitutions on the ring can join to form additional rings;

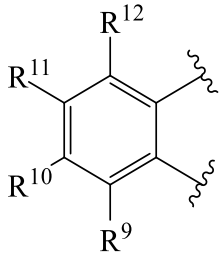
any two L groups may be joined together to form a bidentate Lewis base;

an X group may be joined to an L group to form a monoanionic bidentate group; and

any two X groups may be joined together to form a dianionic ligand group,

wherein n is preferably 2 and each X is preferably independently chloro, benzyl, or methyl.

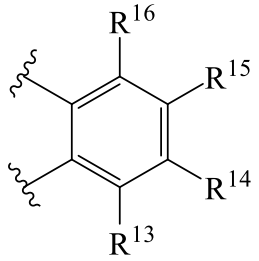
2. The catalyst compound of claim 1, wherein A^1 is represented by the formula:



wherein ~ indicates a connection to the catalyst compound, and

each of R^9, R^{10}, R^{11}, and R^{12} is independently hydrogen, C_1-C_{40} hydrocarbyl, C_1-C_{40} substituted hydrocarbyl, a heteroatom or a heteroatom-containing group, or one or more of R^9 and R^{10}, R^{10} and R^{11}, or R^{11} and R^{12} may be joined to form one or more substituted hydrocarbyl rings, unsubstituted hydrocarbyl rings, substituted heterocyclic rings, or unsubstituted heterocyclic rings each having 5, 6, 7, or 8 ring atoms.

3. The catalyst compound of claim 1, wherein A^2 is represented by the formula:

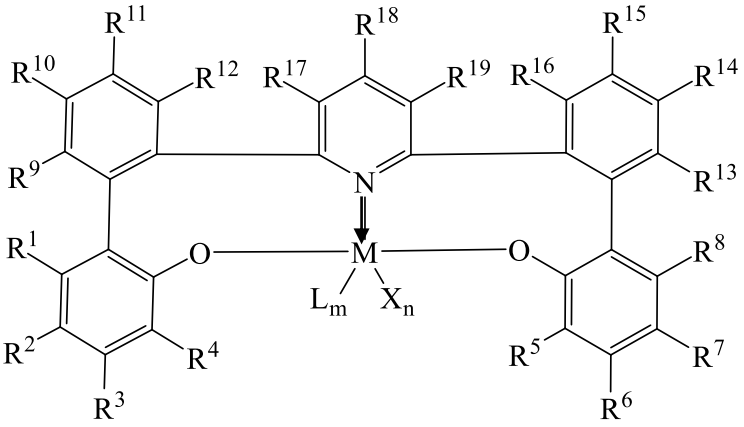


wherein ~ indicates a connection to the catalyst compound, and

each of R^{13}, R^{14}, R^{15}, and R^{16} is independently hydrogen, C_1-C_{40} hydrocarbyl, C_1-C_{40} substituted hydrocarbyl, a heteroatom or a heteroatom-containing group, or one or more of R^{13} and R^{14}, R^{14} and R^{15}, or R^{15} and R^{16} may be joined to form one or more substituted hydrocarbyl rings, unsubstituted hydrocarbyl rings, substituted heterocyclic rings, or unsubstituted heterocyclic rings each having 5, 6, 7, or 8 ring atoms.

4. The catalyst compound of claim 1, wherein R^{17}, R^{18}, and R^{19} are hydrogen.

5. The catalyst compound of claim 1, wherein the complex is represented by Formula (**II**):



(**II**)

wherein:

each of R^1, R^2, R^3, , R^6, R^7, and R^8 is independently hydrogen, C_1-C_{40} hydrocarbyl, C_1-C_{40} substituted hydrocarbyl, a heteroatom or a heteroatom-containing group, or one or more of R^1 and R^2, R^2 and R^3, R^6 and R^7, or R^7 and R^8 may be joined to form one or more substituted hydrocarbyl rings, unsubstituted hydrocarbyl rings, substituted heterocyclic rings, or unsubstituted heterocyclic rings each having 5, 6, 7, or 8 ring atoms;

each of R^4 and R^5 is independently C_1-C_{40} hydrocarbyl, C_1-C_{40} substituted hydrocarbyl, a heteroatom or a heteroatom-containing group, or one or more of R^3 and R^4 or R^5 and R^6 may be joined to form one or more substituted hydrocarbyl rings, unsubstituted hydrocarbyl rings, substituted heterocyclic rings, or unsubstituted heterocyclic rings each having 5, 6, 7, or 8 ring atoms, and where substitutions on the ring can join to form additional rings;

each of R^9, R^{10}, R^{11}, and R^{12} is independently hydrogen, C_1-C_{40} hydrocarbyl, C_1-C_{40} substituted hydrocarbyl, a heteroatom or a heteroatom-containing group, or one or more of R^9 and R^{10}, R^{10} and R^{11}, or R^{11} and R^{12} may be joined to form one or more substituted hydrocarbyl rings, unsubstituted hydrocarbyl rings, substituted heterocyclic rings, or unsubstituted heterocyclic rings each having 5, 6, 7, or 8 ring atoms;

each of R^{13}, R^{14}, R^{15}, and R^{16} is independently hydrogen, C_1-C_{40} hydrocarbyl, C_1-C_{40} substituted hydrocarbyl, a heteroatom or a heteroatom-containing group, or one or more of R^{13} and R^{14}, R^{14} and R^{15}, or R^{15} and R^{16} may be joined to form one or more substituted hydrocarbyl rings, unsubstituted hydrocarbyl rings, substituted heterocyclic rings, or unsubstituted heterocyclic rings each having 5, 6, 7, or 8 ring atoms;

each of R^{17}, R^{18}, and R^{19} is independently hydrogen, C_1-C_{40} hydrocarbyl, C_1-C_{40} substituted hydrocarbyl, a heteroatom or a heteroatom-containing group, or one or more of R^{17} and R^{18}, R^{18} and R^{19}, or R^{17} and R^{19} may be joined to form one or more substituted hydrocarbyl rings, unsubstituted hydrocarbyl rings, substituted heterocyclic rings, or unsubstituted heterocyclic rings each having 5, 6, 7, or 8 ring atoms;

M is a group 3, 4, or 5 metal, preferably zirconium or hafnium;

L is a Lewis base;

X is an anionic ligand, preferably halogens or hydrocarbyl groups containing 1 to 8 carbons;

n is 1, 2 or 3;

m is 0, 1, or 2;

n+m is not greater than 4;

any two L groups may be joined together to form a bidentate Lewis base;

an X group may be joined to an L group to form a monoanionic bidentate group; and

any two X groups may be joined together to form a dianionic ligand group.

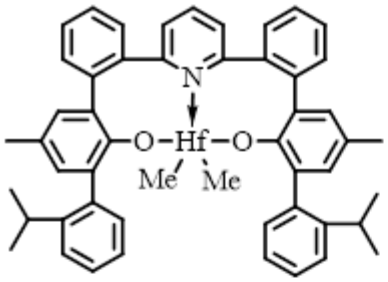
6. The catalyst compound of claim 5, wherein each of R^1, R^2, R^3, R^6, R^7, and R^8 is independently selected from hydrogen, C_1-C_{40} hydrocarbyl, C_1-C_{40} substituted hydrocarbyl, alkoxy, silyl, amino, aryloxy, halogen, or phosphino, or one or more of R^1 and R^2, R^2 and R^3,

R^6 and R^7, or R^7 and R^8 may be joined to form one or more substituted hydrocarbyl rings, unsubstituted hydrocarbyl rings, substituted heterocyclic rings, or unsubstituted heterocyclic rings each having 5, 6, 7, or 8 ring atoms, wherein preferably R^2 and R^7 are independently C_1-C_{10} alkyl or are methyl.

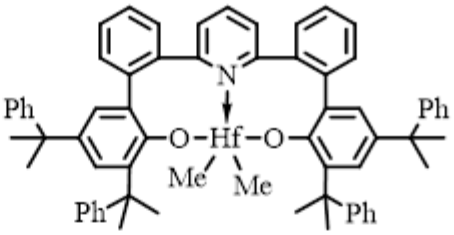
7. The catalyst compound of claim 6, wherein R^4 and R^5 are independently C_1-C_{10} alkyl, and preferably *tert*-butyl, aryl, phenyl, carbazole, Et_3Si, or 3,5-di-*tert*-butylbenzyl.

8. The catalyst compound of claim 6, wherein each of R^1, R^3, R^6, R^8, R^9, R^{10}, R^{11}, R^{12}, R^{13}, R^{14}, R^{15}, R^{16}, R^{17}, R^{18}, and R^{19} is independently hydrogen, C_1-C_{10} alkyl, methyl, ethyl, propyl, isopropyl, phenyl, cyclohexyl, fluoro, chloro, methoxy, ethoxy, phenoxy, or trimethylsilyl, preferably hydrogen.

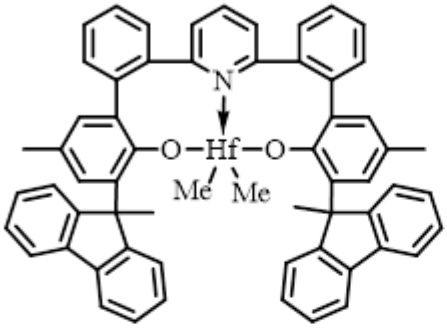
9. The catalyst compound of claim 1, wherein the catalyst compound is selected from:



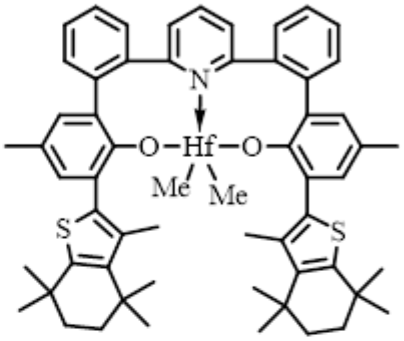
Catalyst 8



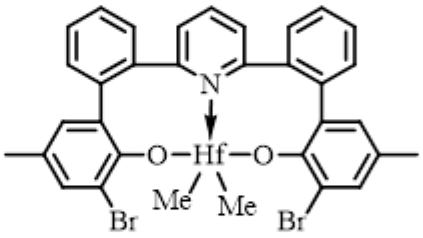
Catalyst 9



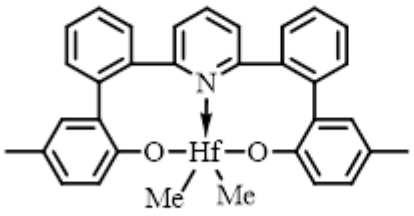
Catalyst 10



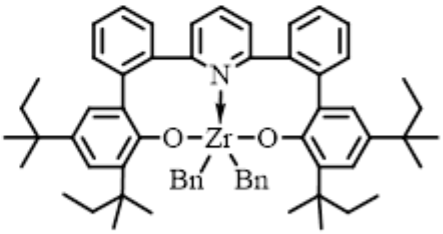
Catalyst 11



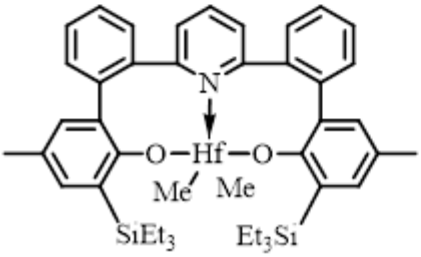
Catalyst 13



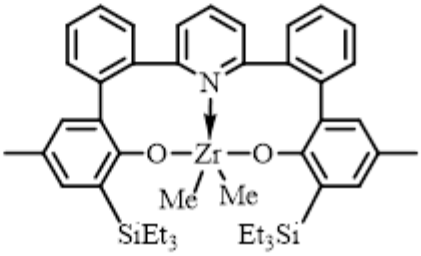
Catalyst 14



Catalyst 15

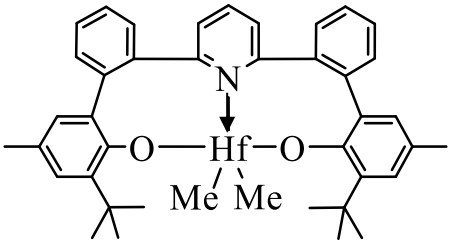
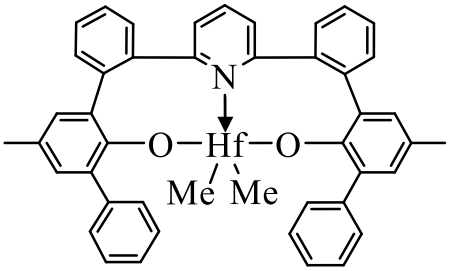
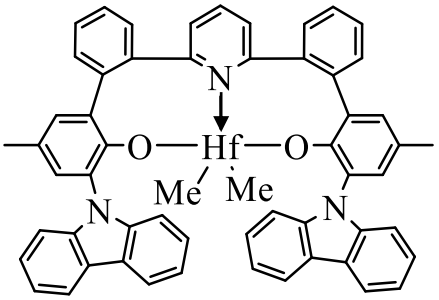
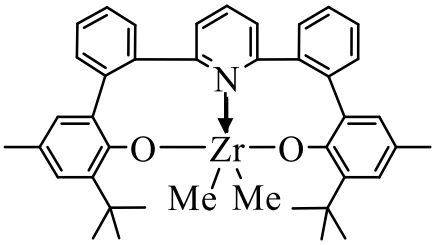
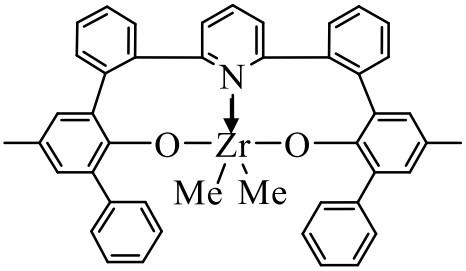
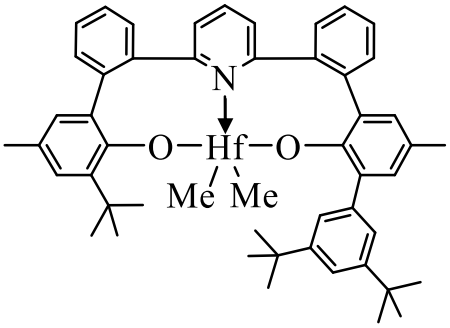
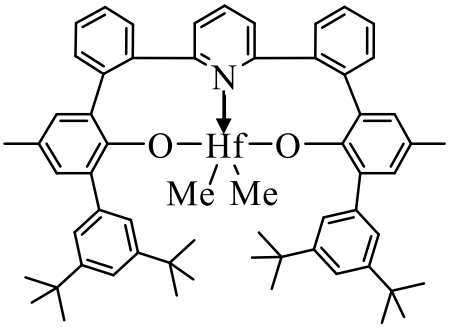
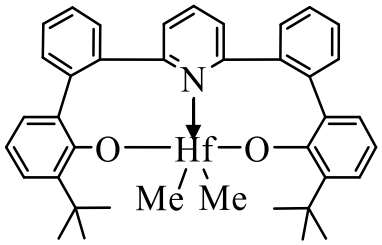
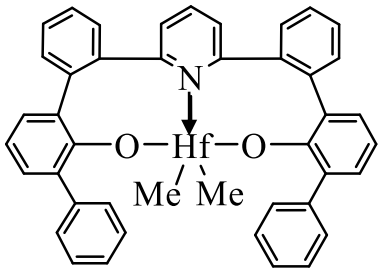
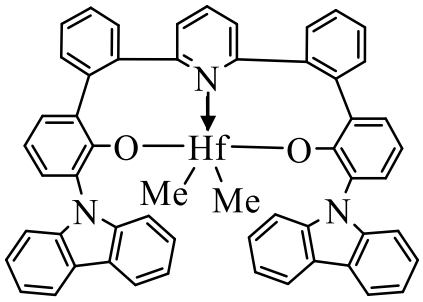


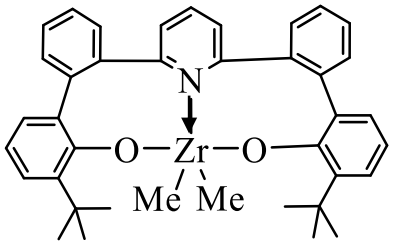
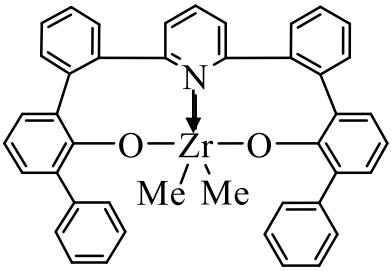
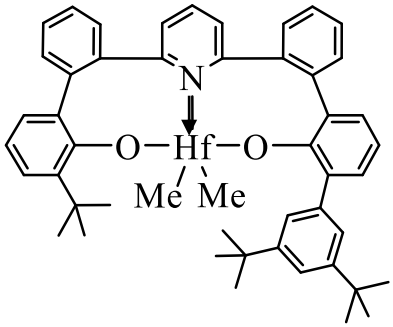
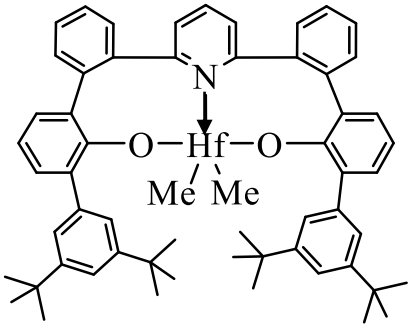
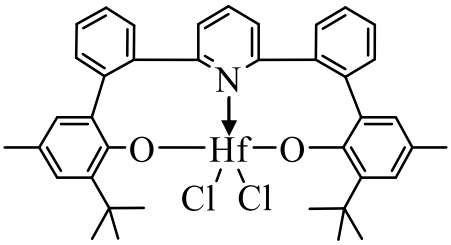
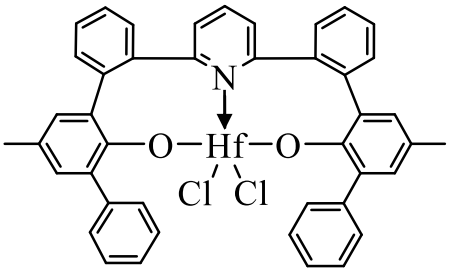
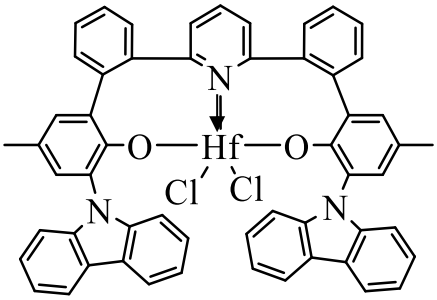
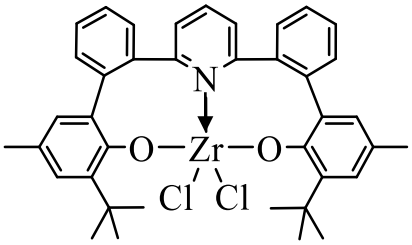
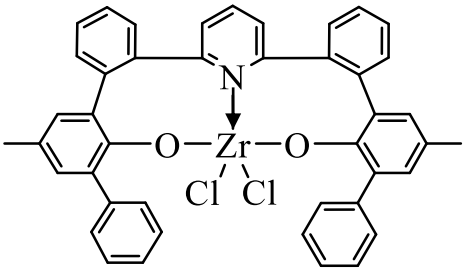
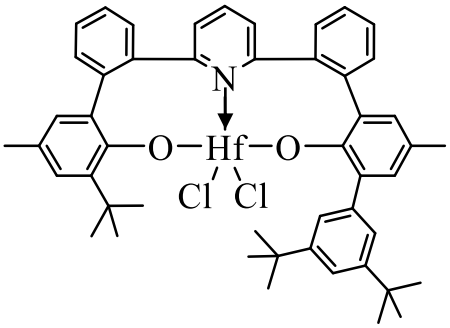
Catalyst 16

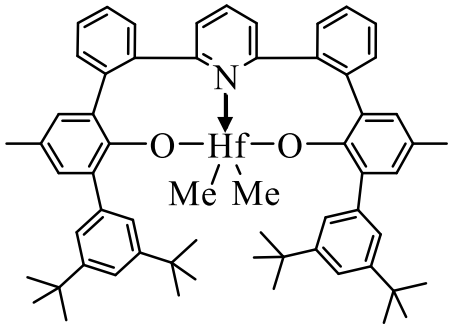
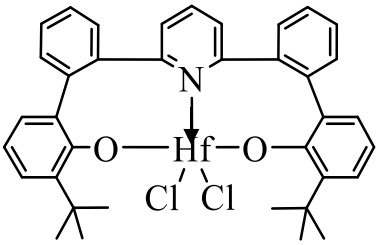
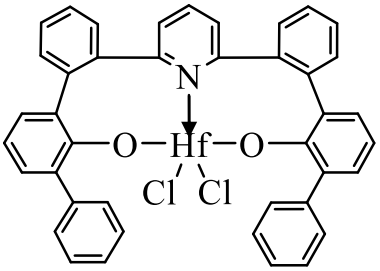
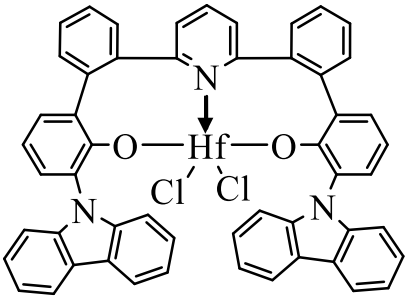
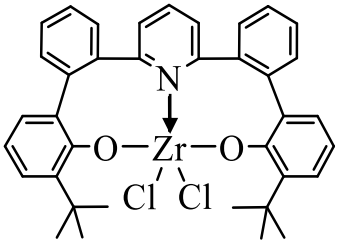
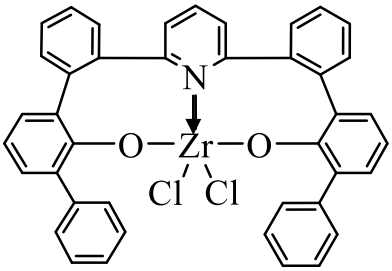
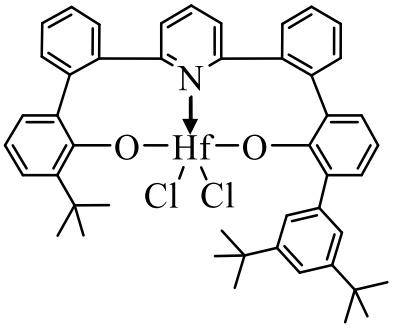
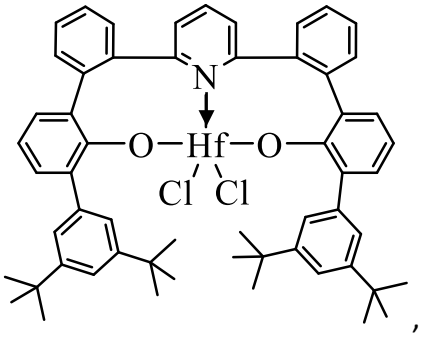


Catalyst 17

10. The catalyst compound of claim 1, wherein the catalyst compound is selected from:

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preferably catalysts 1 or 4.

11. A process for the production of an ethylene or propylene based polymer comprising: polymerizing ethylene or propylene by contacting the ethylene, optionally with at least one C_3-C_{20} alpha-olefin, or propylene with a catalyst of claim 1 to 10, in one or more continuous stirred tank reactors or loop reactors, in series or in parallel, at a reactor pressure of from 0.05 MPa to 1,500 MPa and a reactor temperature of from 30°C to 230°C.

12. The process of claim 11, wherein the ethylene based polymer has an Mw value of from 1,000 to 3,000,000 g/mol, Mn value of from 1,000 to 2,000,000 g/mol, Mz value of from 1,000 to 10,000,000 g/mol, and a PDI of from 1 to 20, or the propylene based polymer has an Mw value of from 500 to 150,000 g/mol, Mn value of from 500 to 100,000 g/mol, Mz value of from 2,000 to 400,000 g/mol, a PDI of from 1 to 3, 1 to 5, or 10 to 20, wherein the ethylene based polymer has a melting point of from 100°C to 140°C or the propylene based polymer has a melting point of from 50°C to 170°C.

13. The process of claim 11, wherein the ethylene alpha-olefin copolymer has an Mw value of from 5,000 to 1,500,000 g/mol, and Mz value of from 5,000 to 10,000,000 g/mol, an Mn value of from 2,000 to 400,000 g/mol, a PDI of from 1 to 40, preferably 1 to 5, or preferably 20 to 40, and a melting point of from 40°C to 140°C.

14. A transition metal compound comprising a tridentate dianionic ligand chelated to a group 4 transition metal, represented by formula (I) as defined in claim 1, wherein the tridentate ligand coordinates to the metal with two anionic oxygen donors and one neutral heterocyclic nitrogen donor to form a pair of eight-membered metallocycle rings.