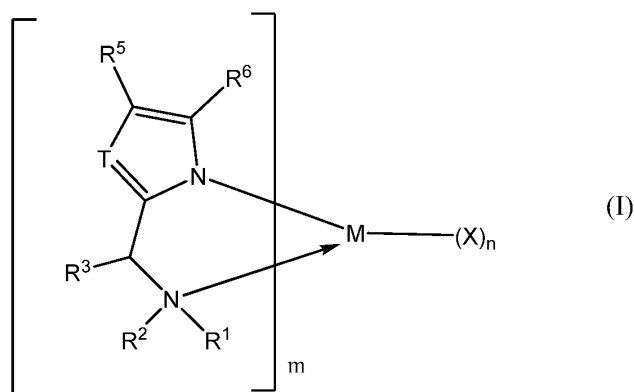


CLAIMS

1. A catalyst system comprising a metal–ligand complex according to formula (I):



where

M is a metal chosen from titanium, zirconium, or hafnium, the metal having a formal oxidation state of +2, +3, or +4;

each X is a monodentate or bidentate ligand independently chosen from unsaturated

(C₂–C₅₀)hydrocarbon, unsaturated (C₂–C₅₀)heterohydrocarbon,

(C₁–C₅₀)hydrocarbyl, (C₁–C₅₀)heterohydrocarbyl, (C₆–C₅₀)aryl,

(C₆–C₅₀)heteroaryl, cyclopentadienyl, substituted cyclopentadienyl,

(C₄–C₁₂)diene, halogen, –N(R^N)₂, and –NCOR^C;

n is 1, 2, or 3;

m is 1 or 2;

the metal–ligand complex has 6 or fewer metal–ligand bonds;

each T is nitrogen or CR⁴, wherein each R⁴ is independently chosen from

(C₁–C₅₀)hydrocarbyl, (C₁–C₅₀)heterohydrocarbyl, (C₆–C₅₀)aryl,

(C₄–C₅₀)heteroaryl, –Si(R^C)₃, –Ge(R^C)₃, –P(R^P)₂, –N(R^N)₂, –OR^C, –SR^C, –NO₂,

–CN, –CF₃, halogen, or –H;

each R¹ is independently selected from the group consisting of an aliphatic

(C₁–C₅₀)hydrocarbyl, an aliphatic (C₁–C₅₀)heterohydrocarbyl, – halogen, and –H,

and, when m is 2, two R¹ are optionally covalently connected to each other;

each R² is independently chosen from (C₁–C₅₀)hydrocarbyl, (C₁–C₅₀)heterohydrocarbyl,

(C₆–C₅₀)aryl, (C₄–C₅₀)heteroaryl, –Si(R^C)₃, and –Ge(R^C)₃;

R¹ and R² are optionally covalently connected to form a ring structure;

each R^3 and each R^5 is independently chosen from (C_1-C_{50}) hydrocarbyl, (C_1-C_{50}) heterohydrocarbyl, (C_6-C_{50}) aryl, (C_4-C_{50}) heteroaryl, $-\text{Si}(R^C)_3$, $-\text{Ge}(R^C)_3$, $-\text{P}(R^P)_2$, $-\text{N}(R^N)_2$, $-\text{OR}^C$, $-\text{SR}^C$, $-\text{NO}_2$, $-\text{CN}$, $-\text{CF}_3$, $R^CS(O)-$, $R^CS(O)_2-$, $(R^C)_2C=N-$, $R^CC(O)O-$, $R^COC(O)-$, $R^CC(O)N(R)-$, $(R^C)_2NC(O)-$, halogen, or $-H$;

each R^6 is independently chosen from (C_1-C_{50}) hydrocarbyl, (C_1-C_{50}) heterohydrocarbyl, (C_6-C_{50}) aryl, (C_4-C_{50}) heteroaryl, $-\text{Si}(R^C)_3$, $-\text{Ge}(R^C)_3$, $-\text{P}(R^P)_2$, $-\text{N}(R^N)_2$, $-\text{OR}^C$, $-\text{SR}^C$, $-\text{NO}_2$, $-\text{CN}$, $-\text{CF}_3$, $R^CS(O)-$, $R^CS(O)_2-$, $(R^C)_2C=N-$, $R^CC(O)O-$, $R^COC(O)-$, $R^CC(O)N(R)-$, $(R^C)_2NC(O)-$, or halogen;

R^5 and R^6 are optionally covalently connected to form a ring structure; and

each R^C and R^N in formula (I) is independently a (C_1-C_{50}) hydrocarbyl.

2. The catalyst system according to claim 1, wherein:

M is zirconium or hafnium;

each X is independently chosen from (C_6-C_{20}) aryl, (C_4-C_{20}) heteroaryl, (C_4-C_{12}) diene, or a halogen; and

each R^6 is independently chosen from (C_1-C_{50}) aryl or (C_4-C_{50}) heteroaryl.

3. The catalyst system according to claim 1, wherein R^5 and R^6 are covalently connected to form a six-member aromatic ring.

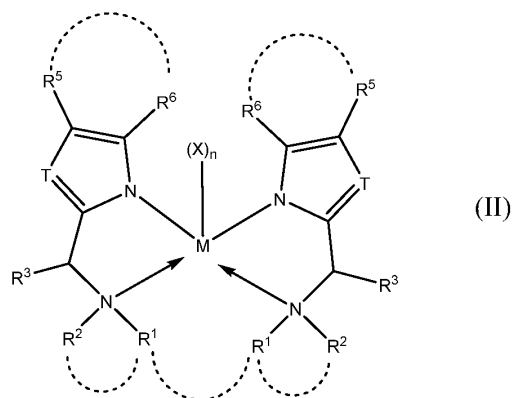
4. The catalyst system according to any one of claims 1-3, wherein R^5 and R^6 are covalently connected to form a six-member aromatic ring; R^3 is $-H$; and R^2 is methyl.

5. The catalyst system according to claim 1 or claim 2, wherein each R^6 is anthracenyl, di-substituted anthracenyl, or tri-substituted anthracenyl.

6. The catalyst system according to claim 1 or claim 2, wherein each R^6 is phenyl or a substituted phenyl.

7. The catalyst system according to claim 1 or claim 2, wherein each R^6 is a substituted phenyl chosen from 2,4,6-trimethylphenyl; 2,6-di(*iso*-propyl)phenyl; 3,5-di-*tert*-butylphenyl, or 3,5-diphenylphenyl.

8. The catalyst system according to claim 1, wherein m is 2 and the metal–ligand complex has a structure according to formula (II):



where M , T , R^1 , R^2 , R^3 , R^4 , R^5 , R^6 , and X are as defined in formula (I); n is 1 or 2; and the dotted lines indicate optional covalent connections.

9. The catalyst system according to claim 8, wherein:

M is zirconium or hafnium;

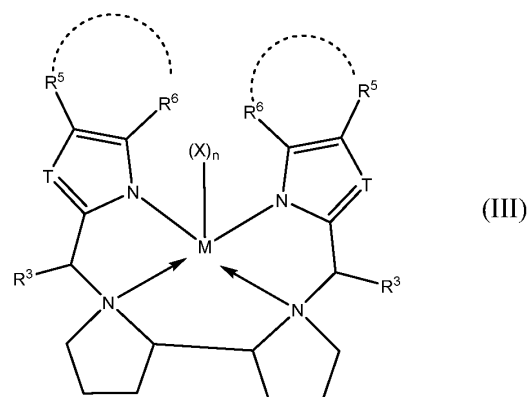
each X is independently chosen from (C_6-C_{50}) aryl, (C_6-C_{50}) heteroaryl, (C_4-C_{12}) diene, or halogen;

each R^1 and R^2 is independently chosen from (C_1-C_{50}) hydrocarbyl, (C_1-C_{50}) heterohydrocarbyl, (C_6-C_{50}) aryl, (C_4-C_{50}) heteroaryl, or halogen.

10. The catalyst system according to claim 8 or claim 9, wherein the two R^1 are covalently connected to each other; and each R^2 is independently (C_1-C_{10}) alkyl.

11. The catalyst system according to any one of claims 8 to 10, wherein the two R^1 are covalently connected as an alkylene chosen from $-CH_2CH_2-$, $-CH_2CH_2CH_2-$, or $-CH_2CH_2CH_2CH_2-$.

12. The catalyst system according to claim 1, wherein m is 2 and the metal–ligand complex has a structure according to formula (III):



where M , T , R^3 , R^4 , R^5 , R^6 , and X are as defined in formula (I); n is 1 or 2; and the dotted lines indicate optional covalent connections.

13. The catalyst system according to claim 12, wherein each R^6 is independently chosen from carbazolyl, 3,5-di-*tert*-butylphenyl; 2,4,6-trimethylphenyl; 2,6-di-*iso*-propylphenyl; or 3,5-di-*iso*-propylphenyl.

14. The catalyst system according to claim 12, wherein each R^6 is 2,6-di-*iso*-propylphenyl.

15. The catalyst system according to claim 12, wherein each R^6 is 2,4,6-trimethylphenyl.

16. The catalyst system according to one of claims 1 to 15, wherein T is N .

17. The catalyst system according to one of claims 1 to 15, wherein T is CR^4 , and R^4 is $-H$.

18. A polymerization process for producing an ethylene-based polymer, the polymerization process comprising:

polymerizing ethylene and at least one additional α -olefin in the presence of a catalyst system according to any one of claims 1–17 and at least one activator to form a polymer.

19. The polymerization process according claim 18, wherein the activator comprises MMAO, bis(hydrogenated tallow alkyl)methylammonium tetrakis(pentafluorophenyl)borate, or tris(pentafluorophenyl)borane.