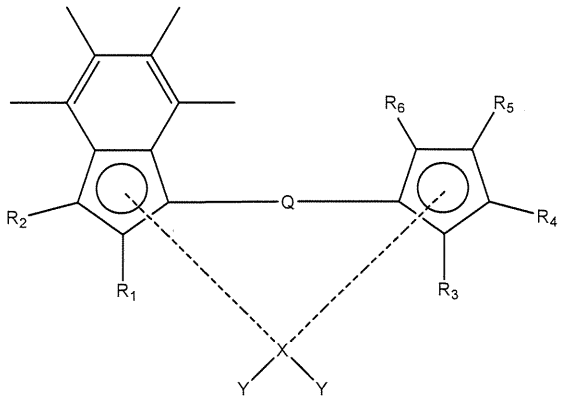
CLAIMS

1. A compound of the formula I shown below:



(I)

wherein:

R_1 and R_2 are each independently (1-2C)alkyl;

R_3 and R_4 are each independently hydrogen or (1-4C)alkyl, or R_3 and R_4 are linked such that, when taken in combination with the atoms to which they are attached, they form a 6-membered fused aromatic ring optionally substituted with one or more groups selected from (1-6C)alkyl, (2-6C)alkenyl, (2-6C)alkynyl, (1-6C)alkoxy, aryl, heteroaryl, carbocyclic and heterocyclic, wherein each aryl, heteroaryl, carbocyclic and heterocyclic group is optionally substituted with one or more groups selected from (1-6C)alkyl, (2-6C)alkenyl, (2-6C)alkynyl, (1-6C)alkoxy, halo, amino, nitro, cyano, (1-6C)alkylamino, $[(1\text{-}6C)alkyl]_2$amino and $-S(O)_2$(1-6C)alkyl;

R_5 and R_6 are each independently hydrogen or (1-4C)alkyl, or R_5 and R_6 are linked such that, when taken in combination with the atoms to which they are attached, they form a 6-membered fused aromatic ring optionally substituted with one or more groups selected from (1-6C)alkyl, (2-6C)alkenyl, (2-6C)alkynyl, (1-6C)alkoxy, aryl, heteroaryl, carbocyclic and heterocyclic, wherein each aryl, heteroaryl, carbocyclic and heterocyclic group is optionally substituted with one or more groups selected from (1-6C)alkyl, (2-6C)alkenyl, (2-6C)alkynyl, (1-6C)alkoxy, halo, amino, nitro, cyano, (1-6C)alkylamino, $[(1\text{-}6C)alkyl]_2$amino and $-S(O)_2$(1-6C)alkyl;

Q is a bridging group comprising 1, 2 or 3 bridging atoms selected from C, N, O, S, Ge, Sn, P, B, or Si, or a combination thereof, and is optionally substituted with one or more

groups selected from hydroxyl, (1-6C)alkyl, (2-6C)alkenyl, (2-6C)alkynyl, (1-6C)alkoxy and aryl;

X is selected from zirconium, titanium or hafnium; and

each Y group is independently selected from halo, hydride, a phosphonated, sulfonated or borate anion, or a (1-6C)alkyl, (2-6C)alkenyl, (2-6C)alkynyl, (1-6C)alkoxy, aryl or aryloxy group which is optionally substituted with one or more groups selected from (1-6C)alkyl, halo, nitro, amino, phenyl, (1-6C)alkoxy, $-C(O)NR_xR_y$, or $Si[(1\text{-}4C)alkyl]_3$;

wherein R_x and R_y are independently (1-4C)alkyl;

with the proviso that:

i) when R_3 and R_4 are hydrogen or (1-4C)alkyl, R_5 and R_6 are not linked to form a fused 6-membered aromatic ring that is substituted with four methyl groups; and

ii) when R_5 and R_6 are hydrogen or (1-4C)alkyl, R_3 and R_4 are not linked to form a fused 6-membered aromatic ring that is substituted with four methyl groups.

2. A compound according to claim 1, wherein

R_3 and R_4 are each independently hydrogen or (1-4C)alkyl, or R_3 and R_4 are linked such that, when taken in combination with the atoms to which they are attached, they form a fused 6-membered aromatic ring optionally substituted with one or more groups selected from (1-4C)alkyl, (2-4C)alkenyl, (2-4C)alkynyl, (1-4C)alkoxy, aryl, heteroaryl, carbocyclic and heterocyclic, wherein each aryl, heteroaryl, carbocyclic and heterocyclic group is optionally substituted with one or more groups selected from (1-4C)alkyl, (2-4C)alkenyl, (2-4C)alkynyl, (1-4C)alkoxy, halo, amino, nitro, cyano, (1-4C)alkylamino, $[(1\text{-}4C)alkyl]_2$amino and $-S(O)_2$(1-4C)alkyl; and

R_5 and R_6 are each independently hydrogen or (1-4C)alkyl, or R_5 and R_6 are linked such that, when taken in combination with the atoms to which they are attached, they form a fused 6-membered aromatic ring optionally substituted with one or more groups selected from (1-4C)alkyl, (2-4C)alkenyl, (2-4C)alkynyl, (1-4C)alkoxy, aryl, heteroaryl, carbocyclic and heterocyclic, wherein each aryl, heteroaryl, carbocyclic and heterocyclic group is optionally substituted with one or more groups selected from (1-4C)alkyl, (2-4C)alkenyl, (2-4C)alkynyl, (1-4C)alkoxy, halo, amino, nitro, cyano, (1-4C)alkylamino, $[(1\text{-}4C)alkyl]_2$amino and $-S(O)_2$(1-4C)alkyl.

3. A compound according to claim 1 or 2, wherein

R_3 and R_4 are each independently hydrogen or (1-4C)alkyl, or R_3 and R_4 are linked such that, when taken in combination with the atoms to which they are attached, they form a fused 6-membered aromatic ring optionally substituted with one or more groups selected from (1-4C)alkyl, aryl, heteroaryl, carbocyclic and heterocyclic, wherein each aryl, heteroaryl, carbocyclic and heterocyclic group is optionally substituted with one or more groups selected from (1-4C)alkyl, (2-4C)alkenyl, (2-4C)alkynyl, (1-4C)alkoxy, halo, amino and nitro; and

R_5 and R_6 are each independently hydrogen or (1-4C)alkyl, or R_5 and R_6 are linked such that, when taken in combination with the atoms to which they are attached, they form a fused 6-membered aromatic ring optionally substituted with one or more groups selected from (1-4C)alkyl, aryl, heteroaryl, carbocyclic and heterocyclic, wherein each aryl, heteroaryl, carbocyclic and heterocyclic group is optionally substituted with one or more groups selected from (1-4C)alkyl, (2-4C)alkenyl, (2-4C)alkynyl, (1-4C)alkoxy, halo, amino and nitro.

4. A compound according to any of claims 1, 2 or 3, wherein

R_3 and R_4 are each independently hydrogen or (1-4C)alkyl, or R_3 and R_4 are linked such that, when taken in combination with the atoms to which they are attached, they form a fused 6-membered aromatic ring optionally substituted with one or more groups selected from (1-4C)alkyl, aryl and heteroaryl, wherein each aryl and heteroaryl group is optionally substituted with one or more groups selected from (1-4C)alkyl, (2-4C)alkenyl, (2-4C)alkynyl, (1-4C)alkoxy, halo, amino and nitro; and

R_5 and R_6 are each independently hydrogen or (1-4C)alkyl, or R_5 and R_6 are linked such that, when taken in combination with the atoms to which they are attached, they form a fused 6-membered aromatic ring optionally substituted with one or more groups selected from (1-4C)alkyl, aryl and heteroaryl, wherein each aryl and heteroaryl group is optionally substituted with one or more groups selected from (1-4C)alkyl, (2-4C)alkenyl, (2-4C)alkynyl, (1-4C)alkoxy, halo, amino and nitro.

5. A compound according to any preceding claim, wherein

R_3 and R_4 are each independently hydrogen or (1-4C)alkyl, or R_3 and R_4 are linked such that, when taken in combination with the atoms to which they are attached, they form a fused 6-membered aromatic ring optionally substituted with one or more groups selected from (1-4C)alkyl and phenyl, wherein each phenyl group is optionally substituted with one or more groups selected from (1-4C)alkyl, (2-4C)alkenyl, (2-4C)alkynyl, (1-4C)alkoxy, halo, amino and nitro; and

R_5 and R_6 are each independently hydrogen or (1-4C)alkyl, or R_5 and R_6 are linked such that, when taken in combination with the atoms to which they are attached, they form a fused 6-membered aromatic ring optionally substituted with one or more groups selected from (1-4C)alkyl and phenyl, wherein each phenyl group is optionally substituted with one or more groups selected from (1-4C)alkyl, (2-4C)alkenyl, (2-4C)alkynyl, (1-4C)alkoxy, halo, amino and nitro.

6. A compound according to any preceding claim, wherein:
   i) when R_3 and R_4 are hydrogen or (1-4C)alkyl, and R_5 and R_6 are linked to form a fused 6-membered aromatic ring, said ring is optionally substituted with one or two substituents as defined in respect of R_3 or R_4 in any preceding claim; or
   ii) when R_5 and R_6 are hydrogen or (1-4C)alkyl, and R_3 and R_4 are linked to form a fused 6-membered aromatic ring, said ring is optionally substituted with one or two substituents as defined in respect of R_5 or R_6 in any preceding claim.

7. A compound according to any preceding claim, wherein Q is a bridging group comprising 1, 2 or 3 bridging atoms selected from C, Si, or a combination thereof, and is optionally substituted with one or more groups selected from hydroxyl, (1-6C)alkyl, (2-6C)alkenyl, (2-6C)alkynyl, (1-6C)alkoxy and aryl.

8. A compound according to any preceding claim, wherein Q is a bridging group selected from $-[C(R_a)(R_b)-C(R_c)(R_d)]-$ and $-[Si(R_e)(R_f)]-$, wherein R_a, R_b, R_c, R_d, R_e and R_f are independently selected from hydrogen, hydroxyl, (1-6C)alkyl, (2-6C)alkenyl, (2-6C)alkynyl, (1-6C)alkoxy and aryl.

9. A compound according to claim 8, wherein R_a, R_b, R_c and R_d are each hydrogen, and R_e and R_f are each independently (1-6C)alkyl, (2-6C)alkenyl or phenyl.

10. A compound according to claim 8 or 9, wherein Q is a bridging group $-[Si(R_e)(R_f)]-$, wherein R_e and R_f are each independently selected from methyl, ethyl, propyl, i-propyl, allyl or phenyl.

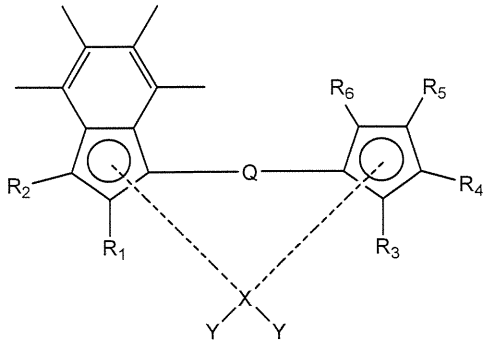
11. A compound according to any preceding claim, wherein each Y is independently selected from halo or a (1-2C)alkyl group which is optionally substituted with halo, phenyl, or Si[(1-4C)alkyl]$_3$.

12. A compound according to any preceding claim, wherein Y is halo.

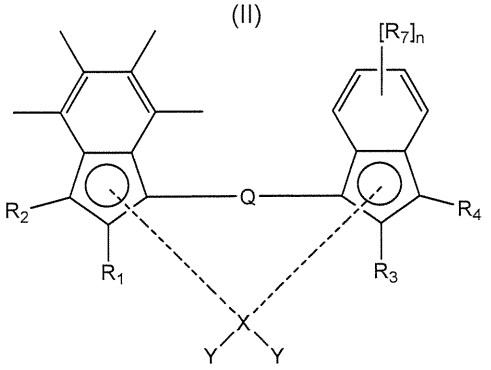
13. A compound according to any preceding claim, wherein X is zirconium or hafnium.

14. A compound according to any preceding claim, wherein X is zirconium.

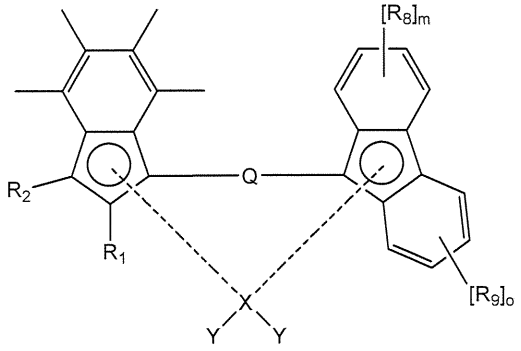
15. A compound according to any preceding claim, wherein the compound has any of formulae (II), (III) or (IV) shown below:



(II)



(III)



(IV)

wherein:

R_1, R_2, R_3, R_4, R_5, R_6, Q, X and Y are each independently as defined in any preceding claim;

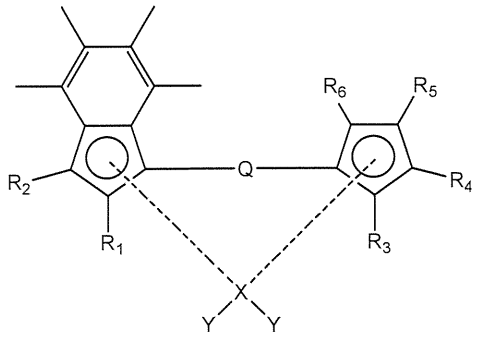
each R_7, R_8 and R_9 is independently selected from any of the ring substituents defined in any preceding claim in respect of 6-membered aromatic rings formed when either or both of (i) R_3 and R_4, and (ii) R_5 and R_6, are linked;

n, m and o are independently 0, 1 or 2.

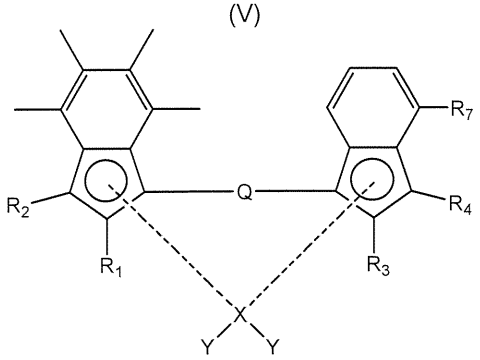
16. A compound according to claim 15, wherein each R_7, R_8 and R_9 is independently selected from hydrogen, (1-4C)alkyl and phenyl, said phenyl group being optionally substituted with one or more groups selected from (1-4C)alkyl, (2-4C)alkenyl, (2-4C)alkynyl, (1-4C)alkoxy, halo, amino and nitro.

17. A compound according to claim 15 or 16 wherein
each R_7, R_8 and R_9 is independently selected from hydrogen, methyl, n-butyl, tert-butyl and phenyl.

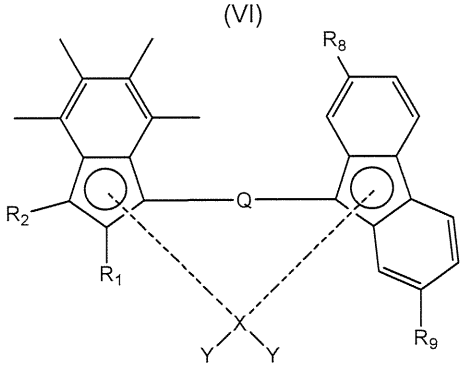
18. A compound according to any preceding claim, wherein the compound has any of formulae (V), (VI) or (VII) shown below:



(V)



(VI)



(VII)

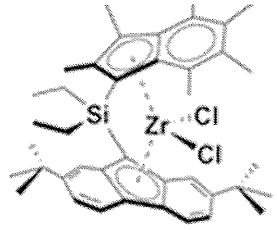
wherein

R_1, R_2, R_3, R_5, R_6, Q, X and Y are each independently as defined in any preceding claim;

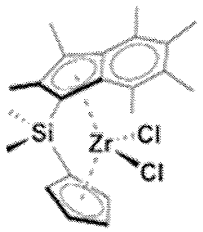
R_7, R_8 and R_9 are each independently as defined in any of claims 15, 16 and 17; and

R_4 is hydrogen.

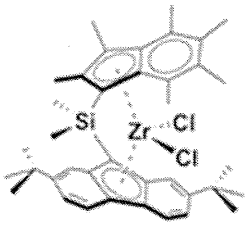
19. A compound according to any preceding claim, where the compound has any one of the structures shown below:



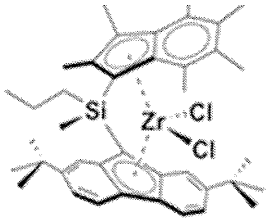
$^{Et}_{2}SB(^{tBu}_{2}Flu,I^*)ZrCl_2$



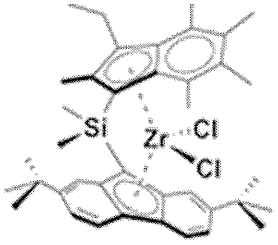
$SB(Cp,I^*)ZrCl_2$



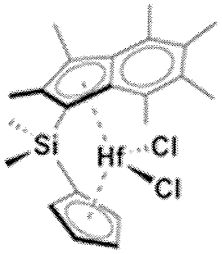
$SB(^{tBu}_{2}Flu,I^*)ZrCl_2$



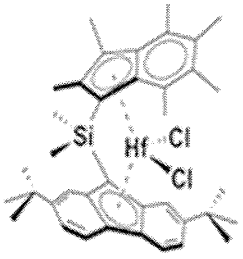
$^{Me,Prop}SB(^{tBu}_{2}Flu,I^*)ZrCl_2$



$SB(^{tBu}_{2}Flu,I^{*,3\text{-}ethyl})ZrCl_2$



$SB(Cp,I^*)HfCl_2$



$SB(^{tBu}_{2}Flu,I^*)HfCl_2$

20. The use of a compound as defined in any preceding claim as a polymerisation procatalyst for the preparation of a polyethylene homopolymer or a copolymer comprising polyethylene.

21. The use according to claim 20, wherein the copolymer comprises 1-10 wt% of a (4-8C) α-olefin.

22. A composition comprising a compound as defined in any one of claims 1 to 19, and a suitable activator.

23. The composition of claim 22, wherein the activator is an alkyl aluminium compound.

24. The composition of claim 22 or 23, wherein the activator is methylaluminoxane (MAO), triisobutylaluminium (TIBA), diethylaluminium (DEAC) or triethylaluminium (TEA).

25. The composition of claim 22, 23 or 24, wherein the compound is immobilized on a support.

26. The composition of claim 25, wherein the support is an activated support.

27. The composition of claim 26, wherein the activated support is methylaluminoxane-activated silica or methylaluminoxane-activated layered double hydroxide.

28. The use of a composition as claimed in any of claims 22 to 27 as a polymerization catalyst for the preparation of a polyethylene homopolymer or a copolymer comprising polyethylene.

29. A process for forming a polyethylene which comprises reacting olefin monomers in the presence of (i) a compound as defined in any of claim 1 to 19, and (ii) a suitable activator as defined in claim 22 or 24.

30. The process of claim 29, wherein the compound of claim 1 to 19 is immobilized on a support or an activated support.