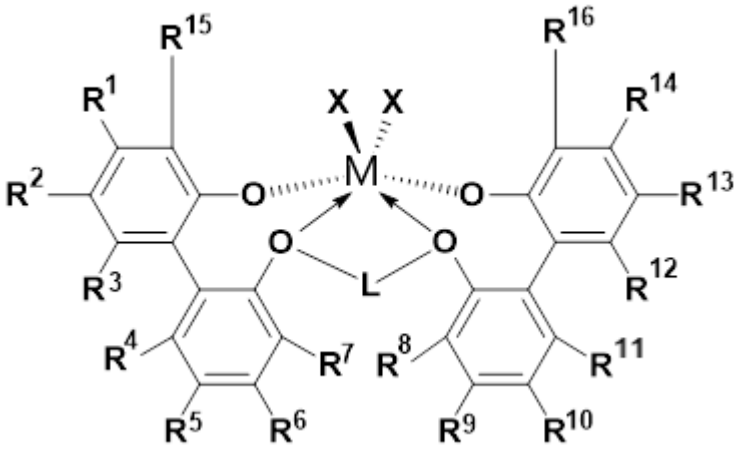
Claims:

What is claimed is:

1. A use of a biphenylphenol polymerization catalyst to make a polymer in a gas-phase or slurry-phase polymerization process conducted in a single gas-phase or slurry-phase polymerization reactor, wherein the biphenylphenol polymerization catalyst is made from a biphenylphenol polymerization precatalyst of Formula I:



(Formula I)

wherein each of R^1, R^2, R^3, R^4, R^5, R^{10}, R^{11}, R^{12}, R^{13}, and R^{14} is independently a C_1 to C_{20} alkyl, aryl or aralkyl, a hydrogen, halogen, or silyl group;

wherein each of R^{15} and R^{16} is a 2,7-disubstituted carbazol-9-yl;

wherein L is a saturated C_4 alkyl that forms a bridge between the two oxygen atoms to which L is covalently bonded;

wherein each X independently is a halogen, a hydrogen, a (C_1-C_{20})alkyl, a (C_7-C_{20})aralkyl, a (C_1-C_6)alkyl-substituted (C_6-C_{12})aryl, or a (C_1-C_6)alkyl-substituted benzyl, $-CH_2Si(R^C)_3$, where R^C is C_1-C_{12} hydrocarbon;

wherein each of R^7 and R^8 is independently a C_1 to C_{20} alkyl, aryl or aralkyl or a hydrogen; wherein at least one of R^7 and R^8 comprises a C_1 to C_{20} alkyl, aralkyl, or hydrogen;

wherein M is Zr and Hf;

wherein each of R^6 and R^9 is independently a halogen, C_1 to C_{20} alkyl, aryl or aralkyl or a hydrogen; and

wherein the biphenylphenol polymerization catalyst has a kinetic induction time of greater than 40 seconds as determined by a least squares fit of a first-order exponential

for a rate of increase of an instantaneous polymerization rate for the gas-phase or slurry-phase polymerization process.

2. The use of claim 1, wherein each of R^5 and R^{10} is a halogen or a fluorine.

~~3. The use of claim 1, wherein each of R^5 and R^{10} is fluorine.~~

~~4~~3. The use of claim 1, wherein:
each of R^7 and R^8 comprises a C_1 alkyl; or
R^7 or R^8 comprises a C_1 alkyl and the other of R^7 or R^8 comprises a hydrogen.

~~5~~4. The use of ~~any one of~~ claim~~s~~ 1~~-4~~, wherein:
each of R^2 and R^{13} comprises a 1,1-dimethylethyl; or
each of R^{15} and R^{16} comprises a 2,7-di-t-butylcarbazol-9-yl.

~~6. The use of any one of claims 1-5, wherein each of R^{15} and R^{16} comprises a 2,7-di-t-butylcarbazol-9-yl.~~

~~7~~5. The use of ~~any one of~~ claim~~s~~ 1~~-6~~, wherein L comprises a C_4 alkyl, and wherein the C_4 alkyl is selected from a group consisting of n-butyl and 2-methyl-pentyl.

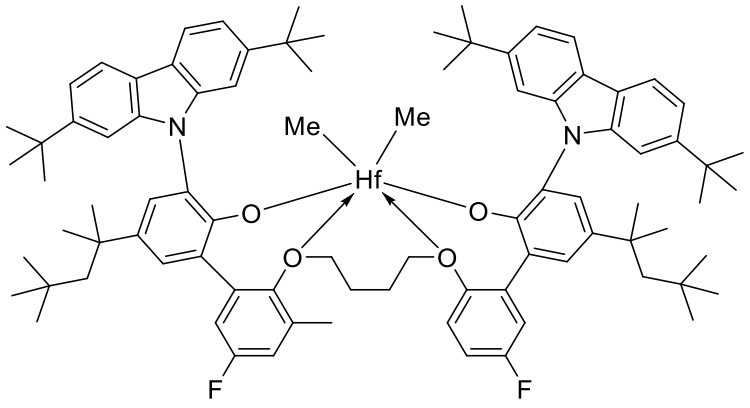
~~8. The use of claim 7, wherein the C_4 alkyl is selected from a group consisting of n-butyl and 2-methyl-pentyl.~~

~~9~~6. The use of claim 1, wherein each X comprises a C_1 alkyl and wherein M is Zr or Hf.

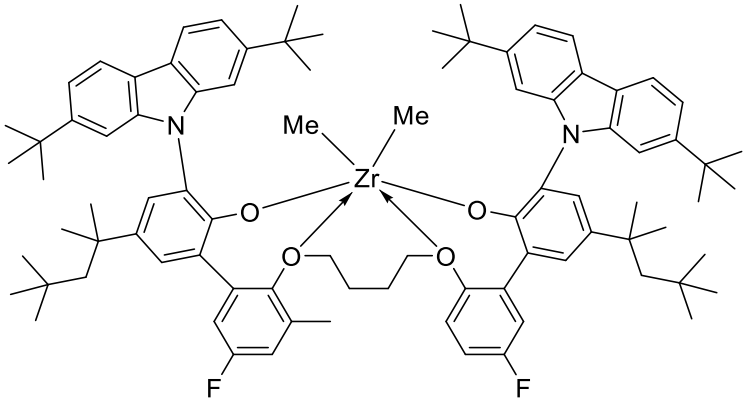
~~10. The use of claim 1, wherein M is Zr.~~

~~11. The use of claim 1, wherein M is Hf.~~

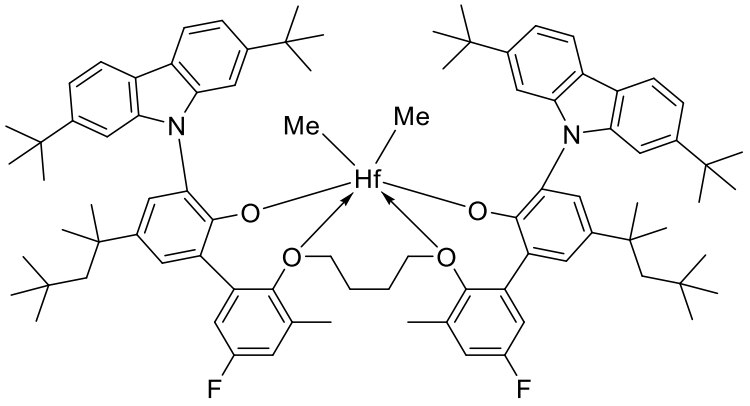
~~12~~7. A biphenylphenol polymerization precatalyst selected from a group consisting of the structures of (i), (ii), (iii), (iv), and (v).



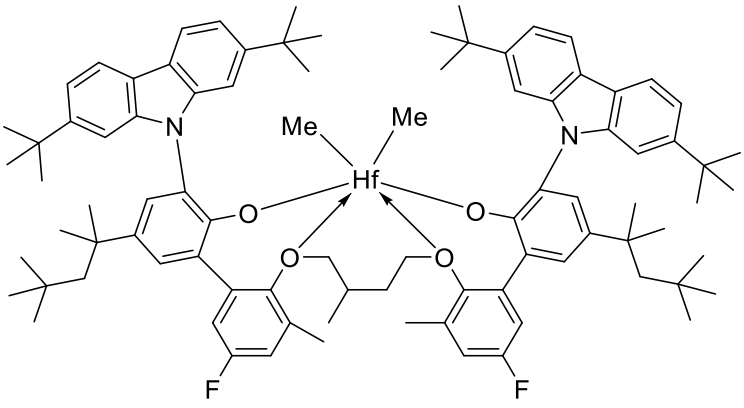
(i);



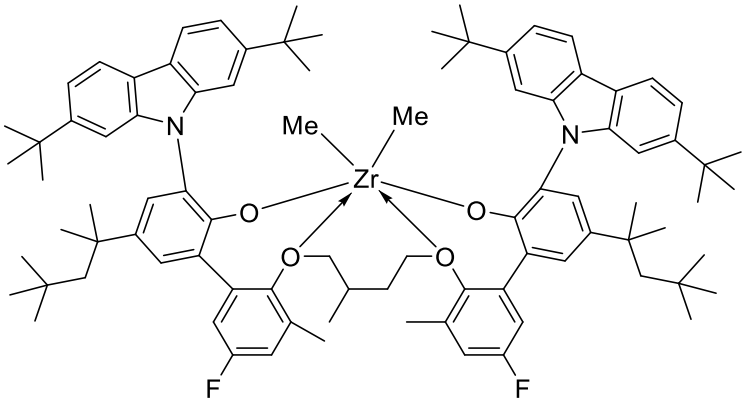
(ii);



(iii);



(iv); and



(v).

~~13.~~8. A method of making a biphenylphenol polymerization catalyst, the method comprising contacting, under activating conditions, a biphenylphenol polymerization precatalyst of Formula I with an activator so as to activate the biphenylphenol polymerization precatalyst of Formula I, thereby making the biphenylphenol polymerization catalyst that has a kinetic induction time of greater than 40 seconds as determined by a least squares fit of a first-order exponential for a rate of increase of an instantaneous polymerization rate.

~~14~~9. A method of making a polyethylene, the method comprising:

polymerizing an olefin monomer in a polymerization reactor in presence of the biphenylphenol polymerization catalyst of claim ~~13~~ 8 to make a polyethylene composition.

~~15~~10. The method of claim ~~14~~9, wherein the biphenylphenol polymerization catalyst of claim ~~13~~ 8 is introduced into the polymerization reactor in the form of:

a slurry including the biphenylphenol polymerization catalyst; or

a spray-dried catalyst composition including the biphenylphenol polymerization catalyst.