CLAIMS

What is claimed is:

1. A supported catalyst system comprising:

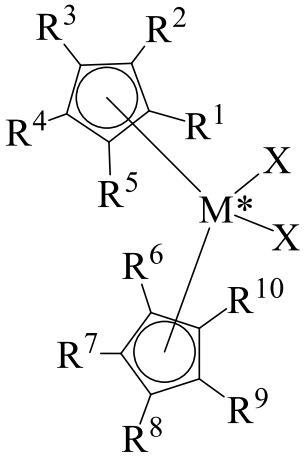
an unbridged hafnium metallocene compound;

an unbridged zirconium metallocene compound;

a support material; and

an activator;

wherein the unbridged hafnium metallocene compound is represented by formula (A):



(A)

where:

M* is Hf;

each of R^1, R^2, R^4, and R^5 is independently hydrogen, alkoxide, or C_1 to C_{40} substituted or unsubstituted hydrocarbyl;

R^3 is independently hydrogen, alkoxide, C_1 to C_{40} substituted or unsubstituted hydrocarbyl, or $–R^{11}$-SiR'_3 or $–R^{11}$-CR'_3 where R^{11} is a C_1 to C_4 hydrocarbyl, and each R' is independently C_1 to C_{20} substituted or unsubstituted hydrocarbyl;

each R^6, R^7, R^8, and R^{10} is independently hydrogen, halide, alkoxide, or C_1 to C_{40} substituted or unsubstituted hydrocarbyl;

R^9 is -CH_2-$SiMe_3$, -CH_2-$SiEt_3$, -CH_2-$SiPr_3$, -CH_2-$SiBu_3$, -CH_2-$SiCy_3$, -CH_2-$SiH(CH_3)_2$, -CH_2SiPh_3, -CH_2-$Si(CH_3)_2Ph$, -CH_2-$Si(CH_3)Ph_2$, -CH_2-$Si(Et)_2Ph$, -CH_2-$Si(Et)Ph_2$, -CH_2-$Si(CH_2)_3Ph$, -CH_2-$Si(CH_2)_4Ph$, -CH_2-$Si(Cy)Ph_2$, -CH_2-$Si(Cy)_2Ph$; -CH_2-$Si(CH_3)_2Cy$, or -CH_2-$Si(CH_3)Cy_2$;

each X is independently a univalent anionic ligand, or two Xs are joined to form a metallocyclic ring, or two Xs are joined to form a chelating ligand, a diene ligand, or an alkylidene ligand;

and the unbridged zirconium metallocene compound represented by formula (B):

$$Cp^ACp^BZrX'_n \quad (B)$$

wherein

Cp^A is selected from the group consisting of cyclopentadienyl, substituted cyclopentadieny, indenyl, and substituted indenyl;

Cp^B is substituted indenyl;

each X' is independently a halide, a hydride, an alkyl group, an alkenyl group or an arylalkyl group; and

n is 1 or 2.

2. The supported catalyst system of claim 1, wherein M* of formula (A) is Hf, each R^1, R^2, R^3, R^4 and R^5 is C_1 to C_{20} alkyl.

3. The supported catalyst system of claim 1, wherein R^9 is $-CH_2-SiMe_3$, $-CH_2-SiEt_3$, $-CH_2-SiPr_3$, $-CH_2-SiBu_3$, $-CH_2-SiCy_3$, $-CH_2-SiH(CH_3)_2$, $-CH_2SiPh_3$, $-CH_2-Si(CH_3)_2Ph$, $-CH_2-Si(CH_3)Ph_2$, $-CH_2-Si(Et)_2Ph$, $-CH_2-Si(Et)Ph_2$, $-CH_2-Si(CH_2)_3Ph$, $-CH_2-Si(CH_2)_4Ph$, $-CH_2-Si(Cy)Ph_2$, or $-CH_2-Si(Cy)_2Ph$.

4. A supported catalyst system comprising:

an unbridged hafnium metallocene compound;

an unbridged zirconium metallocene compound;

a support material; and

an activator;

wherein the unbridged zirconium metallocene compound is represented by formula (B):

$$Cp^ACp^BZrX'n \qquad (B)$$

wherein

Cp^A is selected from the group consisting of cyclopentadienyl, substituted cyclopentadieny, indenyl, and substituted indenyl,

Cp^B is substituted indenyl,

each X' is independently a halide, a hydride, an alkyl group, an alkenyl group or an arylalkyl group, and

n is 1 or 2; and

the unbridged hafnium metallocene compound is one or more of:

$(Cp)(3-CH_2-SiMe_3-Cp)HfMe_2$; $(MeCp)(3-CH_2-SiMe_3-Cp)HfMe_2$; $(EtCp)(3-CH_2-SiMe_3-Cp)HfMe_2$; $(PrCp)(3-CH_2-SiMe_3-Cp)HfMe_2$; $(BuCp)(3-CH_2-SiMe_3-Cp)HfMe_2$; $(BzCp)(3-CH_2-SiMe_3-Cp)HfMe_2$; $(3-CH_2-SiMe_3-Cp)_2HfMe_2$; $(Me_3Cp)(3-CH_2-SiMe_3-Cp)HfMe_2$;

$(Me_4Cp)(3\text{-}CH_2\text{-}SiMe_3\text{-}Cp)HfMe_2$; $(Me_5Cp)(3\text{-}CH_2\text{-}SiMe_3\text{-}Cp)HfMe_2$; (1-Me, 3-Bu-Cp)(3-$CH_2$-$SiMe_3$-Cp)$HfMe_2$; (1-Me, 3-Ph-Cp)(3-$CH_2$-$SiMe_3$-Cp)$HfMe_2$; ($Me_4$Cp-Pr)(3-$CH_2$-$SiMe_3$-Cp)$HfMe_2$; ($Me_4$Cp-$CH_2$-$SiMe_3$)(3-$CH_2$-$SiMe_3$-Cp)$HfMe_2$; (2-Me,3-$CH_2$-$SiMe_3$-Ind)$_2HfMe_2$; (2-Et,3-$CH_2$-$SiMe_3$-Ind)$_2HfMe_2$; (2-Pr,3-$CH_2$-$SiMe_3$-Ind)$_2HfMe_2$; (2-Bu,3-$CH_2$-$SiMe_3$-Ind)$_2HfMe_2$; (2-Ph,3-$CH_2$-$SiMe_3$-Ind)$_2HfMe_2$; (3-$CH_2$-$SiMe_3$-Ind)$_2HfMe_2$; (3-$CH_2$-$SiMe_3$-Ind)(3-$CH_2$-$SiMe_3$-Cp)$HfMe_2$; (3-Me-Ind)(3-$CH_2$-$SiMe_3$-Cp)$HfMe_2$; (3-Et-Ind)(3-$CH_2$-$SiMe_3$-Cp)$HfMe_2$; (3-Pr-Ind)(3-$CH_2$-$SiMe_3$-Cp)$HfMe_2$; (3-Bu-Ind)(3-$CH_2$-$SiMe_3$-Cp)$HfMe_2$; (Cp)(3-$CH_2$-$SiMe_3$-Ind)$HfMe_2$; (MeCp)(3-$CH_2$-$SiMe_3$-Ind)$HfMe_2$; (EtCp)(3-$CH_2$-$SiMe_3$-Ind)$HfMe_2$; (PrCp)(3-$CH_2$-$SiMe_3$-Ind)$HfMe_2$; (BuCp)(3-$CH_2$-$SiMe_3$-Ind)$HfMe_2$; ($Me_3$Cp)(3-$CH_2$-$SiMe_3$-Ind)$HfMe_2$; ($Me_4$Cp)(3-$CH_2$-$SiMe_3$-Ind)$HfMe_2$; ($Me_5$Cp)(3-$CH_2$-$SiMe_3$-Ind)$HfMe_2$; (1-Me, 3-Bu-Cp)(3-$CH_2$-$SiMe_3$-Ind)$HfMe_2$; (1-Me, 3-Ph-Cp)(3-$CH_2$-$SiMe_3$-Ind)$HfMe_2$; (Cp)(3-$CH_2$-$SiMe_3$-Cp)$HfMe_2$; (MeCp)(3-$CH_2$-$SiMe_3$-Cp)$HfMe_2$; (EtCp)(3-$CH_2$-$SiMe_3$-Cp)$HfMe_2$; (PrCp)(3-$CH_2$-$SiMe_3$-Cp)$HfMe_2$; (BuCp)(3-$CH_2$-$SiMe_3$-Cp)$HfMe_2$; (BzCp)(3-$CH_2$-$SiMe_3$-Cp)$HfMe_2$; (3-$CH_2$-$SiMe_3$-Cp)$_2HfMe_2$; ($Me_2$Cp)(3-$CH_2$-$SiMe_3$-Cp)$HfMe_2$; ($Me_3$Cp)(3-$CH_2$-$SiMe_3$-Cp)$HfMe_2$; ($Me_4$Cp)(3-$CH_2$-$SiMe_3$-Cp)$HfMe_2$; ($Me_5$Cp)(3-$CH_2$-$SiMe_3$-Cp)$HfMe_2$; ($Et_2$Cp)(3-$CH_2$-$SiMe_3$-Cp)$HfMe_2$; ($Et_3$Cp)(3-$CH_2$-$SiMe_3$-Cp)$HfMe_2$; ($Et_4$Cp)(3-$CH_2$-$SiMe_3$-Cp)$HfMe_2$; ($Et_5$Cp)(3-$CH_2$-$SiMe_3$-Cp)$HfMe_2$; ($Pr_2$Cp)(3-$CH_2$-$SiMe_3$-Cp)$HfMe_2$; ($Pr_3$Cp)(3-$CH_2$-$SiMe_3$-Cp)$HfMe_2$; ($Pr_4$Cp)(3-$CH_2$-$SiMe_3$-Cp)$HfMe_2$; ($Pr_5$Cp)(3-$CH_2$-$SiMe_3$-Cp)$HfMe_2$;($Bu_2$Cp)(3-$CH_2$-$SiMe_3$-Cp)$HfMe_2$; ($Bu_3$Cp)(3-$CH_2$-$SiMe_3$-Cp)$HfMe_2$; ($Bu_4$Cp)(3-$CH_2$-$SiMe_3$-Cp)$HfMe_2$; ($Bu_5$Cp)(3-$CH_2$-$SiMe_3$-Cp)$HfMe_2$; ($Bz_2$Cp)(3-$CH_2$-$SiMe_3$-Cp)$HfMe_2$; ($Bz_3$Cp)(3-$CH_2$-$SiMe_3$-Cp)$HfMe_2$; ($Bz_4$Cp)(3-$CH_2$-$SiMe_3$-Cp)$HfMe_2$; ($Bz_5$Cp)(3-$CH_2$-$SiMe_3$-Cp)$HfMe_2$; ($EtMe_4$Cp)(3-$CH_2$-$SiMe_3$-Cp)$HfMe_2$; ($PrMe_4$Cp)(3-$CH_2$-$SiMe_3$-Cp)$HfMe_2$; ($BuMe_4$Cp)(3-$CH_2$-$SiMe_3$-Cp)$HfMe_2$; ($PnMe_4$Cp)(3-$CH_2$-$SiMe_3$-Cp)$HfMe_2$; ($HxMe_4$Cp)(3-$CH_2$-$SiMe_3$-Cp)$HfMe_2$; ($BzMe_4$Cp)(3-$CH_2$-$SiMe_3$-Cp)$HfMe_2$; ($Me_4$Cp-$CH_2$-$SiMe_3$)(3-$CH_2$-$SiMe_3$-Cp)$HfMe_2$; ($Me_4$Cp-$CH_2$-$SiMe_2Ph$)(3-$CH_2$-$SiMe_3$-Cp)$HfMe_2$; ($Me_4$Cp-$CH_2$-$SiMe_2Ph$)(3-$CH_2$-$SiMe_3$-Cp)$HfMe_2$; ($Me_4$Cp-$CH_2$-$SiMePh_2$)(3-$CH_2$-$SiMe_3$-Cp)$HfMe_2$; ($Me_4$Cp-$CH_2$-$SiPh_3$)(3-$CH_2$-$SiMe_3$-Cp)$HfMe_2$; ($Me_4$Cp-$CH_2$-$SiMe_2Cy$)(3-$CH_2$-$SiMe_3$-Cp)$HfMe_2$; ($Me_4$Cp-$CH_2$-$SiMeCy_2$)(3-$CH_2$-$SiMe_3$-Cp)$HfMe_2$; ($Me_4$Cp-$CH_2$-$SiCy_3$)(3-$CH_2$-$SiMe_3$-Cp)$HfMe_2$; ($EtMe_3$Cp)(3-$CH_2$-$SiMe_3$-Cp)$HfMe_2$; ($PrMe_3$Cp)(3-$CH_2$-$SiMe_3$-Cp)$HfMe_2$; ($BuMe_3$Cp)(3-$CH_2$-$SiMe_3$-Cp)$HfMe_2$; ($BzMe_3$Cp)(3-$CH_2$-$SiMe_3$-Cp)$HfMe_2$; ($Me_3$Cp-$CH_2$-$SiMe_3$)(3-$CH_2$-$SiMe_3$-Cp)$HfMe_2$; ($Me_3$Cp-$CH_2$-$SiMe_2Ph$)(3-$CH_2$-$SiPh_3$-Cp)$HfMe_2$; ($Me_3$Cp-$CH_2$-$SiMePh_2$)(3-$CH_2$-$SiMe_3$-Cp)$HfMe_2$; ($Me_3$Cp-$CH_2$-$SiPh_3$)(3-$CH_2$-$SiMe_3$-Cp)$HfMe_2$; ($Me_3$Cp-$CH_2$-$SiMe_2Cy$)(3-$CH_2$-$SiMe_3$-Cp)$HfMe_2$; ($Me_3$Cp-$CH_2$-$SiMeCy_2$)(3-$CH_2$-$SiMe_3$-Cp)$HfMe_2$; ($Me_3$Cp-$CH_2$-$SiCy_3$)(3-$CH_2$-$SiMe_3$-Cp)$HfMe_2$;

(MeEtCp)(3-CH_2-$SiMe_3$-Cp)$HfMe_2$; (MePrCp)(3-CH_2-$SiMe_3$-Cp)$HfMe_2$; (MeBuCp)(3-CH_2-$SiMe_3$-Cp)$HfMe_2$; (BzMeCp)(3-CH_2-$SiMe_3$-Cp)$HfMe_2$; (EtPrCp)(3-CH_2-$SiMe_3$-Cp)$HfMe_2$; (EtBuCp)(3-CH_2-$SiMe_3$-Cp)$HfMe_2$; (BzEtCp)(3-CH_2-$SiMe_3$-Cp)$HfMe_2$; (PrBuCp)(3-CH_2-$SiMe_3$-Cp)$HfMe_2$; (BzPrCp)(3-CH_2-$SiMe_3$-Cp)$HfMe_2$; (BuBzCp)(3-CH_2-$SiMe_3$-Cp)$HfMe_2$; (Cp)(3-CH_2-$SiMe_2Ph$-Cp)$HfMe_2$; (MeCp)(3-CH_2-$SiMe_2Ph$-Cp)$HfMe_2$; (EtCp)(3-CH_2-$SiMe_2Ph$-Cp)$HfMe_2$; (PrCp)(3-CH_2-$SiMe_2Ph$-Cp)$HfMe_2$; (BuCp)(3-CH_2-$SiMe_2Ph$-Cp)$HfMe_2$; (BzCp)(3-CH_2-$SiMe_2Ph$-Cp)$HfMe_2$; (3-CH_2-$SiMe_2Ph$-Cp)$_2HfMe_2$; (Me_2Cp)(3-CH_2-$SiMe_2Ph$-Cp)$HfMe_2$; (Me_3Cp)(3-CH_2-$SiMe_2Ph$-Cp)$HfMe_2$; (Me_4Cp)(3-CH_2-$SiMe_2Ph$-Cp)$HfMe_2$; (Me_5Cp)(3-CH_2-$SiMe_2Ph$-Cp)$HfMe_2$; (Et_2Cp)(3-CH_2-$SiMe_2Ph$-Cp)$HfMe_2$; (Et_3Cp)(3-CH_2-$SiMe_2Ph$-Cp)$HfMe_2$; (Et_4Cp)(3-CH_2-$SiMe_2Ph$-Cp)$HfMe_2$; (Et_5Cp)(3-CH_2-$SiMe_2Ph$-Cp)$HfMe_2$; (Pr_2Cp)(3-CH_2-$SiMe_2Ph$-Cp)$HfMe_2$; (Pr_3Cp)(3-CH_2-$SiMe_2Ph$-Cp)$HfMe_2$; (Pr_4Cp)(3-CH_2-$SiMe_2Ph$-Cp)$HfMe_2$; (Pr_5Cp)(3-CH_2-$SiMe_2Ph$-Cp)$HfMe_2$;(Bu_2Cp)(3-CH_2-$SiMe_2Ph$-Cp)$HfMe_2$; (Bu_3Cp)(3-CH_2-$SiMe_2Ph$-Cp)$HfMe_2$; (Bu_4Cp)(3-CH_2-$SiMe_2Ph$-Cp)$HfMe_2$; (Bu_5Cp)(3-CH_2-$SiMe_2Ph$-Cp)$HfMe_2$; (Bz_2Cp)(3-CH_2-$SiMe_2Ph$-Cp)$HfMe_2$; (Bz_3Cp)(3-CH_2-$SiMe_2Ph$-Cp)$HfMe_2$; (Bz_4Cp)(3-CH_2-$SiMe_2Ph$-Cp)$HfMe_2$; (Bz_5Cp)(3-CH_2-$SiMe_2Ph$-Cp)$HfMe_2$; (EtMe_4Cp)(3-CH_2-$SiMe_2Ph$-Cp)$HfMe_2$; (PrMe_4Cp)(3-CH_2-$SiMe_2Ph$-Cp)$HfMe_2$; (BuMe_4Cp)(3-CH_2-$SiMe_2Ph$-Cp)$HfMe_2$; (BzMe_4Cp)(3-CH_2-$SiMe_2Ph$-Cp)$HfMe_2$; (Me_4Cp-CH_2-$SiMe_3$)(3-CH_2-$SiMe_2Ph$-Cp)$HfMe_2$; (Me_4Cp-CH_2-$SiMe_2Ph$)(3-CH_2-$SiMe_2Ph$-Cp)$HfMe_2$; (Me_4Cp-CH_2-$SiMePh_2$)(3-CH_2-$SiMe_2Ph$-Cp)$HfMe_2$; (Me_4Cp-CH_2-$SiPh_3$)(3-CH_2-$SiMe_2Ph$-Cp)$HfMe_2$; (Me_4Cp-CH_2-$SiMe_2Cy$)(3-CH_2-$SiMe_2Ph$-Cp)$HfCl_2$; (Me_4Cp-CH_2-$SiMeCy_2$)(3-CH_2-$SiMe_2Ph$-Cp)$HfCl_2$; (Me_4Cp-CH_2-$SiCy_3$)(3-CH_2-$SiMe_2Ph$-Cp)$HfMe_2$; (EtMe_3Cp)(3-CH_2-$SiMe_2Ph$-Cp)$HfMe_2$; (PrMe_3Cp)(3-CH_2-$SiMe_2Ph$-Cp)$HfMe_2$; (BuMe_3Cp)(3-CH_2-$SiMe_2Ph$-Cp)$HfMe_2$; (BzMe_3Cp)(3-CH_2-$SiMe_2Ph$-Cp)$HfMe_2$; (Me_3Cp-CH_2-$SiMe_3$)(3-CH_2-$SiMe_2Ph$-Cp)$HfMe_2$; (Me_3Cp-CH_2-$SiMe_2Ph$)(3-CH_2-$SiMe_2Ph$-Cp)$HfMe_2$; (Me_3Cp-CH_2-$SiMePh_2$)(3-CH_2-$SiMe_2Ph$-Cp)$HfMe_2$; (Me_3Cp-CH_2-$SiPh_3$)(3-CH_2-$SiMe_2Ph$-Cp)$HfMe_2$; (Me_3Cp-CH_2-$SiMe_2Cy$)(3-CH_2-$SiMe_2Ph$-Cp)$HfMe_2$; (Me_3Cp-CH_2-$SiMeCy_2$)(3-CH_2-$SiMe_2Ph$-Cp)$HfMe_2$; (Me_3Cp-CH_2-$SiCy_3$)(3-CH_2-$SiMe_2Ph$-Cp)$HfMe_2$; (MeEtCp)(3-CH_2-$SiMe_2Ph$-Cp)$HfMe_2$; (MePrCp)(3-CH_2-$SiMe_2Ph$-Cp)$HfMe_2$; (MeBuCp)(3-CH_2-$SiMe_2Ph$-Cp)$HfMe_2$; (BzMeCp)(3-CH_2-$SiMe_2Ph$-Cp)$HfMe_2$; (EtPrCp)(3-CH_2-$SiMe_2Ph$-Cp)$HfMe_2$; (EtBuCp)(3-CH_2-$SiMe_2Ph$-Cp)$HfMe_2$; (BzEtCp)(3-CH_2-$SiMe_2Ph$-Cp)$HfMe_2$; (PrBuCp)(3-CH_2-$SiMe_2Ph$-Cp)$HfMe_2$; (BzPrCp)(3-CH_2-$SiMe_2Ph$-Cp)$HfMe_2$; (BuBzCp)(3-CH_2-$SiMe_2Ph$-Cp)$HfMe_2$; (Cp)(3-CH_2-$SiMePh_2$-Cp)$HfMe_2$; (MeCp)(3-CH_2-$SiMePh_2$-Cp)$HfMe_2$; (EtCp)(3-CH_2-$SiMePh_2$-Cp)$HfMe_2$; (PrCp)(3-CH_2-$SiMePh_2$-Cp)$HfMe_2$; (BuCp)(3-CH_2-$SiMePh_2$-Cp)$HfMe_2$;

((BzCp)(3-CH_2-$SiMePh_2$-Cp)$HfMe_2$; (3-CH_2-$SiMePh_2$-Cp)$_2HfMe_2$; (Me_2Cp)(3-CH_2-$SiMePh_2$-Cp)$HfMe_2$; (Me_3Cp)(3-CH_2-$SiMePh_2$-Cp)$HfMe_2$; (Me_4Cp)(3-CH_2-$SiMePh_2$-Cp)$HfMe_2$; (Me_5Cp)(3-CH_2-$SiMePh_2$-Cp)$HfMe_2$; (Et_2Cp)(3-CH_2-$SiMePh_2$-Cp)$HfMe_2$; (Et_3Cp)(3-CH_2-$SiMePh_2$-Cp)$HfMe_2$; (Et_4Cp)(3-CH_2-$SiMePh_2$-Cp)$HfMe_2$; (Et_5Cp)(3-CH_2-$SiMePh_2$-Cp)$HfMe_2$; (Pr_2Cp)(3-CH_2-$SiMePh_2$-Cp)$HfMe_2$; (Pr_3Cp)(3-CH_2-$SiMePh_2$-Cp)$HfMe_2$; (Pr_4Cp)(3-CH_2-$SiMePh_2$-Cp)$HfMe_2$; (Pr_5Cp)(3-CH_2-$SiMePh_2$-Cp)$HfMe_2$; (Bu_2Cp)(3-CH_2-$SiMePh_2$-Cp)$HfMe_2$; (Bu_3Cp)(3-CH_2-$SiMePh_2$-Cp)$HfMe_2$; (Bu_4Cp)(3-CH_2-$SiMePh_2$-Cp)$HfMe_2$; (Bu_5Cp)(3-CH_2-$SiMePh_2$-Cp)$HfMe_2$; (Bz_2Cp)(3-CH_2-$SiMePh_2$-Cp)$HfMe_2$; (Bz_3Cp)(3-CH_2-$SiMePh_2$-Cp)$HfMe_2$; (Bz_4Cp)(3-CH_2-$SiMePh_2$-Cp)$HfMe_2$; (Bz_5Cp)(3-CH_2-$SiMePh_2$-Cp)$HfMe_2$; (EtMe_4Cp)(3-CH_2-$SiMePh_2$-Cp)$HfMe_2$; (PrMe_4Cp)(3-CH_2-$SiMePh_2$-Cp)$HfMe_2$; (BuMe_4Cp)(3-CH_2-$SiMePh_2$-Cp)$HfMe_2$; (PnMe_4Cp)(3-CH_2-$SiMePh_2$-Cp)$HfMe_2$; (HxMe_4Cp)(3-CH_2-$SiMePh_2$-Cp)$HfMe_2$; (BzMe_4Cp)(3-CH_2-$SiMePh_2$-Cp)$HfMe_2$; (Me_4Cp-CH_2-$SiMe_3$)(3-CH_2-$SiMePh_2$-Cp)$HfMe_2$; (Me_4Cp-CH_2-$SiMe_2$Ph)(3-CH_2-$SiMePh_2$-Cp)$HfMe_2$; (Me_4Cp-CH_2-$SiMePh_2$)(3-CH_2-$SiMePh_2$-Cp)$HfMe_2$; (Me_4Cp-CH_2-$SiPh_3$)(3-CH_2-$SiMePh_2$-Cp)$HfMe_2$; (Me_4Cp-CH_2-$SiMe_2$Cy)(3-CH_2-$SiMePh_2$-Cp)$HfMe_2$; (Me_4Cp-CH_2-$SiMeCy_2$)(3-CH_2-$SiMePh_2$-Cp)$HfMe_2$; (Me_4Cp-CH_2-$SiCy_3$)(3-CH_2-$SiMePh_2$-Cp)$HfMe_2$; (EtMe_3Cp)(3-CH_2-$SiMePh_2$-Cp)$HfMe_2$; (PrMe_3Cp)(3-CH_2-$SiMePh_2$-Cp)$HfMe_2$; (BuMe_3Cp)(3-CH_2-$SiMePh_2$-Cp)$HfMe_2$; (BzMe_3Cp)(3-CH_2-$SiMePh_2$-Cp)$HfMe_2$; (Me_3Cp-CH_2-$SiMe_3$)(3-CH_2-$SiMePh_2$-Cp)$HfMe_2$; (Me_3Cp-CH_2-$SiMe_2$Ph)(3-CH_2-$SiMePh_2$-Cp)$HfMe_2$; (Me_3Cp-CH_2-$SiMePh_2$)(3-CH_2-$SiMePh_2$-Cp)$HfMe_2$; (Me_3Cp-CH_2-$SiPh_3$)(3-CH_2-$SiMePh_2$-Cp)$HfMe_2$; (Me_3Cp-CH_2-$SiMe_2$Cy)(3-CH_2-$SiMePh_2$-Cp)$HfMe_2$; (Me_3Cp-CH_2-$SiMeCy_2$)(3-CH_2-$SiMePh_2$-Cp)$HfMe_2$; (Me_3Cp-CH_2-$SiCy_3$)(3-CH_2-$SiMePh_2$-Cp)$HfMe_2$; (MeEtCp)(3-CH_2-$SiMePh_2$-Cp)$HfMe_2$; (MePrCp)(3-CH_2-$SiMePh_2$-Cp)$HfMe_2$; (MeBuCp)(3-CH_2-$SiMePh_2$-Cp)$HfMe_2$; (BzMeCp)(3-CH_2-$SiMePh_2$-Cp)$HfMe_2$; (EtPrCp)(3-CH_2-$SiMePh_2$-Cp)$HfMe_2$; (EtBuCp)(3-CH_2-$SiMePh_2$-Cp)$HfMe_2$; (BzEtCp)(3-CH_2-$SiMePh_2$-Cp)$HfMe_2$; (PrBuCp)(3-CH_2-$SiMePh_2$-Cp)$HfMe_2$; (BzPrCp)(3-CH_2-$SiMePh_2$-Cp)$HfMe_2$; (BuBzCp)(3-CH_2-$SiMePh_2$-Cp)$HfMe_2$; (Cp)(3-CH_2-$SiPh_3$-Cp)$HfMe_2$; (MeCp)(3-CH_2-$SiPh_3$-Cp)$HfMe_2$; (EtCp)(3-CH_2-$SiPh_3$-Cp)$HfMe_2$; (PrCp)(3-CH_2-$SiPh_3$-Cp)$HfMe_2$; (BuCp)(3-CH_2-$SiPh_3$-Cp)$HfMe_2$; (BzCp)(3-CH_2-$SiPh_3$-Cp)$HfMe_2$; (3-CH_2-$SiPh_3$-Cp)$_2HfMe_2$; (Me_2Cp)(3-CH_2-$SiPh_3$-Cp)$HfMe_2$; (Me_3Cp)(3-CH_2-$SiPh_3$-Cp)$HfMe_2$; (Me_4Cp)(3-CH_2-$SiPh_3$-Cp)$HfMe_2$; (Me_5Cp)(3-CH_2-$SiPh_3$-Cp)$HfMe_2$; (Et_2Cp)(3-CH_2-$SiPh_3$-Cp)$HfMe_2$; (Et_3Cp)(3-CH_2-$SiPh_3$-Cp)$HfMe_2$; (Et_4Cp)(3-CH_2-$SiPh_3$-Cp)$HfMe_2$; (Et_5Cp)(3-CH_2-$SiPh_3$-Cp)$HfMe_2$; (Pr_2Cp)(3-CH_2-$SiPh_3$-Cp)$HfMe_2$; (Pr_3Cp)(3-CH_2-$SiPh_3$-Cp)$HfMe_2$; (Pr_4Cp)(3-CH_2-$SiPh_3$-Cp)$HfMe_2$; (Pr_5Cp)(3-CH_2-$SiPh_3$-Cp)$HfMe_2$;(Bu_2Cp)(3-CH_2-$SiPh_3$-Cp)$HfMe_2$; (Bu_3Cp)(3-CH_2-$SiPh_3$-

Cp)$HfMe_2$; (Bu_4Cp)(3-CH_2-$SiPh_3$-Cp)$HfMe_2$; (Bu_5Cp)(3-CH_2-$SiPh_3$-Cp)$HfMe_2$; (Bz_2Cp)(3-CH_2-$SiPh_3$-Cp)$HfMe_2$; (Bz_3Cp)(3-CH_2-$SiPh_3$-Cp)$HfMe_2$; (Bz_4Cp)(3-CH_2-$SiPh_3$-Cp)$HfMe_2$; (Bz_5Cp)(3-CH_2-$SiPh_3$-Cp)$HfMe_2$; ($EtMe_4Cp$)(3-CH_2-$SiPh_3$-Cp)$HfMe_2$; ($PrMe_4Cp$)(3-CH_2-$SiPh_3$-Cp)$HfMe_2$; ($BuMe_4Cp$)(3-CH_2-$SiPh_3$-Cp)$HfMe_2$; ($BzMe_4Cp$)(3-CH_2-$SiPh_3$-Cp)$HfMe_2$; (Me_4Cp-CH_2-$SiMe_3$)(3-CH_2-$SiPh_3$-Cp)$HfMe_2$; (Me_4Cp-CH_2-$SiMe_2Ph$)(3-CH_2-$SiPh_3$-Cp)$HfMe_2$; (Me_4Cp-CH_2-$SiMePh_2$)(3-CH_2-$SiPh_3$-Cp)$HfMe_2$; (Me_4Cp-CH_2-$SiPh_3$)(3-CH_2-$SiPh_3$-Cp)$HfMe_2$; (Me_4Cp-CH_2-$SiMe_2Cy$)(3-CH_2-$SiPh_3$-Cp)$HfMe_2$; (Me_4Cp-CH_2-$SiMeCy_2$)(3-CH_2-$SiPh_3$-Cp)$HfMe_2$; (Me_4Cp-CH_2-$SiCy_3$)(3-CH_2-$SiPh_3$-Cp)$HfMe_2$; ($EtMe_3Cp$)(3-CH_2-$SiPh_3$-Cp)$HfMe_2$; ($PrMe_3Cp$)(3-CH_2-$SiPh_3$-Cp)$HfMe_2$; ($BuMe_3Cp$)(3-CH_2-$SiPh_3$-Cp)$HfMe_2$; ($BzMe_3Cp$)(3-CH_2-$SiPh_3$-Cp)$HfMe_2$; (Me_3Cp-CH_2-$SiMe_3$)(3-CH_2-$SiPh_3$-Cp)$HfMe_2$; (Me_3Cp-CH_2-$SiMe_2Ph$)(3-CH_2-$SiPh_3$-Cp)$HfMe_2$; (Me_3Cp-CH_2-$SiMePh_2$)(3-CH_2-$SiPh_3$-Cp)$HfMe_2$; (Me_3Cp-CH_2-$SiPh_3$)(3-CH_2-$SiPh_3$-Cp)$HfMe_2$; (Me_3Cp-CH_2-$SiMe_2Cy$)(3-CH_2-$SiPh_3$-Cp)$HfMe_2$; (Me_3Cp-CH_2-$SiMeCy_2$)(3-CH_2-$SiPh_3$-Cp)$HfMe_2$; (Me_3Cp-CH_2-$SiCy_3$)(3-CH_2-$SiPh_3$-Cp)$HfMe_2$; (MeEtCp)(3-CH_2-$SiPh_3$-Cp)$HfMe_2$; (MePrCp)(3-CH_2-$SiPh_3$-Cp)$HfMe_2$; (MeBuCp)(3-CH_2-$SiPh_3$-Cp)$HfMe_2$; (BzMeCp)(3-CH_2-$SiPh_3$-Cp)$HfMe_2$; (EtPrCp)(3-CH_2-$SiPh_3$-Cp)$HfMe_2$; (EtBuCp)(3-CH_2-$SiPh_3$-Cp)$HfMe_2$; (BzEtCp)(3-CH_2-$SiPh_3$-Cp)$HfMe_2$; (PrBuCp)(3-CH_2-$SiPh_3$-Cp)$HfMe_2$; (BzPrCp)(3-CH_2-$SiPh_3$-Cp)$HfMe_2$; (BuBzCp)(3-CH_2-$SiPh_3$-Cp)$HfMe_2$; (Cp)(3-CH_2-$SiCyMe_2$-Cp)$HfMe_2$; (MeCp)(3-CH_2-$SiCyMe_2$-Cp)$HfMe_2$; (EtCp)(3-CH_2-$SiCyMe_2$-Cp)$HfMe_2$; (PrCp)(3-CH_2-$SiCyMe_2$-Cp)$HfMe_2$; (BuCp)(3-CH_2-$SiCyMe_2$-Cp)$HfMe_2$; (BzCp)(3-CH_2-$SiCyMe_2$-Cp)$HfMe_2$; (3-CH_2-$SiCyMe_2$-Cp)$_2HfMe_2$; (Me_2Cp)(3-CH_2-$SiCyMe_2$-Cp)$HfMe_2$; (Me_3Cp)(3-CH_2-$SiCyMe_2$-Cp)$HfMe_2$; (Me_4Cp)(3-CH_2-$SiCyMe_2$-Cp)$HfMe_2$; (Me_5Cp)(3-CH_2-$SiCyMe_2$-Cp)$HfMe_2$; (Et_2Cp)(3-CH_2-$SiCyMe_2$-Cp)$HfMe_2$; (Et_3Cp)(3-CH_2-$SiCyMe_2$-Cp)$HfMe_2$; (Et_4Cp)(3-CH_2-$SiCyMe_2$-Cp)$HfMe_2$; (Et_5Cp)(3-CH_2-$SiCyMe_2$-Cp)$HfMe_2$; (Pr_2Cp)(3-CH_2-$SiCyMe_2$-Cp)$HfMe_2$; (Pr_3Cp)(3-CH_2-$SiCyMe_2$-Cp)$HfMe_2$; (Pr_4Cp)(3-CH_2-$SiCyMe_2$-Cp)$HfMe_2$; (Pr_5Cp)(3-CH_2-$SiCyMe_2$-Cp)$HfMe_2$;(Bu_2Cp)(3-CH_2-$SiCyMe_2$-Cp)$HfMe_2$; (Bu_3Cp)(3-CH_2-$SiCyMe_2$-Cp)$HfMe_2$; (Bu_4Cp)(3-CH_2-$SiCyMe_2$-Cp)$HfMe_2$; (Bu_5Cp)(3-CH_2-$SiCyMe_2$-Cp)$HfMe_2$; (Bz_2Cp)(3-CH_2-$SiCyMe_2$-Cp)$HfMe_2$; (Bz_3Cp)(3-CH_2-$SiCyMe_2$-Cp)$HfMe_2$; (Bz_4Cp)(3-CH_2-$SiCyMe_2$-Cp)$HfMe_2$; (Bz_5Cp)(3-CH_2-$SiCyMe_2$-Cp)$HfMe_2$; ($EtMe_4Cp$)(3-CH_2-$SiCyMe_2$-Cp)$HfMe_2$; ($PrMe_4Cp$)(3-CH_2-$SiCyMe_2$-Cp)$HfMe_2$; ($BuMe_4Cp$)(3-CH_2-$SiCyMe_2$-Cp)$HfMe_2$; ($BzMe_4Cp$)(3-CH_2-$SiCyMe_2$-Cp)$HfMe_2$; (Me_4Cp-CH_2-$SiMe_3$)(3-CH_2-$SiCyMe_2$-Cp)$HfMe_2$; (Me_4Cp-CH_2-$SiCyMe_2Ph$)(3-CH_2-$SiCyMe_2$-Cp)$HfMe_2$; (Me_4Cp-CH_2-$SiMePh_2$)(3-CH_2-$SiCyMe_2$-Cp)$HfMe_2$; (Me_4Cp-CH_2-$SiPh_3$)(3-CH_2-$SiCyMe_2$-Cp)$HfMe_2$; (Me_4Cp-CH_2-$SiMe_2Cy$)(3-CH_2-$SiCyMe_2$-Cp)$HfMe_2$; (Me_4Cp-CH_2-$SiMeCy_2$)(3-CH_2-

SiCyMe$_2$-Cp)HfMe$_2$; (Me$_4$Cp-CH$_2$-SiCy$_3$)(3-CH$_2$-SiCyMe$_2$-Cp)HfMe$_2$; (EtMe$_3$Cp)(3-CH$_2$-SiCyMe$_2$-Cp)HfMe$_2$; (PrMe$_3$Cp)(3-CH$_2$-SiCyMe$_2$-Cp)HfMe$_2$; (BuMe$_3$Cp)(3-CH$_2$-SiCyMe$_2$-Cp)HfMe$_2$; (BzMe$_3$Cp)(3-CH$_2$-SiCyMe$_2$-Cp)HfMe$_2$; (Me$_3$Cp-CH$_2$-SiMe$_3$)(3-CH$_2$-SiCyMe$_2$-Cp)HfMe$_2$; (Me$_3$Cp-CH$_2$-SiMe$_2$Ph)(3-CH$_2$-SiCyMe$_2$-Cp)HfMe$_2$; (Me$_3$Cp-CH$_2$-SiMePh$_2$)(3-CH$_2$-SiCyMe$_2$-Cp)HfMe$_2$; (Me$_3$Cp-CH$_2$-SiPh$_3$)(3-CH$_2$-SiCyMe$_2$-Cp)HfMe$_2$; (Me$_3$Cp-CH$_2$-SiMe$_2$Cy)(3-CH$_2$-SiCyMe$_2$-Cp)HfMe$_2$; (Me$_3$Cp-CH$_2$-SiMeCy$_2$)(3-CH$_2$-SiCyMe$_2$-Cp)HfMe$_2$; (Me$_3$Cp-CH$_2$-SiCy$_3$)(3-CH$_2$-SiCyMe$_2$-Cp)HfMe$_2$; (MeEtCp)(3-CH$_2$-SiCyMe$_2$-Cp)HfMe$_2$; (MePrCp)(3-CH$_2$-SiCyMe$_2$-Cp)HfMe$_2$; (MeBuCp)(3-CH$_2$-SiCyMe$_2$-Cp)HfMe$_2$; (BzMeCp)(3-CH$_2$-SiCyMe$_2$-Cp)HfMe$_2$; (EtPrCp)(3-CH$_2$-SiCyMe$_2$-Cp)HfMe$_2$; (EtBuCp)(3-CH$_2$-SiCyMe$_2$-Cp)HfMe$_2$; (BzEtCp)(3-CH$_2$-SiCyMe$_2$-Cp)HfMe$_2$; (PrBuCp)(3-CH$_2$-SiCyMe$_2$-Cp)HfMe$_2$; (BzPrCp)(3-CH$_2$-SiCyMe$_2$-Cp)HfMe$_2$; (BuBzCp)(3-CH$_2$-SiCyMe$_2$-Cp)HfMe$_2$; (Cp)(3-CH$_2$-SiCy$_2$Me-Cp)HfMe$_2$; (MeCp)(3-CH$_2$-SiCy$_2$Me-Cp)HfMe$_2$; (EtCp)(3-CH$_2$-SiCy$_2$Me-Cp)HfMe$_2$; (PrCp)(3-CH$_2$-SiCy$_2$Me-Cp)HfMe$_2$; (BuCp)(3-CH$_2$-SiCy$_2$Me-Cp)HfMe$_2$; (BzCp)(3-CH$_2$-SiCy$_2$Me-Cp)HfMe$_2$; (3-CH$_2$-SiCy$_2$Me-Cp)$_2$HfMe$_2$; (Me$_2$Cp)(3-CH$_2$-SiCy$_2$Me-Cp)HfMe$_2$; (Me$_3$Cp)(3-CH$_2$-SiCy$_2$Me-Cp)HfMe$_2$; (Me$_4$Cp)(3-CH$_2$-SiCy$_2$Me-Cp)HfMe$_2$; (Me$_5$Cp)(3-CH$_2$-SiCy$_2$Me-Cp)HfMe$_2$; (Et$_2$Cp)(3-CH$_2$-SiCy$_2$Me-Cp)HfMe$_2$; (Et$_3$Cp)(3-CH$_2$-SiCy$_2$Me-Cp)HfMe$_2$; (Et$_4$Cp)(3-CH$_2$-SiCy$_2$Me-Cp)HfMe$_2$; (Et$_5$Cp)(3-CH$_2$-SiCy$_2$Me-Cp)HfMe$_2$; (Pr$_2$Cp)(3-CH$_2$-SiCy$_2$Me-Cp)HfMe$_2$; (Pr$_3$Cp)(3-CH$_2$-SiCy$_2$Me-Cp)HfMe$_2$; (Pr$_4$Cp)(3-CH$_2$-SiCy$_2$Me-Cp)HfMe$_2$; (Pr$_5$Cp)(3-CH$_2$-SiCy$_2$Me-Cp)HfMe$_2$;(Bu$_2$Cp)(3-CH$_2$-SiCy$_2$Me-Cp)HfMe$_2$; (Bu$_3$Cp)(3-CH$_2$-SiCy$_2$Me-Cp)HfCl$_2$; (Bu$_4$Cp)(3-CH$_2$-SiCy$_2$Me-Cp)HfCl$_2$; (Bu$_5$Cp)(3-CH$_2$-SiCy$_2$Me-Cp)HfCl$_2$; (Bz$_2$Cp)(3-CH$_2$-SiCy$_2$Me-Cp)HfMe$_2$; (Bz$_3$Cp)(3-CH$_2$-SiCy$_2$Me-Cp)HfMe$_2$; (Bz$_4$Cp)(3-CH$_2$-SiCy$_2$Me-Cp)HfCl$_2$; (Bz$_5$Cp)(3-CH$_2$-SiCy$_2$Me-Cp)HfCl$_2$; (EtMe$_4$Cp)(3-CH$_2$-SiCy$_2$Me-Cp)HfCl$_2$; (PrMe$_4$Cp)(3-CH$_2$-SiCy$_2$Me-Cp)HfMe$_2$; (BuMe$_4$Cp)(3-CH$_2$-SiCy$_2$Me-Cp)HfMe$_2$; (BzMe$_4$Cp)(3-CH$_2$-SiCy$_2$Me-Cp)HfMe$_2$; (Me$_4$Cp-CH$_2$-SiMe$_3$)(3-CH$_2$-SiCy$_2$Me-Cp)HfMe$_2$; (Me$_4$Cp-CH$_2$-SiMe$_2$Ph)(3-CH$_2$-SiCy$_2$Me-Cp)HfMe$_2$; (Me$_4$Cp-CH$_2$-SiMePh$_2$)(3-CH$_2$-SiCy$_2$Me-Cp)HfMe$_2$; (Me$_4$Cp-CH$_2$-SiPh$_3$)(3-CH$_2$-SiCy$_2$Me-Cp)HfMe$_2$; (Me$_4$Cp-CH$_2$-SiMe$_2$Cy)(3-CH$_2$-SiCy$_2$Me-Cp)HfMe$_2$; (Me$_4$Cp-CH$_2$-SiMeCy$_2$)(3-CH$_2$-SiCy$_2$Me-Cp)HfMe$_2$; (Me$_4$Cp-CH$_2$-SiCy$_3$)(3-CH$_2$-Cy$_2$Me-Cp)HfMe$_2$; (EtMe$_3$Cp)(3-CH$_2$-SiCy$_2$Me-Cp)HfMe$_2$; (PrMe$_3$Cp)(3-CH$_2$-SiCy$_2$Me-Cp)HfMe$_2$; (BuMe$_3$Cp)(3-CH$_2$-SiCy$_2$Me-Cp)HfMe$_2$; (BzMe$_3$Cp)(3-CH$_2$-SiCy$_2$Me-Cp)HfMe$_2$; (Me$_3$Cp-CH$_2$-SiMe$_3$)(3-CH$_2$-SiCy$_2$Me-Cp)HfMe$_2$; (Me$_3$Cp-CH$_2$-SiMe$_2$Ph)(3-CH$_2$-SiCy$_2$Me-Cp)HfMe$_2$; (Me$_3$Cp-CH$_2$-SiMePh$_2$)(3-CH$_2$-SiCy$_2$Me-Cp)HfMe$_2$; (Me$_3$Cp-CH$_2$-SiPh$_3$)(3-CH$_2$-SiCy$_2$Me-Cp)HfMe$_2$; (Me$_3$Cp-CH$_2$-SiMe$_2$Cy)(3-CH$_2$-SiCy$_2$Me-Cp)HfMe$_2$; (Me$_3$Cp-CH$_2$-SiMeCy$_2$)(3-CH$_2$-SiCy$_2$Me-Cp)HfMe$_2$;

(Me_3Cp-CH_2-$SiCy_3$)(3-CH_2-$SiCy_2Me$-Cp)$HfMe_2$; (MeEtCp)(3-CH_2-$SiCy_2Me$-Cp)$HfMe_2$; (MePrCp)(3-CH_2-$SiCy_2Me$-Cp)$HfMe_2$; (MeBuCp)(3-CH_2-$SiCy_2Me$-Cp)$HfMe_2$; (BzMeCp)(3-CH_2-$SiCy_2Me$-Cp)$HfMe_2$; (EtPrCp)(3-CH_2-$SiCy_2Me$-Cp)$HfMe_2$; (EtBuCp)(3-CH_2-$SiCy_2Me$-Cp)$HfMe_2$; (BzEtCp)(3-CH_2-$SiCy_2Me$-Cp)$HfMe_2$; (PrBuCp)(3-CH_2-$SiCy_2Me$-Cp)$HfMe_2$; (BzPrCp)(3-CH_2-$SiCy_2Me$-Cp)$HfMe_2$; (BuBzCp)(3-CH_2-$SiCy_2Me$-Cp)$HfMe_2$; (Cp)(3-CH_2-$SiCy_3$-Cp)$HfMe_2$; (MeCp)(3-CH_2-$SiCy_3$-Cp)$HfMe_2$; (EtCp)(3-CH_2-$SiCy_3$-Cp)$HfMe_2$; (PrCp)(3-CH_2-$SiCy_3$-Cp)$HfMe_2$; (BuCp)(3-CH_2-$SiCy_3$-Cp)$HfMe_2$ (BzCp)(3-CH_2-$SiCy_3$-Cp)$HfMe_2$; (3-CH_2-$SiCy_3$-Cp)$_2HfMe_2$; (Me_2Cp)(3-CH_2-$SiCy_3$-Cp)$HfMe_2$; (Me_3Cp)(3-CH_2-$SiCy_3$-Cp)$HfMe_2$; (Me_4Cp)(3-CH_2-$SiCy_3$-Cp)$HfMe_2$; (Me_5Cp)(3-CH_2-$SiCy_3$-Cp)$HfMe_2$; (Et_2Cp)(3-CH_2-$SiCy_3$-Cp)$HfMe_2$; (Et_3Cp)(3-CH_2-$SiCy_3$-Cp)$HfMe_2$; (Et_4Cp)(3-CH_2-$SiCy_3$-Cp)$HfMe_2$; (Et_5Cp)(3-CH_2-$SiCy_3$-Cp)$HfMe_2$; (Pr_2Cp)(3-CH_2-$SiCy_3$-Cp)$HfMe_2$; (Pr_3Cp)(3-CH_2-$SiCy_3$-Cp)$HfMe_2$; (Pr_4Cp)(3-CH_2-$SiCy_3$-Cp)$HfMe_2$; (Pr_5Cp)(3-CH_2-$SiCy_3$-Cp)$HfMe_2$;(Bu_2Cp)(3-CH_2-$SiCy_3$-Cp)$HfMe_2$; (Bu_3Cp)(3-CH_2-$SiCy_3$-Cp)$HfMe_2$; (Bu_4Cp)(3-CH_2-$SiCy_3$-Cp)$HfMe_2$; (Bu_5Cp)(3-CH_2-$SiCy_3$-Cp)$HfMe_2$; (Bz_2Cp)(3-CH_2-$SiCy_3$-Cp)$HfMe_2$; (Bz_3Cp)(3-CH_2-$SiCy_3$-Cp)$HfMe_2$; (Bz_4Cp)(3-CH_2-$SiCy_3$-Cp)$HfMe_2$; (Bz_5Cp)(3-CH_2-$SiCy_3$-Cp)$HfMe_2$; (EtMe_4Cp)(3-CH_2-$SiCy_3$-Cp)$HfMe_2$; (PrMe_4Cp)(3-CH_2-$SiCy_3$-Cp)$HfMe_2$; (BuMe_4Cp)(3-CH_2-$SiCy_3$-Cp)$HfMe_2$; (BzMe_4Cp)(3-CH_2-$SiCy_3$-Cp)$HfMe_2$; (Me_4Cp-CH_2-$SiMe_3$)(3-CH_2-$SiCy_3$-Cp)$HfMe_2$; (Me_4Cp-CH_2-$SiMe_2Ph$)(3-CH_2-$SiCy_3$-Cp)$HfMe_2$; (Me_4Cp-CH_2-$SiMePh_2$)(3-CH_2-$SiCy_3$-Cp)$HfMe_2$; (Me_4Cp-CH_2-$SiPh_3$)(3-CH_2-$SiCy_3$-Cp)$HfMe_2$; (Me_4Cp-CH_2-$SiMe_2Cy$)(3-CH_2-$SiCy_3$-Cp)$HfMe_2$; (Me_4Cp-CH_2-$SiMeCy_2$)(3-CH_2-$SiCy_3$-Cp)$HfMe_2$; (Me_4Cp-CH_2-$SiCy_3$)(3-CH_2-$SiCy_3$-Cp)$HfMe_2$; (EtMe_3Cp)(3-CH_2-$SiCy_3$-Cp)$HfMe_2$; (PrMe_3Cp)(3-CH_2-$SiCy_3$-Cp)$HfMe_2$; (BuMe_3Cp)(3-CH_2-$SiCy_3$-Cp)$HfMe_2$; (BzMe_3Cp)(3-CH_2-$SiCy_3$-Cp)$HfMe_2$; (Me_3Cp-CH_2-$SiMe_3$)(3-CH_2-$SiCy_3$-Cp)$HfMe_2$; (Me_3Cp-CH_2-$SiMe_2Ph$)(3-CH_2-$SiCy_3$-Cp)$HfMe_2$; (Me_3Cp-CH_2-$SiMePh_2$)(3-CH_2-$SiCy_3$-Cp)$HfMe_2$; (Me_3Cp-CH_2-$SiPh_3$)(3-CH_2-$SiCy_3$-Cp)$HfMe_2$; (Me_3Cp-CH_2-$SiMe_2Cy$)(3-CH_2-$SiCy_3$-Cp)$HfMe_2$; (Me_3Cp-CH_2-$SiMeCy_2$)(3-CH_2-$SiCy_3$-Cp)$HfMe_2$; (Me_3Cp-CH_2-$SiCy_3$)(3-CH_2-$SiCy_3$-Cp)$HfMe_2$; (MeEtCp)(3-CH_2-$SiCy_3$-Cp)$HfMe_2$; (MePrCp)(3-CH_2-$SiCy_3$-Cp)$HfMe_2$; (MeBuCp)(3-CH_2-$SiCy_3$-Cp)$HfMe_2$; (BzMeCp)(3-CH_2-$SiCy_3$-Cp)$HfMe_2$; (EtBuCp)(3-CH_2-$SiCy_3$-Cp)$HfMe_2$; (BzEtCp)(3-CH_2-$SiCy_3$-Cp)$HfMe_2$; (PrBuCp)(3-CH_2-$SiCy_3$-Cp)$HfMe_2$; (BzPrCp)(3-CH_2-$SiCy_3$-Cp)$HfMe_2$; (BuBzCp)(3-CH_2-$SiCy_3$-Cp)$HfMe_2$; (2-Me,3-CH_2-$SiMe_3$-Ind)$_2HfMe_2$; (2-Et,3-CH_2-$SiMe_3$-Ind)$_2HfMe_2$; (2-Pr,3-CH_2-$SiMe_3$-Ind)$_2HfMe_2$; (2-Bu,3-CH_2-$SiMe_3$-Ind)$_2HfMe_2$; (2-Ph,3-CH_2-$SiMe_3$-Ind)$_2HfMe_2$; (2-Bz,3-CH_2-$SiMe_3$-Ind)$_2HfMe_2$; (2-Me,3-CH_2-$SiMe_2Ph$-Ind)$_2HfMe_2$; (2-Et,3-CH_2-$SiMe_2Ph$-Ind)$_2HfMe_2$; (2-Pr,3-CH_2-$SiMe_2Ph$-Ind)$_2HfMe_2$; (2-Bu,3-CH_2-$SiMe_2Ph$-Ind)$_2HfMe_2$; (2-Ph,3-CH_2-

$SiMe_2Ph$-Ind)$_2HfMe_2$; (2-Bz,3-CH_2-$SiMe_2Ph$-Ind)$_2HfMe_2$; (2-Me,3-CH_2-$SiMePh_2$-Ind)$_2HfMe_2$; (2-Et,3-CH_2-$SiMePh_2$-Ind)$_2HfMe_2$; (2-Pr,3-CH_2-$SiMePh_2$-Ind)$_2HfMe_2$; (2-Bu,3-CH_2-$SiMePh_2$-Ind)$_2HfMe_2$; (2-Ph,3-CH_2-$SiMePh_2$-Ind)$_2HfMe_2$; (2-Bz,3-CH_2-$SiMePh_2$-Ind)$_2HfMe_2$; (2-Me,3-CH_2-$SiPh_3$-Ind)$_2HfMe_2$; (2-Et,3-CH_2-$SiPh_3$-Ind)$_2HfMe_2$; (2-Pr,3-CH_2-$SiPh_3$-Ind)$_2HfMe_2$; (2-Bu,3-CH_2-$SiPh_3$-Ind)$_2HfMe_2$; (2-Ph,3-CH_2-$SiPh_3$-Ind)$_2HfMe_2$; (2-Bz,3-CH_2-$SiPh_3$-Ind)$_2HfMe_2$; (2-Me,3-CH_2-$SiCyMe_2$-Ind)$_2HfMe_2$; (2-Et,3-CH_2-$SiCyMe_2$-Ind)$_2HfMe_2$; (2-Pr,3-CH_2-$SiCyMe_2$-Ind)$_2HfMe_2$; (2-Bu,3-CH_2-$SiCyMe_2$-Ind)$_2HfMe_2$; (2-Ph,3-CH_2-$SiCyMe_2$-Ind)$_2HfMe_2$; (2-Bz,3-CH_2-$SiCyMe_2$-Ind)$_2HfMe_2$; (2-Me,3-CH_2-$SiCy_2Me$-Ind)$_2HfMe_2$; (2-Et,3-CH_2-$SiCy_2Me$-Ind)$_2HfMe_2$; (2-Pr,3-CH_2-$SiCy_2Me$-Ind)$_2HfMe_2$; (2-Bu,3-CH_2-$SiCy_2Me$-Ind)$_2HfMe_2$; (2-Ph,3-CH_2-$SiCy_2Me$-Ind)$_2HfMe_2$; (2-Bz,3-CH_2-$SiCy_2Me$-Ind)$_2HfMe_2$; (2-Me,3-CH_2-$SiCy_3$-Ind)$_2HfMe_2$; (2-Et,3-CH_2-$SiCy_3$-Ind)$_2HfMe_2$; (2-Pr,3-CH_2-$SiCy_3$-Ind)$_2HfMe_2$; (2-Bu,3-CH_2-$SiCy_3$-Ind)$_2HfMe_2$; (2-Ph,3-CH_2-$SiCy_3$-Ind)$_2HfMe_2$; (2-Bz,3-CH_2-$SiCy_3$-Ind)$_2HfMe_2$; (2-Me,3-CH_2-$SiMe_3$-Ind)(3-CH_2-$SiMe_3$-Cp)$HfMe_2$; (2-Et,3-CH_2-$SiMe_3$-Ind)(3-CH_2-$SiMe_3$-Cp)$HfMe_2$; (2-Pr,3-CH_2-$SiMe_3$-Ind)(3-CH_2-$SiMe_3$-Cp)$HfMe_2$; (2-Bu,3-CH_2-$SiMe_3$-Ind)(3-CH_2-$SiMe_3$-Cp)$HfMe_2$; (2-Pn,3-CH_2-$SiMe_3$-Ind)(3-CH_2-$SiMe_3$-Cp)$HfMe_2$; (2-Hx,3-CH_2-$SiMe_3$-Ind)(3-CH_2-$SiMe_3$-Cp)$HfMe_2$; (2-Ph,3-CH_2-$SiMe_3$-Ind)(3-CH_2-$SiMe_3$-Cp)$HfMe_2$; (2-Me,3-CH_2-$SiMe_2Ph$-Ind)(3-CH_2-$SiMe_3$-Cp)$HfMe_2$; (2-Et,3-CH_2-$SiMe_2Ph$-Ind)(3-CH_2-$SiMe_3$-Cp)$HfMe_2$; (2-Pr,3-CH_2-$SiMe_2Ph$-Ind)(3-CH_2-$SiMe_3$-Cp)$HfMe_2$; (2-Bu,3-CH_2-$SiMe_2Ph$-Ind)(3-CH_2-$SiMe_3$-Cp)$HfMe_2$; (2-Pn,3-CH_2-$SiMe_2Ph$-Ind)(3-CH_2-$SiMe_2Ph$-Cp)$HfMe_2$; (2-Hx,3-CH_2-$SiMe_2Ph$-Ind)(3-CH_2-$SiMe_3$-Cp)$HfMe_2$; (2-Ph,3-CH_2-$SiMe_2Ph$-Ind)(3-CH_2-$SiMe_3$-Cp)$HfMe_2$; (2-Me,3-CH_2-$SiMePh_2$-Ind)(3-CH_2-$SiMe_3$-Cp)$HfMe_2$; (2-Et,3-CH_2-$SiMePh_2$-Ind)(3-CH_2-$SiMe_3$-Cp)$HfMe_2$; (2-Pr,3-CH_2-$SiMePh_2$-Ind)(3-CH_2-$SiMe_3$-Cp)$HfMe_2$; (2-Bu,3-CH_2-$SiMePh_2$-Ind)(3-CH_2-$SiMe_3$-Cp)$HfMe_2$; (2-Pn,3-CH_2-$SiMePh_2$-Ind)(3-CH_2-$SiMe_2Ph$-Cp)$HfMe_2$; (2-Hx,3-CH_2-$SiMePh_2$-Ind)(3-CH_2-$SiMe_3$-Cp)$HfMe_2$; (2-Ph,3-CH_2-Si $MePh_2$-Ind)(3-CH_2-$SiMe_3$-Cp)$HfMe_2$; (2-Me,3-CH_2-$SiPh_3$-Ind)(3-CH_2-$SiMe_3$-Cp)$HfMe_2$; (2-Et,3-CH_2-$SiPh_3$-Ind)(3-CH_2-$SiMe_3$-Cp)$HfMe_2$; (2-Pr,3-CH_2-$SiPh_3$-Ind)(3-CH_2-$SiMe_3$-Cp)$HfMe_2$; (2-Bu,3-CH_2-$SiPh_3$-Ind)(3-CH_2-$SiMe_3$-Cp)$HfMe_2$; (2-Pn,3-CH_2-$SiPh_3$-Ind)(3-CH_2-$SiMe_2Ph$-Cp)$HfMe_2$; (2-Hx,3-CH_2-$SiPh_3$-Ind)(3-CH_2-$SiMe_3$-Cp)$HfMe_2$; (2-Ph,3-CH_2-Si Ph_3-Ind)(3-CH_2-$SiMe_3$-Cp)$HfMe_2$; (2-Me,3-CH_2-$SiCyMe_2$-Ind)(3-CH_2-$SiMe_3$-Cp)$HfMe_2$; (2-Et,3-CH_2-$SiCyMe_2$-Ind)(3-CH_2-$SiMe_3$-Cp)$HfMe_2$; (2-Pr,3-CH_2-$SiCyMe_2$-Ind)(3-CH_2-$SiMe_3$-Cp)$HfMe_2$; (2-Bu,3-CH_2-$SiCyMe_2$-Ind)(3-CH_2-$SiMe_3$-Cp)$HfMe_2$; (2-Pn,3-CH_2-$SiCyMe_2$-Ind)(3-CH_2-$SiMe_2Ph$-Cp)$HfMe_2$; (2-Hx,3-CH_2-$SiCyMe_2$-Ind)(3-CH_2-$SiMe_3$-Cp)$HfMe_2$; (2-Ph,3-CH_2-$SiCyMe_2$-Ind)(3-CH_2-$SiMe_3$-Cp)$HfMe_2$, and the alkyl or halide versions thereof where the Me_2 is replaced with Bz_2, Et_2, Ph_2, Cl_2, Br_2, or I_2.

6. The supported catalyst system of claim 1, wherein the unbridged zirconium metallocene compound is selected from the group consisting of:
rac/meso-bis(1-ethylindenyl)zirconium dichloride, rac/meso-bis(1-ethylindenyl)zirconium dimethyl, rac/meso-bis(1-methylindenyl)zirconium dichloride, rac/meso-bis(1-methylindenyl)zirconium dimethyl, rac/meso-bis(1-propylindenyl)zirconium dichloride, rac/meso-bis(1-propylindenyl)zirconium dimethyl, rac/meso-bis(1-butylindenyl)zirconium dichloride, rac/meso-bis(1-butylindenyl)zirconium dimethyl, meso-bis(1ethylindenyl) zirconium dichloride, meso-bis(1-ethylindenyl) zirconium dimethyl, (1-methylindenyl)(pentamethylcyclopentadienyl) zirconium dichloride, and (1-methylindenyl)(pentamethyl cyclopentadienyl) zirconium dimethyl, and the alkyl or halide versions thereof where the dimethyl is replaced with Bz_2, Et_2, Ph_2, Br_2, or I_2.

7. The supported catalyst system of claim 1, wherein the support material has a surface area from 10 m^2/g to 700 m^2/g and an average particle diameter from 10 μm to 500 μm.

8. The supported catalyst system of claim 1, wherein the support material is selected from the group consisting of silica, alumina, silica-alumina, and combinations thereof.

9. The supported catalyst system of claim 1, wherein the support material is fluorided or sulfated.

10. The supported catalyst system of claim 9, wherein the support material has a fluorine concentration in the range of 0.6 wt% to 3.5 wt%, based upon the weight of the support material.

11. The supported catalyst system of claim 1, wherein the activator comprises alumoxane or a noncoordinating anion.

12. The supported catalyst system of claim 1, wherein the activator is methylalumoxane.

13. The supported catalyst system of claim 1, wherein the support is a silica aluminate and is treated with an electron withdrawing anion such as fluoride or sulphate.

14. The supported catalyst system of claim 1, wherein the electron withdrawing anion treated supported is treated with an alkyl aluminum.

15. The supported catalyst system of claim 1, wherein the electron withdrawing anion treated supported is treated with an alkyl aluminum and is substantially free of methyl alumoxane or a noncoordinating anion.

16. The supported catalyst system of claim 1, wherein the unbridged metallocene compound represented by formula (B) is present in the catalyst system as at least two isomers.

17. The supported catalyst system of claim 1, wherein the activator comprises one or more of: N,N-dimethylanilinium tetrakis(perfluoronaphthyl)borate, N,N-dimethylanilinium tetrakis(perfluorobiphenyl)borate, N,N-dimethylanilinium tetrakis(perfluorophenyl)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 tetrakis(perfluorophenyl)borate, $[Me_3NH^+][B(C_6F_5)^{4-}]$, 1-(4-(tris(pentafluorophenyl)borate)-2,3,5,6-tetrafluorophenyl) pyrrolidinium; $[Me_3NH^+][B(C_6F_5)^{4-}]$, 1-(4-(tris(pentafluorophenyl)borate)-2,3,5,6-tetrafluorophenyl) pyrrolidinium, sodium tetrakis(pentafluorophenyl)borate, potassium tetrakis(pentafluorophenyl)borate, 4-(tris(pentafluorophenyl)borate)-2,3,5,6-tetrafluoropyridinium, solidium tetrakis(perfluorophenyl)aluminate, potassium terakis(pentafluorophenyl), and N,N-dimethylanilinium tetrakis(perfluorophenyl)aluminate.

18. A process for polymerization of olefin monomers comprising contacting one or more olefin monomers with the supported catalyst system of claim 1.

19. The process of claim 18, wherein polymerization of the olefin monomers forms linear low density polyethylene.

20. A process for the production of an ethylene alpha-olefin copolymer comprising: polymerizing ethylene and at least one C_3-C_{20} alpha-olefin by contacting the ethylene and the at least one C_3-C_{20} alpha-olefin with the supported catalyst of claim 1 in at least one gas phase

reactor at a reactor pressure of from 0.7 to 70 bar and a reactor temperature of from 20°C to 150°C to form an ethylene alpha-olefin copolymer.

21. An ethylene alpha-olefin copolymer obtained by contacting ethylene, at least one C_3-C_{20} alpha-olefin, and the supported catalyst of claim 1 in at least one gas-phase reactor, the copolymer having a density of 0.890 g/cc or more, a melt index from 0.1 to 80 g/10 min, and an Mw/Mn value from 1 to 15.

22. The ethylene alpha-olefin copolymer of claim 21, wherein the copolymer has a density from 0.900 to 0.940 g/cc.

23. The ethylene alpha-olefin copolymer of claim 21, wherein the copolymer has an Mz/Mw between 2 and 3.

24. The ethylene alpha-olefin copolymer of claim 21, wherein the copolymer has an Mw value of 50,000 to 250,000 g/mol; an Mw/Mn value of 2.5 to 12.5; a density of from 0.900 to 0.940 g/cc; and an Mz/Mw between 2 and 3.

25. A process for the production of an ethylene alpha-olefin copolymer comprising: polymerizing ethylene and at least one C_3-C_{20} alpha-olefin by contacting the ethylene and the at least one C_3-C_{20} alpha-olefin with the supported catalyst of claim 1 in at least one slurry phase reactor at a reactor pressure of from 0.7 to 70 bar and a reactor temperature of from 60°C to 130°C to form an ethylene alpha-olefin copolymer.

26. An ethylene alpha-olefin copolymer obtained by contacting ethylene, at least one C_3-C_{20} alpha-olefin, and the supported catalyst of claim 1 in at least one slurry phase reactor, the copolymer having a density of 0.890 g/cc or more, a melt flow index from 0.1 g/10 min to 80 g/10 min, and a Mw/Mn from 2.5 to 12.5.

27. An ethylene alpha-olefin copolymer obtained by contacting ethylene, at least one C_3-C_{20} alpha-olefin, and the supported catalyst of claim 1 in at least one gas phase reactor, the copolymer having a density of 0.890 g/cc or more, a melt flow index from 0.1 g/10 min to 80 g/10 min, and a Mw/Mn from 2.5 to 12.5, and a reversed co-monomer index (RCI,m) between 100 and 200 and a co-monomer distribution ratio (CDR-2 m) between 1.5 and 2.5.

28. An ethylene alpha-olefin copolymer obtained by contacting ethylene, at least one C_3-C_{20} alpha-olefin, and the supported catalyst of claim 1 in at least one gas phase reactor, the copolymer having a density of 0.890 g/cc or more, a melt flow index from 0.1 g/10 min to 80 g/10 min, a Mw/Mn of from 2.0 to 5.0, a Mz/Mw between 2 and 3, a RCI,m between 30 and 100, and a CDR-2 m between 1 and 2.