REFERENCES

1. Albizzati, E.; and Galimberti, M. "Catalysts for Olefins Polymerization", *Catalysis Today*, **1998**, *41*, 159-168.
2. Fries, A.; Mise, T.; Matsumoto, A.; Ohmori H.; and Wakatsuki, Y. "Polymerization of 1-Hexene by Homogeneous Zirconocene and Hafnocene Catalysts in Compressed Solution", *Chem. Commun.*, **1996**, 783-784.
3. Britovsek, G. J. P.; Bruce, M.; Gibson, V. C.; Kimberley, B. S.; Maddox, P. J.; Mastroianni, S.; McTavish, S. J.; Redshaw, C.; Solan, G. A.; Stromberg, S.; White, A. J. P.; and Williams, D. J. "Iron and Cobalt Ethylene Polymerization Catalysts Bearing 2,6-Bis(Imino)Pyridyl Ligands: Synthesis, Structures, and Polymerization Studies", *J. Am. Chem. Soc.*, **1999**, *121*, 8728-8740.
4. LePichon, L.; Stephan, D. W.; Gao, X.; and Wang, Q. "Iron Phosphinimide and Phosphinimine Complexes: Catalyst Precursors for Ethylene Polymerization", *Organometallics*, **2002**, *21*, 1362-1366.
5. Krumholz, P. "Studies on the Coordinate Bond VI. The Nature of the Chromophoric Group in Iron(II) Complexes of Tridentate Imine Ligands", *Inorg. Chem.*, **1965**, *4*, 612-616.
6. Curry, J. D.; Robinson, M. A.; and Busch, D. H. "Metal Complexes Derived from Substituted Hydrazones of 2,6-Diacetylpyridine", *Inorg. Chem.*, **1967**, *6*, 1570-1574.
7. Blandamer, M. J.; Burgess, J.; Haines, R. I.; Mekhail, F. M.; and Askalani, P. "Kinetics of Reactions of Schiff-base Complexes of Iron(II). Part 6. The Preparation and Kinetics of Reactions of Complexes of Multidentate Ligands", *J. Chem. Soc., Dalton Trans.*, **1978**, 1001-1008.
8. Stoufer, R. C.; and Busch, D. H. "Complexes of Biacetyldihydrazone and Pyridinaldehydrozones with Iron(II), Cobalt(II) and Nickel(II)", *J. Am. Chem. Soc.*, **1956**, *78*, 6016-6019.

9. Figgins, P. E.; and Busch, D. H. "Complexes of Iron(II), Cobalt(II) and Nickel (II) with Biacetyl-bis-methylimine, 2-Pyridinal-methylimine and 2,6-Pyridindial-bis-methylimine", *J. Am. Chem. Soc.*, **1960**, *82*, 820-824.

10. Lions, L.; and Martin, K. V. "Tridentate Chelate Compounds I", *J. Am. Chem. Soc.*, **1957**, *79*, 2733-2738.

11. Gates, D. P.; Svejda, S. A.; Onate, E.; Johnson, L. K.; White, P. S.; Killian, C. M.; and Brookhart, M. "Synthesis of Branched Polyethylene Using (α-Diimine)nickel(II) Catalysts : Influence of Temperature, Ethylene Pressure and Ligand Structure on Polymer Properties", *Macromolecules*, **2000**, *33*, 2320.

12. Wang, C.; Friedrich, S.; Tounkin, T. R.; Li, R. T.; Grubbs, R.; Bansleben, D. A.; and Day, M. W. "Neutral Nickel(II)-Based Catalysts for Ethylene Polymerization", *Organometallics*, **1998**, *17*, 3149.

13. Small, B. L.; Brookhart, M.; and Bennett, A. M. " Highly Active Iron and Cobalt Catalysts for the Polymerization of Ethylene", *J. Am. Chem. Soc.*, **1998**, *120*, 4049.

14. Scollard, J. D.; and McConville, D. H. "Living Polymerization of α-Olefins by Chelating Diamide Complexes of Titanium", *J. Am. Chem. Soc.*, **1996**, *118*, 10008.

15. Stephan, D. W.; Guerin, F.; Spence, R. E.; Koch, L.; Gao, X.; Brown, S. T.; Swabey, J. W.; Wang, Q.; Xu, W.; Zoricak, P.; and Harrison, D. G. " Remarkably Active Non-metallocene Ethylene Polymerization Catalysts", *Organometallics*, **1999**, *18*, 2046.

16. Gibson, V. C.; Kimberley, B. S.; White, A. J.; Williams, D. J.; and Howard, P. "High Activity Ethylene Polymerization Catalysts Based on Chelating Diamide Ligands", *Chem. Commun.*, **1998**, 313.

17. Tshuva, E. Y.; Goldberg, I.; Kol, M.; Weitman, H.; and Goldschmidt, Z. "Novel Zircomium Complexes of Amine Bis(phenolate) Ligands. Remarkable Reactivity in Polymerization of 1-Hexene due to an Extra Donor Arm", *Chem. Commun.*, **2000**, 379.

18. Schmid, M.; Eberhardt, R.; Klinga, M.; Leskela, M.; and Rieger, B. "New C_{2V}- and Chiral C_2-Symmetric Olefin Polymerization Catalysts Based on Nickel(II) and Palladium(II) Diimine Complexes Bearing 2,6-Diphenyl Aniline Moieties: Synthesis, Structural Cahracterization, and First Insight into Polymerization Properties", *Organometallics*, **2001**, *20*, 2321-2330.

19. Schrock, R. R.; Schattenmann, F.; Aizenberg, M.; and Davis, W. M. "Synthesis of Group 4 Complexes that Contain the Tridentate Diamido Ligands $[(ArNCH_2CH_2)_2O]^{2-}$ (Ar = C_6H_3-Me_2-2,6- or $C_6H_3Pr^i_2$-2,6)", *Chem. Commun.*, **1998**, 199.

20. Aizenberg, M.; Turculet, L.; Davis, W. M.; Schattenmann, F.; and Schrock, R. R. "Synthesis of Group IV Complexes That Contain the Tridentate Diamido/Donor Ligands $[(ArylNCH_2CH_2)_2O]^{2-}$ and Zirconium Complexes That Contain $[(ArylNCH_2CH_2)_2S]^{2-}$ and an Evaluation of Their Activity for the Polymerization of 1-Hexene", *Organometallics*, **1998**, *17*, 4795.

21. Liang, L. C.; Schrock, R. R.; Davis, W. M.; and McConville, D. H. "Synthesis of Group IV Complexes That Contain the Diamidoamine Ligands, $[(2,4,6\text{-}Me_3C_6H_2NCH_2CH_2)_2NR]^{2-}$ ($[Mes_2N_2NR]^{2-}$; R = H or CH_3), and Polymerization of 1-Hexene by Activated $[Mes_2N_2NR]ZrMe_2$ Complexes", *J. Am. Chem. Soc.*, **1999**, *120*, 5797.

22. Schrock, R. R.; Casado, A. L.; Goodman, J. T.; Liang, L. C.; Bonitatebus, P. J.; and Davis, W. M. "Preparation and Activation of Complexes of the Type $[(Mesityl)N(CH_2CH_2)_2NX]ZrMe_2$ (X = H, Me) with $[Ph_3C][B(C_6F_5)_4]$ or $[PhNMe_2H][B(C_6F_5)_4]$", *Organometallics*, **2000**, *10*, 5325.

23. Johnson, L. K.; Killian, C. M.; and Brookhart, M. "New Pd(II)- and Ni(II)-Based Catalysts for Polymerization of Ethylene and alpha-Olefin", *J. Am. Chem. Soc.*, **1995**, *117*, 6414-6415.

24. Johnson, L. K.; Mecking, S.; and Brookhart, M. "Copolymerization of Ethylene and Propylene with Functionalized Vinyl Monomers by Palladium(II) Catalysts", *J. Am. Chem. Soc.*, **1996**, *118*, 267-268.

25. Mecking, S.; Johnson, L. K.; Wang, L.; and Brookhart, M. "Mechanistic Studies of the Palladium-Catalyzed Copolymerization of Ethylene and α-Olefins with Methyl Acrylate", *J. Am. Chem. Soc.*, **1998**, *120*, 888.

26. Britovsek, G. J. P.; Gibson, V. C.; Kimberley, B. S.; Maddox, P. J.; McTavish, S. J.; Solan, G. A.; White, A. J. P.; and Williams, D. J. "Novel Olefin Polymerization Catalysts Based on Iron and Cobalt", *Chem. Commun.*, **1998**, 849-850.

27. Reenen A. J. "Recent Advances in Metallocene Catalyzed Polymerization of Olefin and Other Monomers", Lecture prepared for the 2nd annual UNESCO training school, March 29-31, 1999.

28. Stehling, U. M.; Stein, K. M.; Fiacher, D.; and Waymouth, R. M. "Metallocene/Borate-Catalyzed Copolymerization of 5-N,N-Diisopropyl amino-1-pentene with 1-Hexene or 4-Methyl-1-pentene", *Macromolecules*, **1999**, *32*, 14.

29. Linden, A.; Schaverien, C. J.; Meijboom, N.; Ganter, C.; and Orpen, A. G. "Polymerization of α-Olefins and Butadiene and Catalytic Cyclotrimerization of 1-Alkynes by a New Class of Group IV Catalysts. Control of Molecular Weight and Polymer Microstructure via Ligand Tuning in Sterically Hindered Chelating Phenoxide Titanium and Zirconium Species", *J. Am. Chem. Soc.*, **1995**, *117*, 3008-3021.

30. Britovsek, G. J. P.; Gibson, V. C.; and Wass, D. F. "Example of Highly Active Non-metallocene Olefin Polymerization Catalysts Across the Transition Series", *Angew. Chem. Int. Ed.*, **1999**, *38*, 428-447.

31. Baumann, R.; Davis, W. M.; and Schrock, R. R. "Synthesis of Titanium and Zirconium Complexes That Contain the Tridentate Diamido Ligand, $[((t\text{-Bu-}d_6)\text{N-}o\text{-}C_6H_4)_2O]^{2-}$ ($[NON]^{2-}$) and the Living Polymerization of 1-Hexene by Activated $[NON]ZrMe_2$", *J. Am. Chem. Soc.*, **1997**, *119*, 3830.

32. Janiak, C. Zirconocenes. In Togni, and Halterman (eds.), "Metallocenes: Synthesis and Applications. Vol.2: Applications", New York: Willey-VCH Verlag GmbH, 1998.

33. Burgess, J.; Cotter, W. D.; and Bercaw, J. E. "Ethylene Insertion and Beta-Hydrogen Elimination for Permethylscandocene Alkyl Complexes. A Study of the Chain Propagation and Termination Steps in Ziegler-Natta Polymerization of Ethylene", *J. Am. Chem. Soc.*, **1990**, *112*, 1566.

34. Burgess, J.; and Bercaw, J. E. "Carbon-Carbon Bond Activation via Beta-Alkyl Elimination Reversible Branching of 1,4-Pentandienes Catalyzed by Scandocene Hydride Derivatives", *J. Am. Chem. Soc.*, **1988**, *110*, 976.

35. Coughlin, E. B.; and Bercaw, J. E. "Iso-Specific Ziegler-Natta Polymerization of Alpha-Olefins with a Single-Component Organoyttrium Catalyst", *J. Am. Chem. Soc.*, **1992**, *114*, 7606.

36. Schaeier, T. D.; Labinger, J. A. and Bercaw, J. E. "Model Ziegler-Natta Alpha-Olefin Polymerization Catalysts Derived form [{(.eta. 5-C_5Me_4) $SiMe_2$(.eta. 1-$NCMe_3$)}(PMe_3)Sc(.mu. 2-H)]$_2$ and [{(.eta. 5-C_5Me_4) $SiMe_2$(.eta.1-$NCMe_3$)}Sc(.mu. 2-$CH_2CH_2CH_3$)]$_2$. Synthesis, Structure, and Kinetic and Equilibrium Investigations of the Catalytically Active Species in Solution", *J. Am. Chem. Soc.*, **1994**, *116*, 4623.

37. Xu, G.; and Ruckenstein, "Ethylene Copolymerization with 1-Octene Using A 2-Methylbenz[e]indenyl-Based ansa-Monocyclopentadienylamido Complex and Methylaluminoxanes Catalyst", *Macromolecules*, **1998**, *31*, 4724.

38. Shaffer, T. D.; Canich, J. M. A.; and Squive, K. R. "Metallocene-Catalyzed Copolymerization of Ethylene and Isobutylene to Substantially Alternating Copolymers", *Macromolecules*, **1998**, *31*, 5145.

39. Sita, L. R.; Babcock, J. R. "Rapid Access to Dimethylcyclopentadienyl titanium(IV) Amidinate, (C_5R_5)$TiMe_2$[$NR^1C(R^2)NR^3$] (R = H and Me; R^2 = Me), Libraries", *Organometallics*, **1998**, *17*, 5228.

40. Kumudini, C. J.; and Sita, L. R. "Stereospecific Living Ziegler-Natta Polymerization of 1-Hexene", *J. Am. Chem. Soc.*, **2000**, *122*, 958-959.

41. Deelman, B. J.; Hitchcock, P. B.; Lappert, M. F.; Leung, W. P.; Lee, H. K.; and Mak, T. C. W. "Novel Zirconium and Hafnium Complexes of Monoanionic Di-*N,N*-chelating Pyridyl- and Quinolyl-1-azaallyl Ligands and Their Activity in Olefin Polymerization Catalysis", *Organometallics*, **1999**, *18*, 1444-1452.

42. Jeon, Y. M.; Heo, J. J.; Lee, W. M.; Chang, T.; and Kim, K. "Titanium and Zirconium Complexes with the New Ancillary Diamido Ligand *N,N* - Bis(trimethylsilyl)amidobenzyl-amido($^{2-}$): Syntheses, Structures, and α-Olefin Polymerization Activities", *Organometallics*, **1999**, *18*, 4107-4113.

43. Shiono, T.; Yoshida, K.; and Soga, K. "Syntheses of Terminally Hydroxylated Polyolefins Using $Zn(C_2H_5)_2$ and Oxygen as Chain Transfer and Quenching Reagents", *Synthesis of the Terminally Hydroxylated Polyolefins*, 285-299.

44. Nomura, K.; Komatsu, T.; and Imanishi, Y. "Ligand Effect in Olefin Polymerization Catalyzed by (Cyclopentadienyl)(aryloxy) Titanium (IV) Complexes, $Cp'TiCl_2(OAr)$-MAO System. Ethylene/1-Hexene Polymerization by $(1,3\text{-}^tBu_2C_5H_3)TiCl_2(O\text{-}2,6\text{-}^iPr_2C_6H_3)$-MAO Catalyst System", *J. Mol. Catal. A.*, **2000**, *159*, 127-137.

45. Aizenberg, M.; Turculet, L.; Davis, W. M.; Schattenmann, F.; and Schrock, R. R. "Synthesis of Group 4 Complexes That Contain the Tridentate Diamido/Donor Ligands $[(ArylNCH_2CH_2)_2O]^{2-}$ and Zirconium Complexes That Contain $[(ArylNCH_2CH_2)_2S]^{2-}$ and an Evaluation of Their Activity for the Polymerization of 1-Hexene", *Organometallics*, **1998**, *17*, 4795-4812.

46. Kim, I.; Zhou, J. M.; and Chung, H. "Higher α-Olefin Polymerizations Catalyzed by *rac*-$Me_2Si(1\text{-}C_5H_2\text{-}2\text{-}CH_3\text{-}4\text{-}^tBu)_2Zr(NMe_2)_2$ / $Al(^iBu)_3$ / $[Ph_3C][B(C_6F_5)_4]$", *J. Polym. Sci. Part A*, **2000**, *38*, 1687-1697.

47. Brull, R.; Pasch, H.; Raubenheimer, H. G.; Sanderson, R.; and Wahner, U. M. "Polymerization of Higher Linear α-Olefins with $(CH_3)_2Si$ (2 - methylbenz[e]indenyl)$_2$ $ZrCl_2$", *J. Polym. Sci. Part A*, **2000**, *38*, 2333-2339.

48. Frauenrath, H.; Keul, H.; and Hocker, H. "Coexistence of Two Active Species in the Polymerization of 1-Hexene Catalyzed with Zirconocene/MAO Catalysts", 283-293.

49. Jeon, Y. M.; Park, S. J.; Heo, J. and Kim, K. "Zirconium Complexes with the New Ancillary Diamido Ligand 2,2′-Ethylenebis(*N,N*-(triisopropylsilyl) anilinido)$^{2-}$: Syntheses, Structures and Living α-Olefin Polymerization Activities" *Organometallics*, **1998**, *17*, 3161-3163.

50. Scollard, J. D.; McConville, D. H.; Vittal, J. J.; and Payne, N. C. "Chelating Diamide Complexes of Titanium: New Catalyst Precursors for the Highly Active and Living Polymerization of α-Olefins", *J. Mol. Catal. A.*, **1998**, *128*, 201-214.

51. Nomura, K.; Naga, N.; Miki, M.; and Yanagi, K. "Olefin Polymerization by (Cyclopentadienyl)(aryloxy)titanium(IV) Complexes-Cocatalyst Systems", *Macromolecules*, **1998**, *31*, 7588-7597.

52. Tshuva, E. Y.; Groysman, S.; Goldberg, I.; and Kol, M. "[ONXO]-Type Amine Bis(phenolate) Zirconium and Hafnium Complexes as Extremely Active 1-Hexene Polymerization Catalysts", *Organometallics*, **2002**, *21*, 662-670.

53. Nomura, K.; Komatsu, T.; Nakamura, M.; and Imanishi, Y. "Effect of Cocatalyst in 1-Hexene Polymerization by Cp*$TiMe_2$(O-2,6-$^{i}Pr_2C_6H_3$) Complex", *J. Mol. Catal. A.*, **2000**, *164*, 131-135.

54. Flores, M. A.; Manzoni, M. R.; Baumann, R.; Davis, W. M.; and Schrock, R. R. "Zirconium Complexes That Contain a Diamido O-Donor Ligand with a Restricted Geometry", *Organometallics*, **1999**, *18*, 3220-3227.

55. Warren, T. H.; Schrock R. R.; and Davis, W. M. "Neutral and Cationic Group 4 Complexes Containing Bis(borylamide) Ligands, $[R_2BNCH_2CH_2NBR_2]^{2-}$ (R = 2,4,6-i-$Pr_3C_6H_2$, M = Zr; R = Cyclohexyl, M = Ti, Zr, Hf)", *Organometallics*, **1998**, *17*, 308-321.

56. Tshuva, E. Y.; Goldberg, I.; and Kol, M. "Isospecific Living Polymerization of 1-Hexene by a Readily Available Nonmetallocene C_2-Symmetrical Zirconium Catalyst", *J. Am. Chem. Soc.*, **2000**, *122*, 10706-10707.

57. Baumann, R.; Stumpf, R.; Davis, M.; Liang, L. C.; and Schrock, R. R. "Titanium and Zirconium Complexes that Contain the Tridentate Diamido Ligands $[(i\text{-PrN-}o\text{-}C_6H_4)_2O]^{2-}$ ($[i\text{-PrNON}]^{2-}$) and $[(C_6H_{11}N\text{-}o\text{-}C_6H_4)_2O]^{2-}$ ($[CyNON]^{2-}$)", *J. Am. Chem. Soc.*, **1999**, *121*, 7822-7836.

58. Thomas, D.; and Theopold, K. "Cationic Chromium(III) Alkyls as Olefin Polymerization Catalysts", *J. Am. Chem. Soc.*, **1988**, *110*, 5902.

59. Mashima, K.; and Nakamura, A. "Polymerization of Ethylene Catalyzed by A Tantalum System Ta(.eta.3-C_5Me_5)(.eta.4-diene)$(CH_3)_2$/MAO : An Isoelectronic Analog for Group 4 Metallocene Catalyst (MAO = methylaluminoxane)", *J. Am. Chem. Soc.*, **1993**, *115*, 10990.

60. Sendlinger, S. C.; and Theopold, K. "Paramagnetic Alkyl Chromium Compounds as Homogeneous Catalysts for the Polymerization of Ethylene", *J. Am. Chem. Soc.*, **1991**, *113*, 893.

61. Ballivet, D.; Billard, C.; and Tkatchenko I. "Cationic Metal Nitrosyl Compounds II Catalytic Behaviour of Cationic Complexes of Iron", *J. Organometal. Chem.*, **1977**, *124*, C9-C11.

62. Carbonaro, A.; Cambisi, F. "Oligomerization Catalysts VII. The Role of Diolefin Monocarbonyl Iron(0) Complexes in Butadiene Oligomerization and Polymerization", *J. Organometal. Chem.*, **1972**, *44*, 171-180.

63. Zhang, Z. Y.; Zhang, H. J.; Ma, H. M.; and Wu, Y. "A Novel Iron Catalyst for The Polymerization of Butadiene", *J. Molecular Cat.*, **1982**, *17*, 65-76.

64. Gardner, K. H.; Teasley, M. F.; Coughlin, E. B.; and Brookhart, M. "Addition Polymerization of Cyclopentene with Nickel and Palladium Catalysts", *Macromolecules*, **1998**, *31*, 6705.

65. Souane, R.; Isel, F.; Peruch, F.; and Lutz, P. J. "Pyridine Bis(imine) Cobalt or Iron Complexes for Ethylene and 1-Hexene Copolymerization", *C. R. Chimie,* **2002**, *5*, 43-48.

66. Graf, D. D.; Schrock, R. R.; Davis, W. M.; and Stumpf R. "Synthesis of Zirconium Complexes Containing the Tridentate Diamido Ligands [(t-Bu-d_6-N-o-$C_6H_4)_2S]^{2-}$ and [(i-PrN-o-$C_6H_4)_2S]^{2-}$", *Organometallics*, **1999**, *18*, 843-852.

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