CLAIMS

1. An ethylene homopolymer having:
a melt index greater than or equal to about 50 g/10 min;
a density of less than or equal to about 0.970 g/cm^3;
a Mn in a range from about 5,000 to about 20,000 g/mol; and
a ratio of Mw/Mn of less than or equal to about 4.

2. The homopolymer of claim 1, wherein the ethylene homopolymer has:
a Mn in a range from about 5,000 to about 17,000 g/mol; and
a ratio of Mw/Mn in a range from about 2 to about 3.5.

3. The homopolymer of claim 2, wherein the ethylene homopolymer has:
a MI in a range from about 150 to about 750 g/10 min; and
a density in a range from about 0.960 to about 0.965 g/cm^3.

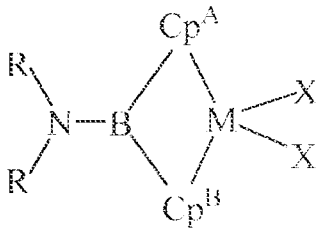
4. The homopolymer of claim 1, wherein the ethylene homopolymer has:
a MI in a range from about 100 to about 1000 g/10 min; and
a density in a range from about 0.960 to about 0.968 g/cm^3.

5. The homopolymer of claim 4, wherein the ethylene homopolymer has:
a Mw in a range from about 18,000 to about 50,000 g/mol; and
a ratio of Mz/Mw in a range from about 1.5 to about 3.

6. The homopolymer of claim 4, wherein the ethylene homopolymer has:
a unimodal molecular weight distribution; and
less than about 0.008 long chain branches per 1000 total carbon atoms.

7. An article comprising the ethylene homopolymer of claim 1.

8. An olefin polymerization process, the process comprising:
contacting a catalyst composition with an olefin monomer and an optional olefin comonomer in a polymerization reactor system under polymerization conditions to produce an olefin polymer, wherein the catalyst composition comprises a metallocene compound, an activator, and an optional co-catalyst,
wherein the metallocene compound has the formula:



(I); wherein:

M is Ti, Zr, or Hf;

each X independently is a monoanionic ligand;

Cp^A is a cyclopentadienyl group with an alkenyl substituent, and Cp^B is an indenyl group; or Cp^A is an indenyl group with an alkenyl substituent, and Cp^B is a cyclopentadienyl group; and

each R independently is H, a C_1 to C_{36} hydrocarbyl group, or a C_1 to C_{36} hydrocarbylsilyl group.

9. The process of claim 8, wherein:

the catalyst composition comprises an organoaluminum co-catalyst; and

the activator comprises a fluorided solid oxide and/or a sulfated solid oxide.

10. The process of claim 8, wherein the activator comprises an aluminoxane compound, an organoboron or organoborate compound, an ionizing ionic compound, or any combination thereof.

11. The process of claim 8, wherein:

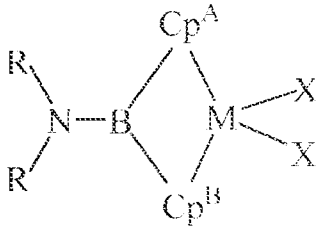
the polymerization reactor system comprises a slurry reactor, gas-phase reactor, solution reactor, or a combination thereof; and

the olefin monomer comprises ethylene, and the olefin comonomer comprises 1-butene, 1-hexene, 1-octene, or a mixture thereof.

12. The process of claim 8, wherein the olefin polymer is an ethylene/α-olefin copolymer characterized by a conventional comonomer distribution or a substantially flat comonomer distribution.

13. The process of claim 8, wherein the ratio of Mw/Mn of the olefin polymer increases as the amount of hydrogen added to the polymerization reactor system increases.

14. A catalyst composition comprising a metallocene compound, an activator, and an optional co-catalyst, wherein the metallocene compound has the formula:



(I); wherein:

M is Ti, Zr, or Hf;

each X independently is a monoanionic ligand;

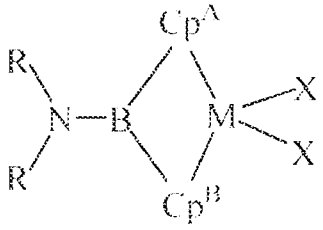
Cp^A is a cyclopentadienyl group with an alkenyl substituent, and Cp^B is an indenyl group; or Cp^A is an indenyl group with an alkenyl substituent, and Cp^B is a cyclopentadienyl group; and

each R independently is H, a C_1 to C_{36} hydrocarbyl group, or a C_1 to C_{36} hydrocarbylsilyl group.

15. The composition of claim 14, wherein the activator comprises an aluminoxane compound, an organoboron or organoborate compound, an ionizing ionic compound, or any combination thereof.

16. The composition of claim 14, wherein the catalyst composition comprises a co-catalyst, and wherein the activator comprises an activator-support, the activator-support comprising a solid oxide treated with an electron-withdrawing anion.

17. A metallocene compound having the formula:



(I); wherein:

M is Ti, Zr, or Hf;

each X independently is a monoanionic ligand;

Cp^A is a cyclopentadienyl group with an alkenyl substituent, and Cp^B is an indenyl group; or Cp^A is an indenyl group with an alkenyl substituent, and Cp^B is a cyclopentadienyl group; and

each R independently is H, a C_1 to C_{36} hydrocarbyl group, or a C_1 to C_{36} hydrocarbylsilyl group.

18. The compound of claim 17, wherein:

M is Zr or Hf;

each X independently is a halide or a C_1 to C_{15} hydrocarbyl group; and

each R independently is H or a C_1 to C_{15} hydrocarbyl group.

19. The compound of claim 17, wherein Cp^A is a cyclopentadienyl group with an alkenyl substituent, and Cp^B is an indenyl group.

20. The compound of claim 17, wherein Cp^A is an indenyl group with an alkenyl substituent, and Cp^B is a cyclopentadienyl group.

Claims

The invention claimed is:

1. An ethylene homopolymer having:

a melt index greater than or equal to about 100 g/10 min;
a density of less than or equal to about 0.970 g/cm^3;
a Mn in a range from about 5,000 to about 20,000 g/mol;
a ratio of Mw/Mn of less than or equal to about 4; and
less than about 0.008 long chain branches per 1000 total carbon atoms.

2. The homopolymer of claim 1, wherein the ethylene homopolymer has:

a Mn in a range from about 5,000 to about 17,000 g/mol; and
a ratio of Mw/Mn in a range from about 2 to about 3.5.

3. The homopolymer of claim 2, wherein the ethylene homopolymer has:
a MI in a range from about 150 to about 750 g/10 min; and
a density in a range from about 0.960 to about 0.965 g/cm^3.

4. The homopolymer of claim 1, wherein the ethylene homopolymer has:
a MI in a range from about 100 to about 1000 g/10 min; and
a density in a range from about 0.960 to about 0.968 g/cm^3.

5. The homopolymer of claim 4, wherein the ethylene homopolymer has:
a Mw in a range from about 18,000 to about 50,000 g/mol; and
a ratio of Mz/Mw in a range from about 1.5 to about 3.

6. The homopolymer of claim 4, wherein the ethylene homopolymer has a unimodal molecular weight distribution.

7. An article comprising the ethylene homopolymer of claim 1.

8. The homopolymer of claim 1, wherein the ethylene homopolymer has:
a MI in a range from about 150 to about 750 g/10 min;
a density in a range from about 0.960 to about 0.968 g/cm^3; and
a ratio of Mw/Mn in a range from about 2.2 to about 3.

9. An article comprising the ethylene homopolymer of claim 8.

10. The homopolymer of claim 8, wherein the ethylene homopolymer has:
a MI in a range from about 250 to about 750 g/10 min;
a density in a range from about 0.960 to about 0.965 g/cm^3; and
a ratio of Mz/Mw in a range from about 1.7 to about 2.8.

11. An article comprising the ethylene homopolymer of claim 3.

12. An article comprising the ethylene homopolymer of claim 4.

13. An ethylene homopolymer having:
a melt index in a range from about 100 to about 1000 g/10 min;
a density in a range from about 0.960 to about 0.970 g/cm^3; and
less than about 0.008 long chain branches per 1000 total carbon atoms.

14. An article comprising the ethylene homopolymer of claim 13.

15. The homopolymer of claim 13, wherein the ethylene homopolymer has:
a MI in a range from about 150 to about 750 g/10 min;
a density in a range from about 0.960 to about 0.968 g/cm^3; and
a ratio of Mw/Mn in a range from about 2 to about 3.5.

16. The homopolymer of claim 13, wherein the ethylene homopolymer has:
a MI in a range from about 250 to about 750 g/10 min; and
a density in a range from about 0.960 to about 0.965 g/cm^3.

17. An article comprising the ethylene homopolymer of claim 16.

18. The homopolymer of claim 16, wherein the ethylene homopolymer has a ratio of Mw/Mn in a range from about 2.2 to about 3.

19. The homopolymer of claim 16, wherein the ethylene homopolymer has a ratio of Mz/Mw in a range from about 1.7 to about 2.8.

20. The homopolymer of claim 16, wherein the ethylene homopolymer has a Mw in a range from about 22,000 to about 35,000 g/mol.