CLAIMS

1. An ethylene polymer comprising a higher molecular weight component and a lower molecular weight component, wherein the ethylene polymer has a density of greater than or equal to about 0.95 g/cm^3, a melt index (MI) of less than or equal to about 1.5 g/10 min, a ratio of high load melt index to melt index (HLMI/MI) in a range from about 40 to about 175, and a slope of a plot of the viscosity (Pa-sec) versus shear rate (sec^{-1}) at 190 °C of the ethylene polymer at 100 sec^{-1} in a range from about 0.42 to about 0.65.

2. The polymer of claim 1, wherein the ethylene polymer has:
a density in a range from about 0.95 to about 0.965 g/cm^3;
a HLMI in a range from about 15 to about 100 g/10 min;
an ESCR (100% igepal) of at 1000 hours; and
an ESCR (10% igepal) of at least 200 hours.

3. The polymer of claim 1, wherein the ethylene polymer has:
a bimodal molecular weight distribution;
less than about 0.008 long chain branches per 1000 total carbon atoms; and
a non-conventional comonomer distribution.

4. The polymer of claim 1, wherein the ethylene polymer has:
a ratio of Mw/Mn in a range from about 6 to about 18;
a ratio of Mz/Mw in a range from about 6 to about 10;
a Mw in a range from about 150,000 to about 375,000 g/mol;
a Mn in a range from about 12,000 to about 35,000 g/mol; or
a Mz in a range from about 1,000,000 to about 3,000,000 g/mol; or
any combination thereof.

5. The polymer of claim 1, wherein the ethylene polymer has:
a melt index in a range from about 0.1 to about 1 g/10 min;
a ratio of HLMI/MI in a range from about 60 to about 160; and
a density in a range from about 0.955 to about 0.965 g/cm^3.

6. The polymer of claim 5, wherein the ethylene polymer is an ethylene/α-olefin copolymer.

7. The polymer of claim 1, wherein the ethylene polymer has:

a CY-a parameter at 190 °C in a range from about 0.02 to about 0.3; and

the slope of the plot of the viscosity (Pa-sec) versus shear rate (sec^{-1}) at 190 °C of the ethylene polymer at 100 sec^{-1} in a range from about 0.44 to about 0.5.

8. The polymer of claim 1, wherein the ethylene polymer is produced by a process comprising melt processing a mixture of a base resin and a peroxide compound in a twin screw extrusion system at a temperature in a range from about 120 to about 300 °C to generate peroxide groups at about 10-400 ppm of peroxide groups based on the weight of the base resin.

9. The polymer of claim 1, wherein the ethylene polymer is an ethylene/1-butene copolymer, an ethylene/1-hexene copolymer, or an ethylene/1-octene copolymer.

10. An article comprising the ethylene polymer of claim 1.

11. A blow molded article comprising the ethylene polymer of claim 1.

12. An ethylene polymer comprising a higher molecular weight component and a lower molecular weight component, wherein the ethylene polymer has a density of greater than or equal to about 0.95 g/cm^3, a melt index (MI) of less than or equal to about 1.5 g/10 min, a ratio of high load melt index to melt index (HLMI/MI) in a range from about 40 to about 175, a peak molecular weight (Mp) of the higher molecular weight component in a range from about 650,000 to about 1,100,000 g/mol, a Mp of the lower molecular weight component in a range from about 40,000 to about 80,000 g/mol, and a ratio of Mw/Mn in a range from about 5 to about 18.

13. The polymer of claim 12, wherein the lower molecular weight component has:

a ratio of Mz/Mw in a range from about 1.5 to about 2.8;

a Mp in a range from about 45,000 to about 75,000 g/mol;

a Mw in a range from about 50,000 to about 80,000 g/mol; and

a Mn in a range from about 10,000 to about 30,000 g/mol.

14. The polymer of claim 12, wherein the higher molecular weight component has:

a ratio of Mz/Mw in a range from about 1.5 to about 2.5;

a Mp in a range from about 700,000 to about 1,100,000 g/mol;

a Mw in a range from about 825,000 to about 1,500,000 g/mol; and

a Mn in a range from about 175,000 to about 700,000 g/mol.

15. The polymer of claim 12, wherein the ethylene polymer has:
a density in a range from about 0.95 to about 0.965 g/cm^3;
a HLMI in a range from about 15 to about 100 g/10 min;
an ESCR (100% igepal) of at 1000 hours; and
an ESCR (10% igepal) of at least 200 hours.

16. The polymer of claim 15, wherein the ethylene polymer has:
a ratio of Mw/Mn in a range from about 6 to about 16; and
less than or equal to about 22 wt. % of the higher molecular weight component.

17. The polymer of claim 16, wherein the ethylene polymer has:
a melt index in a range from about 0.2 to about 0.9;
less than about 0.008 long chain branches per 1000 total carbon atoms; and
a non-conventional comonomer distribution.

18. The polymer of claim 12, wherein the ethylene polymer is an ethylene/1-butene copolymer, an ethylene/1-hexene copolymer, or an ethylene/1-octene copolymer.

19. An article comprising the ethylene polymer of claim 12.

20. A blow molded article comprising the ethylene polymer of claim 12.

CLAIMS

We claim:

1. An ethylene polymer comprising a higher molecular weight component and a lower molecular weight component, wherein the ethylene polymer has a density of greater than or equal to about 0.95 g/cm^3, a melt index (MI) in a range from about 0.05 to about 1.5 g/10 min, a ratio of high load melt index to melt index (HLMI/MI) in a range from about 40 to about 175, a bimodal molecular weight distribution, less than about 0.008 long chain branches per 1000 total carbon atoms, a non-conventional comonomer distribution, and a slope of a plot of the viscosity (Pa-sec) versus shear rate (sec^{-1}) at 190° C. of the ethylene polymer at 100 sec^{-1} in a range from about 0.42 to about 0.65.

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

a density in a range from about 0.95 to about 0.965 g/cm^3;

a HLMI in a range from about 15 to about 100 g/10 min;

an ESCR (100% igepal) of at least 1000 hours; and

an ESCR (10% igepal) of at least 200 hours.

3. The polymer of claim 1, wherein the ethylene polymer has:

a ratio of Mw/Mn in a range from about 6 to about 18;

a ratio of Mz/Mw in a range from about 6 to about 10;

a Mw in a range from about 150,000 to about 375,000 g/mol;

a Mn in a range from about 12,000 to about 35,000 g/mol; or

a Mz in a range from about 1,000,000 to about 3,000,000 g/mol; or any combination thereof.

4. The polymer of claim 1, wherein the ethylene polymer has:

a melt index in a range from about 0.1 to about 1 g/10 min;

a ratio of HLMI/MI in a range from about 60 to about 160; and

a density in a range from about 0.955 to about 0.965 g/cm^3.

5. The polymer of claim 4, wherein the ethylene polymer is an ethylene/α-olefin copolymer.

6. The polymer of claim 1, wherein the ethylene polymer has:

a CY-a parameter at 190° C. in a range from about 0.02 to about 0.3; and

the slope of the plot of the viscosity (Pa-sec) versus shear rate (sec^{-1}) at 190° C. of the ethylene polymer at 100 sec^{-1} in a range from about 0.44 to about 0.5.

7. The polymer of claim 1, wherein the ethylene polymer is produced by a process comprising melt processing a mixture of a base resin and a peroxide compound in a twin screw extrusion system at a temperature in a range from about 120 to about 300° C. to generate peroxide groups at about 10-400 ppm of peroxide groups based on the weight of the base resin.

8. The polymer of claim 1, wherein the ethylene polymer is an ethylene/1-butene copolymer, an ethylene/1-hexene copolymer, or an ethylene/1-octene copolymer.

9. An article comprising the ethylene polymer of claim 1.

10. A blow molded article comprising the ethylene polymer of claim 1.

11. An ethylene polymer comprising a higher molecular weight component and a lower molecular weight component, wherein the ethylene polymer has a density of greater than or equal to about 0.95 g/cm^3, a melt index (MI) in a range from about 0.05 to about 1.5 g/10 min, a ratio of high load melt index to melt index (HLMI/MI) in a range from about 40 to about 175, a peak molecular weight (Mp) of the higher molecular weight component in a range from about 650,000 to about 1,100,000 g/mol, a Mp of the lower molecular weight component in a range from about 40,000 to about 80,000 g/mol, less than about 0.008 long chain branches per 1000 total carbon atoms, a non-conventional comonomer distribution, and a ratio of Mw/Mn in a range from about 5 to about 18.

12. The polymer of claim 11, wherein the lower molecular weight component has:

a ratio of Mz/Mw in a range from about 1.5 to about 2.8;

a Mp in a range from about 45,000 to about 75,000 g/mol;

a Mw in a range from about 50,000 to about 80,000 g/mol; and

a Mn in a range from about 10,000 to about 30,000 g/mol.

13. The polymer of claim 11, wherein the higher molecular weight component has:

a ratio of Mz/Mw in a range from about 1.5 to about 2.5;

a Mp in a range from about 700,000 to about 1,100,000 g/mol;

a Mw in a range from about 825,000 to about 1,500,000 g/mol; and

a Mn in a range from about 175,000 to about 700,000 g/mol.

14. The polymer of claim 11, wherein the ethylene polymer has:

a density in a range from about 0.95 to about 0.965 g/cm^3;

a HLMI in a range from about 15 to about 100 g/10 min;

an ESCR (100% igepal) of at least 1000 hours; and

an ESCR (10% igepal) of at least 200 hours.

15. The polymer of claim 14, wherein the ethylene polymer has:

a ratio of Mw/Mn in a range from about 6 to about 16; and

less than or equal to about 22 wt % of the higher molecular weight component.

16. The polymer of claim 15, wherein the ethylene polymer has:

a melt index in a range from about 0.2 to about 0.9.

17. The polymer of claim 11, wherein the ethylene polymer is an ethylene/1-butene copolymer, an ethylene/1-hexene copolymer, or an ethylene/1-octene copolymer.

18. An article comprising the ethylene polymer of claim 11.

19. A blow molded article comprising the ethylene polymer of claim 11.

20. An ethylene polymer comprising a higher molecular weight component and a lower molecular weight component, wherein the ethylene polymer has a density of greater than or equal to about 0.95 g/cm^3, a melt index (MI) in a range from about 0.05 to about 1.5 g/10 min, a ratio of high load melt index to melt index (HLMI/MI) in a range from about 40 to about 175, and a slope of a plot of the viscosity (Pa-sec) versus shear rate (sec^{-1}) at 190° C. of the ethylene polymer at 100 sec^{-1} in a range from about 0.42 to about 0.65, and wherein the lower molecular weight component has a ratio of Mz/Mw in a range from about 1.5 to about 2.8.

21. The polymer of claim 20, wherein the ethylene polymer has:

a density in a range from about 0.95 to about 0.965 g/cm^3;

an ESCR (100% igepal) of at least 1000 hours; and

an ESCR (10% igepal) of at least 200 hours.

22. The polymer of claim 21, wherein the ethylene polymer is an ethylene/1-butene copolymer, an ethylene/1-hexene copolymer, or an ethylene/1-octene copolymer.

23. A blow molded article comprising the ethylene polymer of claim 22.

24. An ethylene polymer comprising a higher molecular weight component and a lower molecular weight component, wherein the ethylene polymer has a density of greater than or equal to about 0.95 g/cm^3, a melt index (MI) in a range from about 0.05 to about 1.5 g/10 min, a ratio of high load melt index to melt index (HLMI/MI) in a range from about 40 to about 175, a peak molecular weight (Mp) of the higher molecular weight component in a range from about 650,000 to about 1,100,000 g/mol, a Mp of the lower molecular weight component in a range from about 40,000 to about 80,000 g/mol, a ratio of Mz/Mw of the

lower molecular weight component in a range from about 1.5 to about 2.8, and a ratio of Mw/Mn in a range from about 5 to about 18.

25. The polymer of claim 24, wherein the ethylene polymer has:

a density in a range from about 0.95 to about 0.965 g/cm^3;

an ESCR (100% igepal) of at least 1000 hours; and

an ESCR (10% igepal) of at least 200 hours.

26. The polymer of claim 25, wherein the ethylene polymer is an ethylene/1-butene copolymer, an ethylene/1-hexene copolymer, or an ethylene/1-octene copolymer.

27. A blow molded article comprising the ethylene polymer of claim 26.