CLAIMS

What is claimed is:

1. A polymer having a density of from about 0.960 g/cc to about 0.965 g/cc and a melt index of from about 0.2 g/10 min. to about 0.6 g/10 min., wherein an article formed from the polymer has an environmental stress crack resistance of equal to or greater than about 150 hours when measured in accordance with ASTM D 1693 condition B, 100% Igepal.
2. The polymer of claim 1 having an eta100 (η_{100}) of less than about 1350 and a slope of the curve of a plot of the log of the complex modulus as a function of the log of shear rate at 100 shear rate (N_{100}) of greater than about 0.35.
3. The polymer of claim 1 having a predicted die swell of from about 25% to about 35%.
4. The polymer of claim 1 having a z-average molecular weight (M_z) of greater than about 800 kg/mol and a ratio of z-average molecular weight to weight average molecular weight (M_z/M_w) of greater than about 5.
5. The polymer of claim 1, wherein the polymer comprises a copolymer of ethylene and a comonomer comprising 1-hexene, 1-heptene, 1-octene, 1-nonene, 1-decene, or combinations thereof.
6. A polymer having a density of from about 0.955 g/cc to about 0.960 g/cc and a melt index of from about 0.2 g/10 min. to about 0.6 g/10 min., wherein an article formed from the polymer has an environmental stress crack resistance of equal to or greater than about 500 hours when measured in accordance with ASTM D 1693 condition B, 100% Igepal.
7. The polymer of claim 6 having an η_{100} of less than about 1350 and an N_{100} of greater than about 0.35.
8. The polymer of claim 6 having a predicted die swell of from about 25% to about 35%.
9. The polymer of claim 6 having a M_z of greater than 800 kg/mol and a M_z/M_w of greater than about 5.
10. A polymer having a density of from about 0.950 g/cc to about 0.955 g/cc and a melt index of from about 0.2 g/10 min. to about 0.6 g/10 min., wherein an article formed from the polymer has an environmental stress crack resistance of equal to or greater than about 2000 hours when measured in accordance with ASTM D 1693 condition B, 100% Igepal.

11. The polymer of claim 10 having an η_{100} of less than about 1350 and an N_{100} of greater than about 0.35.
12. The polymer of claim 10 having a predicted die swell of from about 25% to about 35%.
13. The polymer of claim 10 having a M_z of greater than 800 kg/mol and a M_z/M_w of greater than about 5.
14. A polymer having a density of from about 0.950 g/cc to about 0.965 g/cc and a melt index of from about 0.2 g/10 min. to about 0.6 g/10 min., wherein an article formed from the polymer has an environmental stress crack resistance (Y) wherein $Y \geq -75{,}078{,}088{,}945x^4 + 287{,}612{,}937{,}602x^3 - 413{,}152{,}026{,}579x^2 + 263{,}756{,}655{,}421x - 63{,}139{,}684{,}577$ and wherein x is the density of the polymer.
15. The polymer of claim 14 having an η_{100} of less than about 1350 and an N_{100} of greater than about 0.35.
16. The polymer of claim 14 having a predicted die swell of from about 25% to about 35%.
17. The polymer of claim 14 having a M_z of greater than 800 kg/mol and a M_z/M_w of greater than about 5.
18. A polymer having at least one lower molecular weight component and at least one higher molecular weight component and comprising a copolymer of ethylene and a comonomer comprising 1-hexene, 1-heptene, 1-octene, 1-nonene, 1-decene, or combinations thereof; wherein the polymer comprises equal to or less than about 0.5 mol.% comonomer; a lower molecular weight component present in an amount of greater than about 60 wt.% and less than about 100 wt.%; a weight average molecular weight (M_w) of the lower molecular weight component ranging from about 50 kg/mol to about 120 kg/mol and a M_w of the higher molecular weight component ranging from about 800 kg/mol to about 2000 kg/mol; a polydispersity index of the higher molecular weight component of from about 2 to about 4; a ratio of short chain branching at a molecular weight (MW) of 1×10^6 to SCB at the peak MW for the polymer of greater than about 3; and wherein the average short chain branching content of each 10 wt.% fraction of polymer increases with molecular weight (MW) increase in a range of MW of greater than about 100 kg/mol.
19. The polymer of claim 18, wherein an article formed from the polymer has an ESCR of greater than about 2000 hours.
20. The polymer of claim 18 having less than about 0.3 mol.% comonomer, wherein an article formed from the polymer has an ESCR of greater than about 500 hours.

21. The polymer of claim 18 having less than about 0.2 mol.% comonomer, wherein an article formed from the polymer has an ESCR of greater than about 150 hours.

22. The polymer of claim 18 having an η_{100} of less than about 1350 and an N_{100} of greater than about 0.35.

23. The polymer of claim 18 having a predicted die swell of from about 25% to about 35%.

24. The polymer of claim 18 having a M_z of greater than 800 kg/mol and a M_z/M_w of greater than about 5.

Claims

1. A polymer having a density of from about 0.960 g/cc to about 0.965 g/cc, a melt index of from about 0.2 g/10 min. to about 0.6 g/10 min., and a high load melt index from greater than about 40 dg/min to about 500 dg/min., wherein an article formed from the polymer has an environmental stress crack resistance of equal to or greater than about 150 hours when measured in accordance with ASTM D 1693 condition B, 100% Igepal.

2. The polymer of claim 1 having an eta100 (η_{100}) of less than about 1350 and a slope of the curve of a plot of the log of the complex modulus as a function of the log of shear rate at 100 shear rate (N_{100}) of greater than about 0.35.

3. The polymer of claim 1 having a predicted die swell of from about 25% to about 35%.

4. The polymer of claim 1 having a z-average molecular weight (M_z) of greater than about 800 kg/mol and a ratio of z-average molecular weight to weight average molecular weight (M_z/M_w) of greater than about 5.

5. The polymer of claim 1, wherein the polymer comprises a copolymer of ethylene and a comonomer comprising 1-hexene, 1-heptene, 1-octene, 1-nonene, 1-decene, or combinations thereof.

6. A polymer having a density of from about 0.955 g/cc to about 0.960 g/cc, a melt index of from about 0.2 g/10 min. to about 0.6 g/10 min., and a high load melt index from greater than about 40 dg/min to about 500 dg/min., wherein an article formed from the polymer has an environmental stress crack resistance of equal to or greater than about 500 hours when measured in accordance with ASTM D 1693 condition B, 100% Igepal.

7. The polymer of claim 6 having an η_{100} of less than about 1350 and an N_{100} of greater than about 0.35.

8. The polymer of claim 6 having a predicted die swell of from about 25% to about 35%.

9. The polymer of claim 6 having a M_z of greater than 800 kg/mol and a M_z/M_w of greater than about 5.

10. A polymer having a density of from about 0.950 g/cc to about 0.955 g/cc, a melt index of from about 0.2 g/10 min. to about 0.6 g/10 min., and a high load melt index from greater than about 40 dg/min to about 500 d min., wherein an article formed from the polymer has an environmental stress crack resistance of equal to or greater than about 2000 hours when measured in accordance with ASTM D 1693 condition B, 100% Igepal.

11. The polymer of claim 10 having an η_{100} of less than about 1350 and an N_{100} of greater than about 0.35.

12. The polymer of claim 10 having a predicted die swell of from about 25% to about 35%.

13. The polymer of claim 10 having a M_z of greater than 800 kg/mol and a M_z/M_w of greater than about 5.

14. A polymer having a density of from about 0.950 g/cc to about 0.965 g/cc, a melt index of from about 0.2 g/10 min. to about 0.6 g/10 min., and a high load melt index from greater than about 40 dg/min to about 500 dg/min., wherein an article formed from the polymer has an environmental stress crack resistance (Y) wherein $Y \geqq -75{,}078{,}088{,}945x^4+287{,}612{,}937{,}602x^3-413{,}152{,}026{,}579x^2+263{,}756{,}655{,}421x-63{,}139{,}684{,}577$ and wherein x is the density of the polymer.

15. The polymer of claim 14 having an η_{100} of less than about 1350 and an N_{100} of greater than about 0.35.

16. The polymer of claim 14 having a predicted die swell of from about 25% to about 35%.

17. The polymer of claim 14 having a M_z of greater than 800 kg/mol and a M_z/M_w of greater than about 5.

18. The polymer of claim 1 having a lower molecular weight (LMW) component and a higher molecular weight (HMW) component.

19. The polymer of claim 6 having a lower molecular weight (LMW) component and a higher molecular weight (HMW) component.

20. The polymer of claim 1 having a CY-a value of less than about 0.3.

21. The polymer of claim 6 having a CY-a value of less than about 0.3.

22. The polymer of claim 1 having a ratio of short chain branching at a molecular weight of 10^6 to short chain branching in the main body of the LMW component of greater than about 3.

23. The polymer of claim 6 having a ratio of short chain branching at a molecular weight of 10^6 to short chain branching in the main body of the LMW component of greater than about 3.

24. The polymer of claim 1 having an average short chain branching content of each 10 wt. % fraction of polymer increase with a molecular weight (MW) increase in a range of MW of greater than about 100 kg/mol.