Claims

1. A multi-block copolymer comprising in polymerized form ethylene and one or more copolymerizable comonomers, said block copolymer having both a polydisperse block distribution and a polydisperse distribution of block sizes.

2. A multi-block copolymer according to claim 1, said copolymer containing therein two or more segments or blocks differing in comonomer content, crystallinity, density, melting point or glass transition temperature.

3. A multi-block copolymer according to claim 1 or 2, wherein the copolymerizable comonomers comprise at least one C_3-C_{20}, preferably C_3-C_8, α-olefin comonomer.

4. A multi-block copolymer according to any one of the preceding claims, having at least one melting point T_m in degrees Celcius and density, d*, in grams/cubic centimetre, wherein the numerical values of the variables correspond to the relationship:

$T_m > -2002.9 + 4538.5(d^*) - 2422.2(d^*)^2$, and wherein the interpolymer has a M_w/M_n from 1.7 to 3.5.

5. A multi-block copolymer according to any one of the preceding claims, having a tensile strength above 10 MPa and an elongation at break of at least 600 percent at a crosshead separation rate of 11 cm/minute.

6. A multi-block copolymer according to any one of the preceding claims, having a storage modulus ratio, G'(25°C)/G'(100°C) of from 1 to 50 and a 70 °C compression set of less than 80 percent.

7. A multi-block copolymer according to any one of the preceding claims, having a heat of fusion of less than 85 J/g and a pellet blocking strength of equal to or less than 100 lbs/ft2 (4800 Pa).

8. A multi-block copolymer according to any one of the preceding claims, being uncrosslinked, elastomeric, and comprising in polymerized form at least

50 mole percent ethylene, having a 70 C compression set of less than 80 percent.

9. A multi-block copolymer according to any one of the preceding claims, containing a single crystalline melting point (Tm) as measured by DSC.

10. A multi-block copolymer according to any one of the preceding claims, having a thermomechanical analysis penetration depth of 1 mm at a temperature of at least 90 C, and a flexural modulus of from 3 kpsi (20 MPa) to 13 kpsi (90 MPa).

11. A multi-block copolymer according to any one of the preceding claims, having an abrasion resistance volume loss according to ISO 4649 of less than 90 min 3.

12. A multi-block copolymer according to claim 10, having a storage modulus, G', such that log (G') is greater than or equal to 0.4 MPa, at a temperature of 100 C.

13. An olefin interpolymer having a Mw/Mn from 1.7 to 3.5, a delta quantity (tallest DSC peak minus tallest CRYSTAF peak) greater than the quantity, y*, defined by the equation:

$$y^* > -0.1299(\Delta H) + 62.81,$$

and a heat of fusion up to 130 J/g,

wherein the CRYSTAF peak is determined using at least 5 percent of the cumulative polymer, and if less than 5 percent of the polymer has an identifiable CRYSTAF peak, then the CRYSTAF temperature is 30 °C, and ΔH is the numerical value of the heat of fusion in J/g.

14. An olefin interpolymer having a delta quantity (tallest DSC peak (measured from the baseline) minus tallest CRYSTAF peak) greater than 48 °C and a heat of fusion greater than or equal to 130 J/g, wherein the CRYSTAF peak is determined using at least 5 percent of the cumulative polymer, and if less than 5 percent of the polymer has an identifiable CRYSTAF peak, then the CRYSTAF temperature is 30 °C.

15. A crosslinked derivative of a polymer according to any one of the preceding claims.

16. A composition comprising a polymer according to any one of the preceding claims in the form of a film, at least one layer of a multilayer film, at least one layer of a laminated article, a foamed article, a fiber, a nonwoven fabric, an injection molded article, a blow molded article, a roto-molded article, or an adhesive.

Claims

1. An ethylene/α-olefin multi-block interpolymer comprising in polymerized form at least 50 mole percent ethylene and one or more copolymerizable α-olefin comonomers, said interpolymer containing therein two or more blocks differing in comonomer content, crystallinity, density, melting point or glass transition temperature;

the interpolymer comprising from 3.7 ppm to 11.0 ppm of a first Group IVB metal and a second Group IVB metal.

2. The multi-block interpolymer of claim 1 wherein the first Group IVB metal is hafnium and the second Group IVB metal is zirconium.

3. An ethylene/α-olefin multi-block interpolymer comprising in polymerized form at least 50 mole percent ethylene and having a single melting point and the interpolymer comprising:

at least three metals.

4. The ethylene/α-olefin block interpolymer of claim 3 having a Mw/Mn from 1.7 to 3.5, at least one melting point, T_m, in degrees Celsius and density, d*, in grams/cubic centimeter, wherein the numerical values of the variables correspond to the relationship:

$T_m > -2002.9+4538.5(d^*)-2422.2(d^*)^2$.

5. The ethylene/α-olefin block interpolymer of claim 4 comprising ethylene in polymerized form and one or more copolymerizable comonomers, said interpolymer containing therein two or more blocks differing in comonomer content, crystallinity, density, melting point or glass transition temperature.

6. The ethylene/α-olefin block interpolymer of claim 3 comprising a first Group IVB metal; and a second Group IVB metal.

7. The ethylene/α-olefin block interpolymer of claim 3 comprising hafnium.

8. The ethylene/α-olefin block interpolymer of claim 3 comprising zinc.