[0005] The present disclosure is directed to polyethylene compositions that may exhibit desirable stiffness without inhibiting performance properties, such as ESCR. As such, the present disclosure may provide a polyethylene composition that, when utilized in the production of polymeric articles, may allow for reduced material costs resulting from said balance of stiffness and ESCR properties.

[0006] According to one or more examples, a polyethylene composition is provided. The polyethylene compositions may include a first polyethylene fraction area defined by an area in the elution profile in a temperature range of 70°C to 97°C via improved comonomer composition distribution (iCCD) analysis method; a first peak in the temperature range of 70°C to 97°C in the elution profile; a second polyethylene fraction area defined by an area in the elution profile in a temperature range of 97°C to 110°C; and a second peak in the temperature range of 97°C to 110°C. The polyethylene composition may have a density of 0.935 g/cm^3 to 0.955 g/cm^3 and a melt index (I_2) of 1.0 g/10 minutes to 10.0 g/10 minutes. A ratio of the first polyethylene fraction area to the second polyethylene fraction area may be less than 2.0.

[0006a] According to one aspect, there is provided a polyethylene composition comprising: a first polyethylene fraction area defined by an area in the elution profile via improved comonomer composition distribution (iCCD) analysis method in a temperature range of 70°C to 97°C; a first peak in the temperature range of 70°C to 97°C in the elution profile; a second polyethylene fraction area defined by an area in the elution profile in a temperature range of 97°C to 110°C; and a second peak in the temperature range of 97°C to 110°C in the elution profile; and wherein the polyethylene composition has a density of 0.935 g/cm^3 to 0.955 g/cm^3, a melt index (I_2) of 1.0 g/10 minutes to 10.0 g/10 minutes, and wherein a ratio of the first polyethylene fraction area to the second polyethylene fraction area is less than 2.0.

[0007] According to one or more examples, a polyethylene composition is provided. The polyethylene compositions may include a first polyethylene fraction in a temperature range of 70°C to 97°C in an elution profile via improved comonomer composition distribution (iCCD) analysis method, the first polyethylene fraction comprising a first peak, and wherein the first polyethylene fraction has a first fraction molecular weight ($Mw_{(iCCD,\ 70°C–97°C)}$); and a second polyethylene fraction in a temperature range of 97°C to 110°C in the elution profile, the second polyethylene fraction comprising a second peak. The polyethylene composition may have an overall molecular weight ($Mw_{(iCCD)}$), a density of 0.935 g/cm^3 to 0.955 g/cm^3, a melt index (I_2) of 1.0 g/10 minutes to 10.0 g/10 minutes. A ratio of the overall molecular weight ($Mw_{(iCCD)}$) to the first fraction molecular weight ($Mw_{(iCCD,\ 70°C–97°C)}$) may be less than 0.9.

[0007a] According to another aspect, there is provided a polyethylene composition comprising: a first polyethylene fraction in a temperature range of 70°C to 97°C in an elution profile via improved comonomer composition distribution (iCCD) analysis method, the first polyethylene fraction comprising a first peak, and wherein the first polyethylene fraction has a first fraction molecular weight determined by iCCD ($Mw_{(iCCD,\ 70°C–97°C)}$); and a second polyethylene fraction in a temperature range of 97°C to 110°C in the elution profile, the second polyethylene fraction comprising a second peak; wherein the polyethylene composition has an overall molecular weight determined by iCCD ($Mw_{(iCCD)}$), a density of 0.935 g/cm^3 to 0.955 g/cm^3, a melt index (I_2) of 1.0 g/10 minutes to 10.0 g/10 minutes; and wherein and a ratio of the overall molecular weight ($Mw_{(iCCD)}$) to the first fraction molecular weight ($Mw_{(iCCD,\ 70°C–97°C)}$) is less than 0.9.

[0008] According to one or more examples, an article is provided. The article may be a rotomolded or injection-molded article. The article may include the above polyethylene composition.

[0008a] According to another aspect, there is provided a method of producing a rotomolded article comprising the polyethylene composition as defined herein.

[0009] These and other examples are described in more detail in the following Detailed Description in conjunction with the appended drawings.

BRIEF DESCRIPTION OF THE DRAWINGS

[0010] The following detailed description of specific embodiments of the present disclosure can be best understood when read in conjunction with the following drawings, where like structure is indicated with like reference numerals and in which:

[0011] FIG. 1 graphically depicts the elution profile of Polyethylene Composition 1, according to one or more embodiments presently described.

DETAILED DESCRIPTION

[0012] Specific embodiments of the present application will now be described. These embodiments are provided so that this disclosure will be thorough and complete and will fully convey the scope of the claimed subject matter to those skilled in the art.

[0013] The term “polymer” refers to a polymeric compound prepared by polymerizing monomers, whether of a same or a different type. The generic term polymer thus embraces the term “homopolymer,” which usually refers to a polymer prepared from only one type of monomer as well as “copolymer,” which refers to a polymer prepared from two or more different monomers. The term “interpolymer,” as used herein, refers to a polymer prepared by the polymerization of at least two different types of monomers. The generic term interpolymer thus includes a copolymer or polymer prepared from more than two different types of monomers, such as terpolymers.

[0014] “Polyethylene” or “ethylene-based polymer” shall mean polymers comprising greater than 50% by mole of units derived from ethylene monomer. This includes ethylene-

CLAIMS

1. A polyethylene composition comprising:

a first polyethylene fraction area defined by an area in the elution profile via improved comonomer composition distribution (iCCD) analysis method in a temperature range of 70°C to 97°C;

a first peak in the temperature range of 70°C to 97°C in the elution profile;

a second polyethylene fraction area defined by an area in the elution profile in a temperature range of 97°C to 110°C; and

a second peak in the temperature range of 97°C to 110°C in the elution profile; and

wherein the polyethylene composition has a density of 0.935 g/cm^3 to 0.955 g/cm^3, a melt index (I_2) of 1.0 g/10 minutes to 10.0 g/10 minutes, and wherein a ratio of the first polyethylene fraction area to the second polyethylene fraction area is less than 2.0.

2. The polyethylene composition of claim 1, wherein the polyethylene composition has a molecular weight distribution, expressed as the ratio of the weight average molecular weight to number average molecular weight ($Mw_{(GPC)}/Mn_{(GPC)}$) in the range of from 2.0 to 4.5.

3. The polyethylene composition of any preceding claim, wherein the second polyethylene fraction area comprises from 30% to 80% of the total area of the elution profile

4. The polyethylene composition of any preceding claim, wherein the polyethylene composition has a composition distribution breadth index 50 (CDBI50) of less than or equal to 50%.

5. The polyethylene composition of any preceding claim, wherein the polyethylene composition has an overall molecular weight determined by iCCD ($Mw_{(iCCD)}$), the first polyethylene fraction has a first fraction molecular weight determined by iCCD ($Mw_{(iCCD,\ 70°C–97°C)}$), and a ratio of the overall molecular weight ($Mw_{(iCCD)}$) to the first fraction molecular weight ($Mw_{(iCCD,\ 70°C–97°C)}$) is less than 0.9.

6. The polyethylene composition of any preceding claim, wherein the polyethylene composition has a zero shear viscosity ratio of less than 2.0.

7. The polyethylene composition of any preceding claim, wherein the polyethylene composition has an Environmental Stress Crack Resistance (ESCR) F50 (10%, A) of greater than 300 hours when measured according to D1693.

8. A polyethylene composition comprising:

a first polyethylene fraction in a temperature range of 70°C to 97°C in an elution profile via improved comonomer composition distribution (iCCD) analysis method, the first polyethylene fraction comprising a first peak, and wherein the first polyethylene fraction has a first fraction molecular weight determined by iCCD ($Mw_{(iCCD,\ 70°C–97°C)}$); and

a second polyethylene fraction in a temperature range of 97°C to 110°C in the elution profile, the second polyethylene fraction comprising a second peak;

wherein the polyethylene composition has an overall molecular weight determined by iCCD ($Mw_{(iCCD)}$), a density of 0.935 g/cm^3 to 0.955 g/cm^3, a melt index (I_2) of 1.0 g/10 minutes to 10.0 g/10 minutes; and

wherein and a ratio of the overall molecular weight ($Mw_{(iCCD)}$) to the first fraction molecular weight ($Mw_{(iCCD,\ 70°C–97°C)}$) is less than 0.9.

9. The polyethylene composition of claim 8, wherein the polyethylene composition has a molecular weight distribution, expressed as the ratio of the weight average molecular weight to number average molecular weight ($Mw_{(GPC)}/Mn_{(GPC)}$) in the range of from 2.0 to 4.5.

10. The polyethylene composition of any of claims 8–9, wherein the second polyethylene fraction area may comprise from 30% to 80% of the total area of the elution profile.

11. The polyethylene composition of any of claims 8–10, wherein the polyethylene composition has a CDBI50 of less than or equal to 50%.

12. The polyethylene composition of any of claims 8–11, wherein and a ratio of the first

mass fraction to the second mass fraction is less than 2.0.

13. The polyethylene composition of any of claims 8–12, wherein the polyethylene composition has a zero shear viscosity ratio of less than 2.0.

14. The polyethylene composition of any of claims 8–13, wherein the polyethylene composition has an ESCR F50 (10%, A) of greater than 300 hours when measured according to D1693.

15. A method of producing a rotomolded article comprising the polyethylene composition of any preceding claim.