Claims

1. Polyethylene composition comprising,

a base resin (A) comprising

a copolymer of ethylene and at least one comonomer selected from alpha-olefins having from three to twelve carbon atoms,

wherein the ethylene copolymer comprises a low molecular weight component (A-1) and a high molecular weight component (A-2) with the low molecular weight component (A-1) having a lower weight average molecular weight than the high molecular weight component (A-2),

(B) carbon black in an amount of 1.0 to 10 wt% based on the total amount of the polyethylene composition, and

(C) optional further additives other than carbon black;

wherein the base resin (A) has a density of equal to or more than 943 kg/m³ to equal to or less than 957 kg/m³, determined according to ISO 1183, and

the composition has a melt flow rate MFR_5 (190°C, 5 kg) of equal to or more than 0.12 g/10 min to equal to or less than 0.20 g/10 min, determined according to ISO 1133, a shear thinning index $SHI_{2.7/210}$ of equal to or more than 80 to equal to or less than 130 and a viscosity at a constant shear stress of 747 Pa, eta_{747}, of equal to or more than 700 kPas to equal to or less than 1200 kPas.

2. The polyethylene composition according to claim 1, wherein the low molecular weight component (A-1) is an ethylene homopolymer.

3. The polyethylene composition according to any of claims 1 or 2, wherein the low molecular weight component (A-1) has a melt flow

rate MFR_2 (190°C, 2.16 kg) of 200 g/10 min to 400 g/10 min, determined according to ISO 1133.

4. The polyethylene composition according to any of the preceding claims, wherein the high molecular weight component (A-2) is a copolymer of ethylene and a comonomer selected from alpha-olefins having from three to twelve carbon atoms.

5. The polyethylene composition according to any of the preceding claims, wherein the weight ratio of the low molecular weight component (A-1) to the high molecular component (A-2) is from 45:55 to 55:45.

6. The polyethylene composition according to any of the previous claims, wherein the composition has a melt flow rate MFR_{21} (190°C, 21.6 kg) of 5.6 g/10 min to 7.0 g/10 min, determined according to ISO 1133.

7. The polyethylene composition according to any of the previous claims, wherein the composition has a density of equal to or more than 953 kg/m³ to equal to or less than 967 kg/m³, determined according to ISO 1183.

8. The polyethylene composition according to any of the previous claims, wherein the composition has a shear thinning index $SHI_{5/200}$ of equal to or more than 50 to equal to or less than 100.

9. The polyethylene composition according to any of the previous claims, wherein the composition has at least one, preferably both, of the following properties a) a weight average molecular weight, Mw, of 250 to 360 kg/mol, more preferably 260 to 340 kg/mol, and/or b) Mz value of 1600 to 2500 kg/mol, preferably 1700 to 2200 kg/mol, even more preferably 1750 to 2150 kg/mol.

10. The polyethylene composition according to any of the previous claims, wherein the composition has a molecular weight distribution Mw/Mn, of at least 25, preferably 30 to 50, more preferably 30 to 45.

11. The polyethylene composition according to any of the previous claims, wherein the composition has a tensile modulus of equal to or less than 1250 MPa, determined according to ISO 527-2:1993.

12. A polyethylene composition obtainable by a multistage process, the process comprising

a) polymerizing ethylene in the presence of a Ziegler-Natta catalyst for obtaining an intermediate material,

b) transferring the intermediate material to a gas phase reactor

(i) feeding ethylene and an alpha-olefin comonomer having from 3 to 12 carbon atoms to the gas phase reactor

(ii) further polymerizing the intermediate material

to obtain a base resin (A) which comprises the intermediate material polymerized in step a) and a material polymerized in step b) which has a higher weight average molecular weight as the intermediate material of step a), wherein the base resin (A) has a density of equal to or more than 943 kg/m³ to equal to or less than 957 kg/m³, determined according to ISO 1183,

c) extruding the base resin (A) in the presence of 1 to 10 wt% carbon black (B), based on the amount of the polyethylene composition, and optional further additive(s) (C), into a polyethylene composition having a melt flow rate MFR_5 (190°C, 5 kg) of equal to or more than 0.12 g/10 min to equal to or less than 0.20 g/10 min, determined according to ISO 1133 (type II), a shear thinning index $SHI_{2.7/210}$ of equal to or more than 80 to equal to or less than 130 and a viscosity at a constant shear stress of 747 Pa, eta_{747}, of equal to or more than 700 kPas to equal to or less than 1200 kPas.

13. An article comprising the polyethylene composition according to any of the preceding claims.

14. The article according to claim 13 being a pipe or pipe fitting, preferably pipe having a wall thickness of at least 60 mm.

15. Use of a polyethylene composition according to any of claims 1 to 12 for the production of an article, preferably a pipe or pipe fitting, preferably pipe having a wall thickness of at least 60 mm.

Claims

1. Polyethylene composition comprising,

a base resin (A) comprising

a copolymer of ethylene and at least one comonomer selected from alpha-olefins having from three to twelve carbon atoms,

wherein the ethylene copolymer comprises a low molecular weight component (A-1) and a high molecular weight component (A-2) with the low molecular weight component (A-1) having a lower weight average molecular weight than the high molecular weight component (A-2),

(B) carbon black in an amount of 1.0 to 10 wt% based on the total amount of the polyethylene composition, and

(C) optional further additives other than carbon black;

wherein the base resin (A) has a density of equal to or more than 943 kg/m^3 to equal to or less than 957 kg/m^3, determined according to ISO 1183, and

the composition has a melt flow rate MFR_5 (190°C, 5 kg) of equal to or more than 0.12 g/10 min to equal to or less than 0.20 g/10 min, determined according to ISO 1133, a shear thinning index $SHI_{2.7/210}$ of equal to or more than 95 to equal to or less than 130 and a viscosity at a constant shear stress of 747 Pa, eta_{747}, of equal to or more than 700 kPas to equal to or less than 1200 kPas.

2. The polyethylene composition according to claim 1, wherein the low molecular weight component (A-1) is an ethylene homopolymer.

3. The polyethylene composition according to any of claims 1 or 2, wherein the low molecular weight component (A-1) has a melt flow

rate MFR_2 (190°C, 2.16 kg) of 200 g/10 min to 400 g/10 min, determined according to ISO 1133.

4. The polyethylene composition according to any of the preceding claims, wherein the high molecular weight component (A-2) is a copolymer of ethylene and a comonomer selected from alpha-olefins having from three to twelve carbon atoms.

5. The polyethylene composition according to any of the preceding claims, wherein the weight ratio of the low molecular weight component (A-1) to the high molecular component (A-2) is from 45:55 to 55:45.

6. The polyethylene composition according to any of the previous claims, wherein the composition has a melt flow rate MFR_{21} (190°C, 21.6 kg) of 5.6 g/10 min to 7.0 g/10 min, determined according to ISO 1133.

7. The polyethylene composition according to any of the previous claims, wherein the composition has a density of equal to or more than 953 kg/m³ to equal to or less than 967 kg/m³, determined according to ISO 1183.

8. The polyethylene composition according to any of the previous claims, wherein the composition has a shear thinning index $SHI_{5/200}$ of equal to or more than 50 to equal to or less than 100.

9. The polyethylene composition according to any of the previous claims, wherein the composition has at least one, preferably both, of the following properties a) a weight average molecular weight, Mw, of 250 to 360 kg/mol, more preferably 260 to 340 kg/mol, and/or b) Mz value of 1600 to 2500 kg/mol, preferably 1700 to 2200 kg/mol, even more preferably 1750 to 2150 kg/mol.

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11. The polyethylene composition according to any of the previous claims, wherein the composition has a tensile modulus of equal to or less than 1250 MPa, determined according to ISO 527-2:1993.

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a) polymerizing ethylene in the presence of a Ziegler-Natta catalyst for obtaining an intermediate material,

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to obtain a base resin (A) which comprises the intermediate material polymerized in step a) and a material polymerized in step b) which has a higher weight average molecular weight as the intermediate material of step a), wherein the base resin (A) has a density of equal to or more than 943 kg/m³ to equal to or less than 957 kg/m³, determined according to ISO 1183,

c) extruding the base resin (A) in the presence of 1 to 10 wt% carbon black (B), based on the amount of the polyethylene composition, and optional further additive(s) (C), into a polyethylene composition having a melt flow rate MFR_5 (190°C, 5 kg) of equal to or more than 0.12 g/10 min to equal to or less than 0.20 g/10 min, determined according to ISO 1133 (type II), a shear thinning index $SHI_{2.7/210}$ of equal to or more than 95 to equal to or less than 130 and a viscosity at a constant shear stress of 747 Pa, eta_{747}, of equal to or more than 700 kPas to equal to or less than 1200 kPas.

13. An article comprising the polyethylene composition according to any of the preceding claims.

14. The article according to claim 13 being a pipe or pipe fitting, preferably pipe having a wall thickness of at least 60 mm.

15. Use of a polyethylene composition according to any of claims 1 to 12 for the production of an article, preferably a pipe or pipe fitting, preferably pipe having a wall thickness of at least 60 mm.