Claims

1. A multimodal polypropylene composition suitable for pipe applications comprising

a multimodal propylene copolymer (U) with at least one comonomer selected from alpha-olefins with 2 or 4 to 8 carbon atoms in a total amount of 4.0 to 10.0 mole-%,

wherein the multimodal propylene copolymer (U) comprises

(A) from 75 to 98 wt.-% of a propylene random copolymer composition (X) wherein the comonomer of the propylene random copolymer composition (X) is selected from at least one of the group consisting of ethylene and C_4-C_8 alpha-olefins, and

whereby propylene random copolymer composition (X) has a melt flow rate MFR_2 of 0.25 to 1.0 g/10 min, or a content of comonomer units of from 2.0 to 12.0 mole-%, or both and propylene random copolymer composition (X) has a content of xylene cold solubles of 4.0 to 15.0 wt.-%, determined at 25°C according to ISO 16152; and

(B) from 2 to 25 wt.-% of a propylene copolymer (Y), wherein the comonomer is selected from at least one of the group consisting of ethylene and C_4-C_8 alpha-olefins and

whereby the propylene copolymer (Y) has a melt flow rate MFR_2 of from 0.0001 to 0.1 g/10 min, or a content of comonomer units of from 9.0 to 40.0 mole-%, or both, and

wherein the multimodal polypropylene composition has a melt flow rate MFR_2 (2.16 kg, 230 °C) of 0.25 to 1.00 g/10 min determined according to ISO 1133,

a content of xylene cold solubles of 4.0 to 17.0 wt.-% determined at 25 °C according to ISO 16152, and

a polydispersity index *PI* of 2.5 to 4.0 Pa^{-1}.

2. The multimodal polymer composition according to claim 1, wherein propylene random copolymer composition (X) comprises

from 30 to 60 wt.-% of a first propylene homopolymer or random copolymer (V) having an MFR_2 of from 1.0 to 5.0 g/10 min: and

from 40 to 70 wt.-% of a second propylene homopolymer or random copolymer (W), having an MFR_2 of from 0.10 to 0.60 g/10 min;

provided that at least one of said first propylene homopolymer or random copolymer (V) and said second propylene homopolymer or random copolymer (W) is a propylene random copolymer.

3. The multimodal polymer composition according to either claim 1 or 2, wherein the propylene random copolymer composition (X) comprises

from 30 to 60 wt.-% of the first propylene random copolymer (V) having an MFR_2 of from 1.0 to 5.0 g/10 min, or a content of comonomer units of from 1.0 to 6.0 mole-%, or both; and

from 40 to 70 wt.-% of the second propylene random copolymer (W) having an MFR_2 of from 0.10 to 0.60 g/10 min, or a content of comonomer units of from 3.0 to 12.0 mole-%, or both.

4. The multimodal polypropylene composition according to either claim 2 or 3, wherein the MFR_2 of the first propylene homopolymer or random copolymer (V) is higher than the MFR_2 of the second propylene homopolymer or random copolymer (W) and the MFR_2 of the second propylene homo polymer or random copolymer (W) is higher than the MFR_2 of the propylene copolymer (Y).

5. The multimodal polypropylene composition according to any of the preceding claims comprising from 0.1 to 10000 ppm by weight of a nucleating agent (Z).

6. The multimodal propylene copolymer composition according to any of the preceding claims, wherein the nucleating agent (Z) is a polymeric nucleating agent.

7. The multimodal propylene copolymer composition according to claim 6, wherein the nucleating agent is a polymer of at least one vinyl compound according to the following formula

$$CH_2=CH-CHR^1R^2 \qquad (1)$$

wherein R^1 and R^2 together form a 5- or 6-membered saturated, unsaturated or aromatic ring, or independently represent an alkyl group comprising 1 to 4 carbon atoms, whereby in case R^1 and R^2 form an aromatic ring the hydrogen atom of the $-CHR^1R^2$ moiety is not present.

8. The multimodal polypropylene composition according to claim 7, wherein the vinyl compound of formula (1) is selected from the group of vinylcyclohexane and/or 3-methyl-1-butene.

9. The multimodal polypropylene composition according to any of the preceding claims, wherein the relationship: crystallization temperature T_C x comonomer content of the multimodal propylene copolymer (U) [°C mole-%] is at least 400 °C mole-%.

10. The multimodal polypropylene composition according to any of the preceding claims, which has a Charpy Notched Impact Strength at 0 °C of at least 4.0 kJ/m^2, determined according to ISO 179/1eA:2000 using notched injection moulded specimens.

11. The multimodal polypropylene composition according to any of the preceding claims, which has a flexural modulus of at least 700 MPa, determined according to ISO 178 at a test speed of 2 mm/min and a force of 100 N on test specimens having a dimension of 80x10x4.0 mm^3 (length x width x thickness) prepared by injection moulding according to EN ISO 1873-2.

12. The multimodal polypropylene composition according to any of the preceding claims, wherein the multimodal propylene copolymer (U) is a multimodal propylene copolymer with ethylene comonomer.

13. A process for producing a multimodal polypropylene composition according to any of the preceding claims, wherein propylene and at least one comonomer selected from alpha-olefins with 2 or 4 to 8 carbon atoms is polymerised in the presence of

(I) a solid catalyst component comprising a magnesium halide, a titanium halide and an internal electron donor; and

(II) a cocatalyst comprising an aluminium alkyl;

the multistage process comprising the steps of

(A) continuously polymerizing propylene, in a first polymerisation stage by introducing streams of propylene and hydrogen into the first polymerisation stage at a temperature of from 60 to 100 °C and a pressure of from 40 to 65 bar to produce a first propylene polymer (V), wherein the first propylene polymer (V) has a melt flow rate MFR2 (2.16 kg, 230 °C; ISO 1133) of from 1.0 to 5.0 g/10 min;

(B) withdrawing from the first polymerisation stage a stream comprising the first propylene polymer (V) and transferring said stream into a second polymerisation stage;

(C) polymerizing propylene in the presence of said first propylene polymer (V) in the second polymerisation stage at a temperature of from 65 to 90 °C and a pressure of from 19 to 25 bar by introducing streams of propylene and hydrogen, to produce a copolymer composition (X) of said first propylene polymer (V) and a second propylene polymer (W); provided that at least one of said first and second polymers (V) and (W) is a propylene random copolymer;

said copolymer composition (X) comprising

from 30 to 60 wt.-% of said first propylene polymer (V) and from 40 to 70 wt.-% of said second propylene polymer (W) with respect to the copolymer composition (X),

wherein the copolymer composition (X) has a melt flow rate MFR2 of 0.25 to 1.0 g/10 min which is lower than the MFR2 of said first polymer (V) and a content of xylene cold solubles of 4.0 to 15.0 wt.-%;

(D) withdrawing a stream comprising the copolymer composition (X) from the second polymerisation stage and transferring said stream into a third polymerisation stage;

(E) polymerizing propylene and at least one comonomer in the presence of the copolymer composition (X) in the third polymerisation stage at a temperature of from 65 to 90 °C and a pressure of from 10 to 100 bar by introducing streams of propylene, hydrogen, and at least one comonomer, to produce the multimodal propylene copolymer (U) comprising the copolymer composition (X) and a further propylene

copolymer (Y) component, wherein the multimodal propylene copolymer (U) has a melt flow rate MFR2 of 0.25 to 1.0 g/10 min;

wherein the multimodal propylene copolymer (U) comprises from 75 to 98 wt.-% of said copolymer composition (X) and from 2 to 25 wt.-% of said propylene copolymer (Y); and

wherein the comonomer content of the propylene copolymer (Y) is from 9.0 to 40 mole-%;

(F) continuously withdrawing a stream comprising the multimodal propylene copolymer (U) from the third polymerisation stage; and

(G) extruding the multimodal propylene copolymer (U) into pellets.

14. The process according to claim 13, wherein the cocatalyst comprises an aluminium alkyl and an external electron donor.

15. The process according to either claim 13 or 14, wherein the propylene and the at least one comonomer selected from alpha-olefins with 2 or 4 to 8 carbon atoms is polymerised in the presence of a nucleating agent.

16. The process according to any of claims 13 to 15, wherein step (A) includes continuously polymerizing propylene, a comonomer selected from the group of ethylene and at least one C4-C8 alpha-olefins, in a first polymerisation stage by introducing streams of propylene, hydrogen and said comonomer into the first polymerisation stage at a temperature of from 60 to 100 °C and a pressure of from 40 to 65 bar to produce a first propylene polymer, wherein the first propylene polymer has a melt flow rate MFR2 (2.16 kg, 230 °C; ISO 1133) of from 1.0 to 5.0 g/10 min, and/or wherein step (C) includes polymerizing propylene in the presence of said first propylene polymer in the second polymerisation stage at a temperature of from 65 to 90 °C and a pressure of from 19 to 25 bar by introducing streams of propylene, hydrogen, and at least one comonomer, to produce a copolymer composition of said first propylene polymer and a second propylene polymer; provided that at least one of said first and second polymers and is a propylene random copolymer.

17. The multistage process according to any one of claims 13 to 16, wherein the multistage process comprises a further step (AA) preceding step (A), wherein

(AA) polymerising a vinyl compound of the formula (1) as defined in any of claim 7 to 9 in the presence of a catalyst system comprising the solid catalyst component (I) to obtain a modified catalyst system which is the reaction mixture comprising the solid catalyst component (I) and the produced polymer of the vinyl compound of formula (1), and wherein, the weight ratio of the polymer of the vinyl compound of the formula (1) to the solid catalyst component (I) is up to 5 (5:1), and the obtained modified catalyst system is fed to polymerisation step (A) of the multistage process for producing the multimodal propylene copolymer (U).

18. The multimodal polypropylene composition according to any of claims 1 to 12 obtained by the multistage process of any of claims 13 to 17.

19. An article comprising the polypropylene composition according to any of claims 1 to 12 or 18.

20. A moulded article or a pressure pipe comprising the polypropylene composition according to any of claims 1 to 12 or 18.