Claims

1. Process for copolymerizing ethylene and at least one C3 to C8 alpha olefin to obtain an ethylene-C3 to C8 alpha olefin copolymer, the process comprising
a) copolymerizing ethylene and at least one C3 to C8 alpha olefin in a solvent in a solution polymerization reactor (1) to obtain an intermediate polymer solution,
b) discharging an effluent stream from the intermediate polymer solution into a heat exchanger (2),
c) setting the temperature of the effluent stream in the heat exchanger (2) to obtain a heated effluent stream,
d) feeding the heated effluent stream to a first flash separation (3),
e) separating at least a part of the ethylene-C3 to C8 alpha olefin copolymer in the first flash separation (3),
characterized by
feeding an inert hydrocarbon fulfilling 90 °C < T(BP) < 130 °C to the solution polymerization reactor (1);
and/or
accumulating an inert hydrocarbon fulfilling 90 °C < T(BP) < 130 °C during the polymerization reaction;
and/or
feeding an inert hydrocarbon fulfilling 90 °C < T(BP) < 130 °C to the discharged effluent stream of step b),
wherein an inert hydrocarbon denotes any hydrocarbon which does not exceed 5% of the total reaction rate of the polymerization reaction with the same catalyst, and
wherein the intermediate polymer solution in the solution polymerization reactor (1) comprises between 0.05 and 30 wt.% inert hydrocarbon fulfilling 90 °C < T(BP) < 130 °C, based on the total weight of the intermediate polymer solution, and wherein accumulating the inert hydrocarbon fulfilling 90 °C < T(BP) < 130 °C during the polymerization reaction is done by recovering the inert hydrocarbon from the first flash separation (3) and/or from a second flash separation downstream of the first flash separation (3) and recycling the recovered inert hydrocarbon back to the solution polymerization reactor (1).

2. Process according to claim 1, whereby the inert hydrocarbon fulfilling 90 °C < T(BP) < 130 °C is a paraffinic hydrocarbon having 7 or 8 carbon atoms, an olefin having 7 or 8 carbon atoms, or mixtures thereof.

3. Process according to claim 1 or claim 2, whereby the inert hydrocarbon fulfilling 90 °C < T(BP) < 130 °C comprises iso-octene, 4-Methyl-3-heptene, 3-Ethyl-2-hexene, 3-Methyl-3-heptene, 2,3-Dimethyl-2-hexene, 3-Methyl-2-heptene, 3,4-Dimethyl-trans-3-hexene, 2-Methyl-2-heptene, or mixtures thereof.

4. Process according to any of the preceding claims, wherein copolymerization of ethylene and the at least one C3 to C8 alpha olefin in solution in step a) takes place at a temperature of at least 140 °C.

5. Process according to any of the preceding claims, wherein in step c) the temperature of the effluent stream is set to a temperature within 200 to 280°C.

6. Process according to any of the preceding claims, wherein the pressure in the solution polymerization reactor (1) and/or in the heat exchanger (2) is from 80 to 150 bar.

7. Process according to any of the preceding claims, wherein the ethylene-C3 to C8 alpha olefin copolymer separated in step e) is directed into a second flash separation downstream of the first flash separation (3).

8. Process according to any of the preceding claims, wherein the obtained ethylene-C3 to C8 alpha olefin copolymer has a weight average molecular weight (Mw) of between 50.000 and 180.000 g/mol, determined according to ISO 16014-4:2012.

9. Process according to any of the preceding claims, wherein the obtained ethylene-C3 to C8 alpha olefin copolymer has a melt flow rate MFR2 (2.16kg, 190 °C) of equal or below 100 g/10min, determined according to ISO 1133-1.

10. Process according to any of the preceding claims, wherein the at least one C3 to C8 alpha olefin is selected from the group of propene, 1-butene, 1-pentene, 1-hexene, 1-heptene and 1-octene, or combinations thereof.

11. Process according to any of the preceding claims, wherein the catalyst used in the solution polymerization is a metallocene catalyst or a Ziegler-Natta catalyst.

12. Use of an inert hydrocarbon fulfilling 90 °C < T(BP) < 130 °C for maintaining single phase of an intermediate polymer solution in a solution polymerization reactor (1) obtained by copolymerizing ethylene and at least one C3 to C8 alpha olefin copolymer and/or of an

effluent stream originating from copolymerization of ethylene and at least one C3 to C8 alpha olefin in solution polymerization during withdrawal from a solution polymerization reactor (1) wherein an inert hydrocarbon denotes any hydrocarbon which does not exceed 5% of the total reaction rate of the polymerization reaction with the same catalyst, and wherein the intermediate polymer solution in the solution polymerization reactor (1) comprises between 0.05 and 30 wt.% inert hydrocarbon fulfilling 90 °C < T(BP) < 130 °C, based on the total weight of the intermediate polymer solution.

13. Use of an inert hydrocarbon fulfilling 90 °C < T(BP) < 130 °C for maintaining single phase of a heated effluent stream originating from polymerization of ethylene and at least one C3 to C8 alpha olefin in solution polymerization, and heated in a heat exchanger (2) wherein an inert hydrocarbon denotes any hydrocarbon which does not exceed 5% of the total reaction rate of the polymerization reaction with the same catalyst, and wherein the intermediate polymer solution in the solution polymerization reactor (1) comprises between 0.05 and 30 wt.% inert hydrocarbon fulfilling 90 °C < T(BP) < 130 °C, based on the total weight of the intermediate polymer solution.