Claims

1. A process for the separation of at least one polyolefin from a product stream (a) from a solution polymerization process, wherein the product stream (a) comprises the at least one polyolefin and a mixture of volatiles, the process comprising the steps of:

   A) separating the product stream (a) into a first polyolefin-lean vapor stream (b) and a first condensed polyolefin-rich stream (c);

   B) separating the first condensed polyolefin-rich stream (c) into a second polyolefin-lean vapor stream (b') and a second condensed polyolefin-rich stream (c');

   C) separating the second condensed polyolefin-rich stream (c') into a last polyolefin-lean vapor stream (b*) and a last condensed polyolefin-rich stream (c*);

   characterized in that

   the first polyolefin-lean vapor stream (b) and the second polyolefin-lean vapor stream (b') are introduced into an initial feed stream (a') of the solution polymerization process without any further purification step,

   wherein in step A) 60 to 90 wt.-% of the mixture of volatiles are removed from the product stream (a).

2. The process according to any of the preceding claims, wherein the mixture of volatiles comprises solvent, monomers, and comonomers

3. The process according to claim 2, wherein the solvent is selected from the group consisting of C4, C5, C6, C7, C8, C9 and C10 alkanes or mixtures thereof, preferably is selected from the group consisting of C4, C5, C6, C7, C8, C9 and C10 n-alkanes or mixtures thereof.

4. The process according to any of the preceding claims, wherein in step B) 25 to 40 wt.-% of the mixture of volatiles are removed from the first condensed polyolefin-rich stream (c).

5. The process according to any of the preceding claims, wherein in step C) 0.2 to 5 wt.-% of the mixture of volatiles are removed from the second condensed polyolefin-rich stream (c').

6. The process according to any of the preceding claims, wherein step A) is a flash separation step.

7. The process according to claim 6, wherein step A) is carried out at a feed temperature of 200 to 250°C and at a pressure of at least 2.5 to 10 bara.

8. The process according to any of the preceding claims, wherein step B) is a flash separation step.

9. The process according to claim 8, wherein step B) is carried out at a feed temperature of 200 to 250 °C and at a pressure of 1.5 to 10 bara.

10. The process according to any of the preceding claims, wherein step C) is a flash separation step with preceding addition of a stripping agent into the second condensed polyolefin-rich stream (c') or an extruding/degassing step.

11. The process according to claim 10, wherein step C) is a flash separation step and is carried out at a feed temperature of 200 to 250 °C and at vacuum pressure conditions.

12. The process according to any of the preceding claims, wherein the solution polymerization process is conducted in the presence of a metallocene catalyst.

13. A polyolefin separated from a mixture of volatiles obtainable by a process according to any of the preceding claims 1 to 12.

14. The polyolefin according to claim 13, wherein the polyolefin comprises less than 150 ppm hydrocarbons from the mixture of volatiles.