

Claims

1. A polymerisation process, comprising:
 - a) supplying a feed containing ethylene and at least one alpha-olefin having 3 to 12 carbon atoms in a hydrocarbon solvent to a polymerisation reactor,
 - b) contacting the feed of step a) in the reactor with a catalyst to form a reaction mixture containing an ethylene-alpha-olefin co-polymer, whereby the average residence time in the reactor is chosen to be between 0.5 and 30 minutes,
 - c) withdrawing the reaction mixture from the polymerisation reactor as a reactor outlet stream which comprises the ethylene-alpha-olefin co-polymer, unreacted monomer and comonomer, catalyst, and hydrocarbon solvent, and
 - d) separating hydrocarbon solvent, monomer and comonomer from the reactor outlet stream and recycling it back to the polymerisation reactor without further purification steps,

wherein in step c) no more than 5 wt.% of catalyst in an active state is leaving the reactor.
2. The process according to claim 1 wherein the average residence time of step b) is adjusted to effect that in step c) no more than 5 wt.% of catalyst in an active state is leaving the reactor.
3. The process according to claim 1 or 2 wherein adjustment of the average residence time is done by either adapting the solvent feed rate, and/or the catalyst feed rate.
4. The process according to any one of the preceding claims wherein the average residence time $t_{average}$ in the reactor is complying with the relation:

$$2900/T_{reactor} - 13 < t_{average} < 4200/T_{reactor} - 13,$$

wherein $T_{reactor}$ is the temperature in the polymerization reactor.
5. The process according to any one of the preceding claims wherein in step c) no more than 4 wt.% of catalyst in an active state are leaving the reactor.

6. The process according to any one of the preceding claims wherein the process is a continuous process.
7. The process according to any one of the preceding claims wherein separating hydrocarbon solvent from the reactor outlet stream in step
5 d) is done by feeding the reactor outlet stream to a low pressure separator.
8. The process according to any one of the preceding claims wherein no catalyst de-activation agent is added to the reactor outlet stream before entering the low pressure separator.
- 10 9. The process according to any one of the preceding claims wherein the polymerization catalyst system comprising a metallocene complex and a boron containing cocatalyst and/or an aluminoxane co-catalyst.
10. The process according claim 9 wherein the metallocene catalyst comprises a hafnocene catalyst.
- 15 11. The process according to claim 10 wherein the hafnocene catalyst comprises a hafnocene complex, comprising a cyclopentadienyl (Cp) ligand, a fluorenyl (Flu) ligand and a covalent bridge connecting the two ligands.
- 20 12. The process according to any of the preceding claims, wherein the polymerization reaction is performed at a temperature of between 120 to 220 °C.
13. The process according to any of the preceding claims, wherein the polymerization reaction is performed at a pressure of between 50 to 300 bar.
- 25 14. The process according to any of the preceding claims, wherein polymer mass fraction inside the reactor is between 5.0 wt% to 50.0 wt%.