

Claims

1. A polymerization 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 polymerization 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,
 - c) withdrawing the reaction mixture from the polymerization reactor as a reactor outlet stream which comprises the ethylene-alpha-olefin co-polymer, unreacted monomer and comonomer, catalyst, and hydrocarbon solvent,
 - d) heating the reactor outlet stream to a temperature which is at least 5 °C higher than the temperature of the reaction mixture at the outlet of the reactor for a time period of between 1 and 250 seconds in order to de-activate the polymerization catalyst, and
 - e) separating hydrocarbon solvent, monomer and comonomer from the reactor outlet stream and recycling it back to the polymerization reactor without further purification steps.
2. The process according to claim 1 wherein the reactor outlet stream is heated to a temperature which is at least 10 °C higher than the temperature of the reaction mixture at the outlet of the reactor.
3. The process according to claim 2 wherein the reactor outlet stream is heated to a temperature which is at least 15 °C higher than the temperature of the reaction mixture at the outlet of the reactor.
4. The process according to any one of the preceding claims wherein the reactor outlet stream is heated to the prescribed temperature for a time period of between 10 and 200 seconds.
5. The process according to any one of the preceding claims wherein the reactor outlet stream is heated for a time period t (min) to a temperature which is at least x (°C) higher than the temperature in the solution reactor complying with the relation:

$$t * x > 0.05.$$

6. 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 separation stage e).
- 5 7. The process according to any one of the preceding claims wherein the reactor outlet stream between leaving the reactor and entering the separation stage e) apart from being heated in step d) is not subjected to any further treatment steps.
8. The process according to any one of the preceding claims wherein the reactor outlet stream is heated to a temperature of at least 180°C.
- 10 9. The process according to any one of the preceding claims wherein after heat treatment of the reactor outlet stream no more than 10 wt.% of the catalyst is in an active state.
10. The process according to any one of the preceding claims wherein the polymerization catalyst is a metallocene catalyst.
- 15 11. The process according claim 10 wherein the metallocene catalyst comprises a hafnocene catalyst.
12. The process according to claim 11 wherein the hafnocene catalyst comprises a hafnocene catalyst complex, comprising a cyclopentadienyl (Cp) ligand, a fluorenyl (Flu) ligand and a covalent bridge connecting the two ligands.
- 20 13. The process according to any of the preceding claims, wherein the polymerization reaction is performed at a temperature of between 100 °C to 250 °C.
- 25 14. The process according to any of the preceding claims, wherein the polymerization reaction is performed at a pressure of between 50 to 300 bar.
- 30 15. Use of heat applied to the outlet stream of a polymerization reactor in which ethylene monomer and at least one alpha-olefin comonomer having 3 to 12 carbon atoms are copolymerized in solution for de-activating the polymerization catalyst.