

CLAIMS

1. A process for preparing a multimodal ethylene copolymer in suspension in a reactor cascade comprising a first polymerization reactor and one or more subsequent polymerization reactors comprising,
- polymerizing, in the reactor cascade, ethylene and one or more C₃-C₁₂-1-alkenes at temperatures of from 40 to 150°C and pressures of from 0.1 to 20 MPa in the presence of a polymerization catalyst and forming a suspension of multimodal ethylene copolymer particles in a suspension medium comprising a diluent,
- transferring the suspension of multimodal ethylene copolymer particles into a separator, in which the suspension is separated into multimodal ethylene copolymer particles and recovered suspension medium,
- purifying a part of the recovered suspension medium in a purification section for producing purified components of the recovered suspension medium, and
- recycling at least some or a part of the purified components of the recovered suspension medium to the first polymerization reactor of the reactor cascade,
- wherein the purified components of the recovered suspension medium recycled to the first polymerization reactor, which comprise the diluent, undergo a catalytic hydrogenation before being introduced into the first polymerization reactor.
2. The process of claim 1, wherein the purified components of the recovered suspension medium, which are recycled to the first polymerization reactor, amount to from 5 to 70 wt.-% of the recovered suspension medium.
3. The process of claim 1 or 2, wherein an ethylene homopolymer is prepared in the first polymerization reactor and a copolymer of ethylene is prepared in a subsequent polymerization reactor.
4. The process of any of claims 1 to 3, wherein the difference between the normal boiling point of one of the comonomers fed to the reactor cascade and the normal boiling point of the diluent or, if the diluent is a mixture of components, the difference between the normal boiling point of one of the comonomers fed to the reactor cascade and the initial normal boiling point or the final normal boiling point of the diluent is not more than 15°C, the normal boiling points being defined as boiling points at 1013,25 hPa.

5. The process of any of claims 1 to 4, wherein the multimodal ethylene copolymer is an ethylene-1-hexene copolymer.
- 5 6. The process of any of claims 1 to 4, wherein the multimodal ethylene copolymer comprises at least two comonomers.
7. The process of claim 6, wherein the multimodal ethylene copolymer comprises at least 1-hexene and 1-butene as comonomers.
- 10 8. The process of any of claims 1 to 7, wherein a part of the recovered suspension medium is directly recycled to a subsequent polymerization reactor.
9. The process of any of claims 1 to 8, wherein the process for producing the purified part of the recovered suspension medium includes a step of evaporating a part of the recovered suspension medium and then re-condensing the evaporated part of the suspension medium.
- 15 10. The process of any of claims 1 to 9, wherein the process for producing the purified part of the recovered suspension medium includes a distillation step.
- 20 11. The process of any of claims 1 to 10, wherein the process for producing the purified components of the recovered suspension medium includes a step of wax removal.
- 25 12. The process of any of claims 1 to 11, wherein the suspension of polyethylene particles withdrawn from the first polymerization reactor of the reactor cascade is fed into a separator, in which a part of the suspension medium is separated from the suspension and recycled to the first polymerization reactor of the reactor cascade and a concentrated suspension of polyethylene particles is transferred into the next polymerization reactor of the reactor cascade.
- 30 13. The process of any of claims 1 to 12, wherein the reactor cascade comprises at least 3 polymerization reactors and the suspension of polyethylene particles withdrawn from the second polymerization reactor is fed into a separator, in which a part of the suspension medium is separated from the suspension and recycled to the second polymerization reactor and a concentrated suspension of polyethylene particles is transferred into the third polymerization reactor.
- 35 14. An apparatus for polymerizing olefinic monomers in suspension in a reactor cascade comprising:
 - 40 - at least two serially connected polymerization reactors forming a reactor cascade,

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- a separator for separating the suspension in polyolefin particles and a recovered suspension medium,
 - transfer lines for transferring a suspension of polyolefin particles in a suspension medium from one polymerization reactor of the reactor cascade to the next polymerization reactor of the reactor cascade and from the last polymerization reactor of the reactor cascade to the separator, and
 - a recycle line for recycling parts of the recovered suspension medium to the first polymerization reactor of the reactor cascade,
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- wherein the recycle line for recycling parts of the recovered suspension medium to the first polymerization reactor of the reactor cascade is equipped with a catalytic hydrogenation unit.
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15. The apparatus of claim 14, wherein the transfer line for transferring the suspension of polyolefin particles from the first polymerization reactor of the reactor cascade to the next polymerization reactor of the reactor cascade is equipped with a separator for separating a part of the suspension medium from the suspension transferred from the first polymerization reactor of the reactor cascade to the next polymerization reactor of the reactor cascade and the apparatus further comprises a recycle line for recycling the suspension medium separated from the suspension in the separator installed between the first polymerization reactor of the reactor cascade and the next polymerization reactor of the reactor cascade to the first polymerization reactor of the reactor cascade.
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