CLAIMS

1. A process for producing poly-α-olefins, the process comprising

a) providing at least one α-olefin monomer and a catalyst,

b) letting the at least one α-olefin monomer react in the presence of the catalyst to form a mixture of poly-α-olefins (PAO),

c) fractionating the obtained mixture of poly-α-olefins to two PAO fractions, wherein the two PAO fractions are a first fraction of PAO having a kinematic viscosity of 5 cSt or lower and a second fraction of PAO having a kinematic viscosity of more than 5 cSt;, and

d) subjecting the obtained two PAO fractions to separate hydrogenation to obtain hydrogenated PAO fractions,

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2. The process according to claim 1, wherein fractionating in step c) further obtains a recycle fraction, of which at least a part is recycled back to the reaction step, and the recycle fraction comprises dimers of the α-olefins.

3. The process according to claim 1 or 2, wherein the process further comprises a step e) fractionating at least one of the hydrogenated PAO fractions to obtain hydrogenated PAO sub-fractions.

4. The process according to any one of claim 1 to 3, wherein the obtained two PAO fractions are hydrogenated in separate hydrogenation units.

5. The process according to any one of claim 3 to 4, wherein the further fractionation step e) is performed on the hydrogenated PAO fraction having a kinematic viscosity of 5 cSt or lower to obtain a first hydrogenated PAO sub-fraction having a kinematic viscosity of about 2 cSt and a second hydrogenated PAO sub-fraction having a kinematic viscosity of about 4 cSt.

6. The process according to any one of claim 1 to 5, wherein the at least one α-olefin monomer comprises C_4 – C_{20} α-olefins.

7. The process according to any one of claim 1 to 6, wherein the at least one α-olefin monomer comprises C_8 – C_{12} α-olefins.

8. The process according to any one of claim 1 to 7, wherein the at least one α-olefin monomer comprises C_{10} α-olefin.

9. The process according to any one of claim 1 to 8, wherein the catalyst is a catalyst complex comprising a primary catalyst and a co-catalyst.

10. The process according to claim 9, wherein the primary catalyst is an aluminium halide or a boron halide.

11. The process according to claim 9 or 10, wherein the primary catalyst is BF3, and the co-catalyst is selected from C_1-C_{10} alcohols.

12. The process according to any one of claim 9 to 11, wherein the co-catalyst is n-butanol.

13. The process according to any one of claim 1 to 12, wherein the hydrogenation is performed in the presence of a noble metal or nickel catalyst in a fixed bed reactor.

14. The process according to any one of claim 1 to 12, wherein the hydrogenation is performed in a pressure from 2 MPa to 10 MPa and a temperature from 100 °C to 320 °C,.

15. The process according to any one of claim 1 to 14, wherein the hydrogenation is performed in a pressure from 2.5 MPa to 8 MPa and a temperature from 120 °C to 280 °C.

16. The process according to any one of claim 1 to 14, wherein the hydrogenation is performed in a pressure from 3 MPa to 6 MPa and a temperature from 130 °C to 250 °C.