Claims

1. Process for oligomerization of C2- to C8-olefins in at least two serially connected reaction stages, each of which comprise at least one reactor and at least one distillation column, wherein

an input mixture containing the C2- to C8-olefins as reactant olefins and a proportion of > 10% by weight of alkanes is subjected to oligomerization in the at least one reactor using a heterogeneous catalyst with a reactant olefin conversion of 60 to 95%, preferably 70 to 93%, particularly preferably 80 to 92%, and the reaction mixture obtained from the at least one reactor is distilled in the at least one distillation column to separate formed oligomers from the residual reaction mixture containing at least the unconverted reactant olefins and forming the distillate from the distillation column, wherein the distillate formed in the at least one distillation column is at least partially passed to the reactor(s) of the same or preceding reaction stage, characterized in that

the concentration of the oligomers in the distillate from the last distillation column of the last reaction stage is <100 ppmw, while the distillate(s) from the preceding distillation column(s) has or have a concentration of the oligomers in the range from > 200 ppmw to 7000 ppmw.

2. Process for oligomerization according to Claim 1, wherein the concentration of the oligomers in the distillate from the last distillation column of the last reaction stage is < 80 ppmw.

3. Process for oligomerization according to Claim 1 or 2, wherein the concentration of the oligomers in the distillate from the last distillation column of the last reaction stage is < 50 ppmw.

4. Process for oligomerization according to any of Claims 1 to 3, wherein the reactors of the individual reaction stages employ an oligomerization catalyst which comprises a nickel compound on an aluminosilicate support material.

5. Process according to Claim 4, wherein the catalyst contains less than 0.5% by weight of titanium dioxide and zirconium dioxide in its overall composition.

6. Process for oligomerization according Claim 4 or 5, wherein the oligomerization catalyst in the reactors of the individual reaction stages has a composition of 15% to 40% by weight of NiO, 5% to 30% by weight of Al_2O_3, 55% to 80% by weight of SiO_2 and 0.01% to 2.5% by weight of an alkali metal oxide.

7. Process for oligomerization according to any of Claims 1 to 6, wherein based on a cooling power of 100% for the reactor(s) in the first reaction stage, the cooling power in the reactor(s) of the subsequent reaction stages is less than 100%, but 0% only in the last reaction stage.

8. Process for oligomerization according to any of Claims 1 to 7, wherein the oligomerization in each of the reaction stages present is carried out at a temperature in the range from 50°C to 200°C.

9. Process for oligomerization according to any of Claims 1 to 8, wherein pressure in the oligomerization of each of the reaction stages present is 10 to 70 bar.

10. Process for oligomerization according to any of Claims 1 to 9, wherein the process is a process for oligomerization of C3- to C6-olefins.

11. Process for oligomerization according to any of Claims 1 to 9, wherein the process is a process for oligomerization of C3- to C5-olefins.

12. Process for oligomerization according to any of Claims 1 to 9, wherein the process is a process for oligomerization of C4-olefins.

13. Process for oligomerization according to any of Claims 1 to 12, wherein a recycle-to-fresh feed ratio for each of the reaction stages present is between 0.1 and 5, preferably between 0.1 and 3.

14. Process according to any of Claims 1 to 13, wherein the oligomerization is carried out in each reaction stage in the liquid phase.

15. Process according to any of Claims 1 to 14, wherein the input mixture contains up to 50% by weight of alkanes.