Claims

What is claimed:

1. A process for producing propylene and a low-sulfur fuel oil component, comprising the steps of:

i) contacting a hydrocarbon-containing feedstock oil with a catalytic conversion catalyst for reaction in a catalytic conversion reactor in the absence of hydrogen under conditions including a reaction temperature of 500-560 °C, a weight hourly space velocity of 18-40 h^{-1} or a reaction time of 4-8 seconds, and a catalyst-to-oil weight ratio of 5-10 till a conversion rate of 50-75%, to obtain a reaction product comprising 8-25 wt% of propylene and 15-50 wt% of a catalytic cracking distillate oil, relative to the weight of the hydrocarbon-containing feedstock oil;

ii) separating the reaction product from step i) to obtain a catalytic cracking distillate oil, wherein the catalytic cracking distillate oil has an initial boiling point of no less than 200 ºC, a final boiling point of no greater than 520 ºC, and a hydrogen content of no greater than 12.0 wt%; and

iii) subjecting the catalytic cracking distillate oil to hydrodesulfurization to obtain a low-sulfur hydrogenated distillate oil and outputting the low-sulfur hydrogenated distillate oil for use as a fuel oil component, wherein the obtained low-sulfur hydrogenated distillate oil has a sulfur content of no greater than 0.1%;

wherein the catalytic conversion catalyst comprises 1-50 wt% zeolite, 5-99 wt% inorganic oxide, and 0-70 wt% clay, based on the total weight of the catalyst.

2. The process according to claim 1, wherein in said catalytic conversion catalyst, said zeolite comprises 51-100 wt% mesoporous zeolite and 0-49 wt% macroporous zeolite, based on the total weight of the zeolite, wherein said mesoporous zeolite has a silica-alumina ratio of greater than 10, preferably greater than 50, most preferably greater than 100;

preferably, the mesoporous zeolite is selected from the group consisting of ZSM-type zeolites and ZRP zeolites; and the macroporous zeolite is a Y-type zeolite.

3. The process according to any one of the preceding claims, wherein step i) is carried out to such an extent that the resulting reaction product has a propylene/propane mass ratio of no less than 4, preferably no less than 6, most preferably no less than 8; and/or an isobutene/isobutane mass ratio of no less than 1, preferably no less than 1.5, most preferably no less than 1.8.

4. The process according to any one of the preceding claims, wherein step i) is carried out to such an extent that the yield of the catalytic cracking distillate oil in the resulting reaction product is not less than 15%, preferably not less than 20%, more preferably not less than 25%, and not more than 50wt%, relative to the weight of said hydrocarbon-containing feedstock oil.

5. The process according to any one of the preceding claims, wherein the hydrocarbon-containing feedstock oil is selected from the group consisting of petroleum hydrocarbons, other mineral oils or mixtures thereof, wherein the petroleum hydrocarbon is selected from the group consisting of vacuum gas oils, atmospheric gas oils, coker gas oils, deasphalted oils, vacuum residues, atmospheric residues, hydrogenated heavy oils or any mixtures thereof, and said other mineral oil is selected from the group consisting of coal liquefied oils, tar sand oils, shale oils or any mixtures thereof.

6. The process according to any one of the preceding claims, wherein the catalytic conversion reactor is a fluidized bed reactor, including a single fluidized bed reactor or a composite reactor comprising a plurality of fluidized bed reactors connected in series or in parallel, preferably an equal-diameter riser reactor or various types of varied-diameter fluidized bed reactors.

7. The process according to any one of the preceding claims, wherein said catalytic cracking distillate oil has an initial boiling point of no less than 250 ºC, a final boiling point of no greater than 500 ºC, and a hydrogen content of no greater than 11.5 wt%.

8. The process according to any one of the preceding claims, wherein a catalyst comprising a Group VIB metal and/or a Group VIII metal supported on an alumina and/or amorphous silica-alumina carrier is used in the hydrodesulfurization step iii).

9. The process according to claim 8, wherein the catalyst used in the hydrodesulfurization step iii) comprises 0-10 wt% of an additive, 1-40 wt% of at least one Group VIII metal (calculated as metal oxide), and 1-50 wt% of at least one Group VIB metal (calculated as metal oxide), with the balance being a carrier selected from alumina and amorphous silica-alumina, wherein the additive comprises an element selected from the group consisting of fluorine, phosphorus, titanium, platinum or a combination thereof.

10. The process according to any one of the preceding claims, wherein the conditions of the hydrodesulfurization step iii) include: a reaction pressure of 2.0-24.0MPa, a reaction temperature of 200-500 ºC, a hydrogen-to-oil volume ratio of 50-5000 Nm^3/m^3, and a liquid hourly space velocity of 0.1-30.0 h^{-1},

preferably, the conditions of the hydrodesulfurization step iii) include: a reaction pressure

of 3.0-15.0 MPa; a reaction temperature of 300-400 ºC; a hydrogen-to-oil volume ratio of 200-2000 Nm^3/m^3; and a liquid hourly space velocity of 0.2-10.0 h^{-1}.

11. The process according to any one of the preceding claims, wherein the low-sulfur hydrogenated distillate oil obtained in step iii) has a sulfur content of no greater than 0.05%.