BRIEF DESCRIPTION OF THE DRAWINGS

Figure 1 represents a scheme for an ionic liquid catalyzed hydrocarbon conversion process using an oxygenate containing hydrocarbon feed, according to an embodiment of the present invention;

Figure 2 represents a scheme for an olefin enrichment process using an oxygenate containing hydrocarbon feed, according to an aspect of the process of Figure 1; and

Figure 3 represents a scheme for an ionic liquid catalyzed olefin oligomerization process, according to another embodiment of the present invention.

SUMMARY

According to one aspect of the present ~~invention~~disclosure there is provided an olefin oligomerization process comprising contacting a first hydrocarbon stream comprising C_2 – C_8 olefins with an ionic liquid catalyst in a hydrocarbon conversion zone under oligomerization conditions to oligomerize the olefins and to provide a first distillate enriched stream including one or more halogenated components, and removing the one or more halogenated components from the first distillate enriched stream to provide a dechlorinated distillate enriched stream.

In another embodiment, the present ~~invention~~disclosure further provides an olefin oligomerization process comprising providing a first Fischer-Tropsch derived hydrocarbon stream comprising a C_8- Fischer-Tropsch condensate comprising oxygenates; contacting the Fischer-Tropsch condensate with a dehydration catalyst in a dehydration zone under oxygenate dehydrating conditions to convert at least a portion of the oxygenates in the Fischer-Tropsch condensate to olefins and to provide an olefin enriched Fischer-Tropsch condensate; contacting the olefin enriched Fischer-Tropsch condensate with an ionic liquid catalyst in an oligomerization zone under oligomerization conditions to oligomerize the olefins and to provide a first distillate enriched stream including one or more halogenated components; contacting the first distillate enriched stream with a

hydrodechlorination catalyst in the presence of hydrogen in a hydrodechlorination zone under hydrodechlorination conditions to provide a dechlorinated distillate enriched stream; contacting at least one of a second Fischer-Tropsch derived hydrocarbon stream and a third Fischer-Tropsch derived hydrocarbon stream with a hydroprocessing catalyst in a hydroprocessing zone under hydroprocessing conditions to provide a second distillate enriched stream; feeding the second distillate enriched stream and the dechlorinated distillate enriched stream to a distillation unit; and via the distillation unit, separating a distillate product from at least one of the dechlorinated distillate enriched stream and the second distillate enriched stream.

In a first aspect, there is provided a process for increasing distillate yield, comprising: a) separating a product from a Fischer-Tropsch unit into: i) a first hydrocarbon stream comprising C_2-C_8 olefins; and ii) a second hydrocarbon stream comprising a C_{9+} Fischer-Tropsch condensate; b) contacting the first hydrocarbon stream comprising C_2-C_8 olefins with an ionic liquid catalyst and an alkyl halide co-catalyst in a hydrocarbon conversion zone under oligomerization conditions to oligomerize the olefins and to provide a first distillate enriched stream including one or more halogenated components; and c) removing the one or more halogenated components from the first distillate enriched stream to provide a dechlorinated distillate enriched stream; d) providing at least one of the second hydrocarbon stream comprising the C_{9+} Fischer-Tropsch condensate and a third hydrocarbon stream comprising C_{19+} paraffins; and e) contacting at least one of the second hydrocarbon stream and the third hydrocarbon stream with a hydroprocessing catalyst in a hydroprocessing zone under hydroprocessing conditions to provide a second distillate enriched stream; wherein the hydroprocessing zone includes a hydrocracking zone.

In a second aspect, there is provided a process for increasing distillate yield, comprising: a) separating a product from a Fischer-Tropsch unit into: i) a first Fischer-Tropsch derived hydrocarbon stream, comprising a C_{8-} Fischer-Tropsch condensate comprising oxygenates; and ii) a second Fischer-Tropsch derived hydrocarbon stream, comprising a C_{9+} Fischer-Tropsch condensate; b) contacting the C_{8-} Fischer-Tropsch condensate comprising oxygenates with a dehydration catalyst in a dehydration zone under

oxygenate dehydrating conditions to convert at least a portion of the oxygenates in the C_{8-} Fischer-Tropsch condensate to olefins and to provide an olefin enriched Fischer-Tropsch condensate; c) contacting the olefin enriched Fischer-Tropsch condensate with an ionic liquid catalyst and an alkyl halide co-catalyst in an oligomerization zone under oligomerization conditions to oligomerize the olefins and to provide a first distillate enriched stream including one or more halogenated components; d) contacting the first distillate enriched stream with a hydrodechlorination catalyst in the presence of hydrogen in a hydrodechlorination zone under hydrodechlorination conditions to provide a dechlorinated distillate enriched stream; e) contacting the second Fischer-Tropsch derived hydrocarbon stream, comprising a C_{9+} Fischer-Tropsch condensate, and a third Fischer-Tropsch derived hydrocarbon stream comprising Fischer-Tropsch wax with a hydroprocessing catalyst in a hydroprocessing zone under hydroprocessing conditions to provide a second distillate enriched stream; wherein the hydroprocessing zone includes a hydrocracking zone; f) feeding the second distillate enriched stream and the dechlorinated distillate enriched stream to a distillation unit; and g) via the distillation unit, separating a distillate product from at least one of the dechlorinated distillate enriched stream and the second distillate enriched stream.

As used herein, the terms "comprising" and "comprises" mean the inclusion of named elements or steps that are identified following those terms, but not necessarily excluding other unnamed elements or steps.

The term "Periodic Table" as referred to herein is the IUPAC version of the Periodic Table of the Elements dated June 22, 2007, and the numbering scheme for the Periodic Table Groups is as described in Chemical and Engineering News, 63(5), 27 (1985).

The term "distillate" or "distillate product" as referred to herein, is a hydrocarbon product boiling in the range of 250°F+ (121°C+).

WHAT IS CLAIMED IS:

1. An olefin oligomerization process, comprising:

a) contacting a first hydrocarbon stream comprising C_2 – C_8 olefins with an ionic liquid catalyst in a hydrocarbon conversion zone under oligomerization conditions to oligomerize the olefins and to provide a first distillate enriched stream including one or more halogenated components; and

b) removing the one or more halogenated components from the first distillate enriched stream to provide a dechlorinated distillate enriched stream.

2. The olefin oligomerization process according to claim 1, wherein the first hydrocarbon stream comprises a C_8 Fischer-Tropsch condensate.

3. The olefin oligomerization process according to claim 1, wherein step b) comprises contacting the first distillate enriched stream with a hydrodechlorination catalyst in the presence of hydrogen in a hydrodechlorination zone under hydrodechlorination conditions.

4. The olefin oligomerization process according to claim 1, wherein the first hydrocarbon stream further comprises oxygenates, and the process further comprises:

c) prior to step a), contacting the first hydrocarbon stream with a dehydration catalyst in a dehydration zone under oxygenate dehydrating conditions to dehydrate at least a portion of the oxygenates.

5. The olefin oligomerization process according to claim 4, wherein the first hydrocarbon stream further comprises isoparaffins, and the process further comprises:

d) concurrently with step a), contacting the first hydrocarbon stream with the ionic liquid catalyst in the hydrocarbon conversion zone under alkylation conditions to alkylate the olefins with the isoparaffins.

6. The olefin oligomerization process according to claim 5, wherein at least one reaction condition of the hydrocarbon conversion zone is adjusted to selectively promote the alkylation of the olefins with the isoparaffins.

7. The olefin oligomerization process according to claim 1, wherein at least one reaction condition of the hydrocarbon conversion zone is adjusted to selectively promote the oligomerization of the olefins.

8. The olefin oligomerization process according to claim 7, wherein at least about 70% of the olefins in the first hydrocarbon stream are oligomerized.

9. The olefin oligomerization process according to claim 1, wherein a first chloride content of the first distillate enriched stream is greater than 50 ppm, and a second chloride content of the dechlorinated distillate enriched stream is less than 50 ppm.

10. The olefin oligomerization process according to claim 1, further comprising:

e) providing at least one of a second hydrocarbon stream and a third hydrocarbon stream;

f) contacting at least one of the second hydrocarbon stream and the third hydrocarbon stream with a hydroprocessing catalyst in a hydroprocessing zone under hydroprocessing conditions to provide a second distillate enriched stream.

11. The olefin oligomerization process according to claim 10, further comprising:

g) feeding the second distillate enriched stream and the dechlorinated distillate enriched stream to a distillation unit; and

h) via the distillation unit, separating a distillate product from at least one of the dechlorinated distillate enriched stream and the second distillate enriched stream.

12. The olefin oligomerization process according to claim 11, wherein the distillate product has a chloride content less than about 10 ppm.

13. The olefin oligomerization process according to claim 11, wherein the distillate product comprises at least about 70 vol% of a distillation unit product stream.

14. The olefin oligomerization process according to claim 10, wherein the second hydrocarbon stream comprises a $C_9 - C_{18}$ condensate, and step f) comprises hydrotreating the $C_9 - C_{18}$ condensate to provide at least a portion of the second distillate enriched stream.

15. The olefin oligomerization process according to claim 10, wherein the third hydrocarbon stream comprises Fischer-Tropsch wax, and step f) comprises hydrocracking the wax to provide at least a portion of the second distillate enriched stream.

16. The olefin oligomerization process according to claim 11, further comprising:

i) via the distillation unit, separating a bottoms fraction from at least one of the dechlorinated distillate enriched stream and the second distillate enriched stream;

j) recycling the bottoms fraction to the hydroprocessing zone; and

k) via the hydroprocessing zone, hydrocracking the bottoms fraction to provide a portion of the second distillate enriched stream.

17. The olefin oligomerization process according to claim 3, wherein the hydrodechlorination catalyst comprises an element selected from the group consisting of elements of Groups 6, 8, 9, 10, and 11 of the Periodic Table, and combinations thereof, present as metals, oxides, or sulfides.

18. The olefin oligomerization process according to claim 3, wherein step b) comprises contacting the first distillate enriched stream with the hydrodechlorination catalyst at a temperature in the range from about 300°F to 750°F, a pressure in the range from about 100 to 5000 psig, a liquid hourly space velocity (LHSV) feed rate in the range from about 0.1 to 50, and a hydrogen supply in the range from about 200 to 8000 standard cubic feet per barrel (SCFB) of the first distillate enriched stream.

19. An olefin oligomerization process, comprising:

a) providing a first Fischer-Tropsch derived hydrocarbon stream comprising a C_8- Fischer-Tropsch condensate comprising oxygenates;

b) contacting the Fischer-Tropsch condensate with a dehydration catalyst in a dehydration zone under oxygenate dehydrating conditions to convert at least a portion of the

oxygenates in the Fischer-Tropsch condensate to olefins and to provide an olefin enriched Fischer-Tropsch condensate;

c) contacting the olefin enriched Fischer-Tropsch condensate with an ionic liquid catalyst in an oligomerization zone under oligomerization conditions to oligomerize the olefins and to provide a first distillate enriched stream including one or more halogenated components;

d) contacting the first distillate enriched stream with a hydrodechlorination catalyst in the presence of hydrogen in a hydrodechlorination zone under hydrodechlorination conditions to provide a dechlorinated distillate enriched stream;

e) contacting at least one of a second Fischer-Tropsch derived hydrocarbon stream and a third Fischer-Tropsch derived hydrocarbon stream with a hydroprocessing catalyst in a hydroprocessing zone under hydroprocessing conditions to provide a second distillate enriched stream;

f) feeding the second distillate enriched stream and the dechlorinated distillate enriched stream to a distillation unit; and

g) via the distillation unit, separating a distillate product from at least one of the dechlorinated distillate enriched stream and the second distillate enriched stream.

20. The olefin oligomerization process according to claim 19, wherein step e) comprises contacting each of the second Fischer-Tropsch derived hydrocarbon stream and the third Fischer-Tropsch derived hydrocarbon stream with the hydroprocessing catalyst in the hydroprocessing zone under hydroprocessing conditions, wherein the second Fischer-Tropsch derived hydrocarbon stream comprises a $C_9 - C_{18}$ Fischer-Tropsch condensate, and the third Fischer-Tropsch derived hydrocarbon stream comprises Fischer-Tropsch wax.

Claims:

1. A process for increasing distillate yield, comprising: a) separating a product from a Fischer-Tropsch unit into: i) a first hydrocarbon stream comprising C_2-C_8 olefins; and ii) a second hydrocarbon stream comprising a C_{9+} Fischer-Tropsch condensate; b) contacting the first hydrocarbon stream comprising C_2-C_8 olefins with an ionic liquid catalyst and an alkyl halide co-catalyst in a hydrocarbon conversion zone under oligomerization conditions to oligomerize the olefins and to provide a first distillate enriched stream including one or more halogenated components; and c) removing the one or more halogenated components from the first distillate enriched stream to provide a dechlorinated distillate enriched stream; d) providing at least one of the second hydrocarbon stream comprising the C_{9+} Fischer-Tropsch condensate and a third hydrocarbon stream comprising C_{19+} paraffins; and e) contacting at least one of the second hydrocarbon stream and the third hydrocarbon stream with a hydroprocessing catalyst in a hydroprocessing zone under hydroprocessing conditions to provide a second distillate enriched stream; wherein the hydroprocessing zone includes a hydrocracking zone.

2. The process according to claim 1, wherein step c) comprises contacting the first distillate enriched stream with a hydrodechlorination catalyst in the presence of hydrogen in a hydrodechlorination zone under hydrodechlorination conditions.

3. The process according to claim 1, wherein the first hydrocarbon stream further comprises isoparaffins, and the process further comprises: d) concurrently with step b), contacting the first hydrocarbon stream with the ionic liquid catalyst in the hydrocarbon conversion zone under alkylation conditions to alkylate the olefins with the isoparaffins.

4. The process according to claim 3, wherein at least one reaction condition of the hydrocarbon conversion zone is adjusted to selectively promote the alkylation of the olefins with the isoparaffins.

5. The process according to claim 1, wherein at least one reaction condition of the hydrocarbon conversion zone is adjusted to selectively promote the oligomerization of the olefins.

6. The process according to claim 5, wherein at least about 70% of the olefins in the first hydrocarbon stream are oligomerized.

7. The process according to claim 1, wherein a first chloride content of the first distillate enriched stream is greater than 50 ppm, and a second chloride content of the dechlorinated distillate enriched stream is less than 50 ppm.

8. The process according to claim 1, further comprising: f) feeding the second distillate enriched stream and the dechlorinated distillate enriched stream to a distillation unit; and g) via the distillation unit, separating a distillate product from at least one of the dechlorinated distillate enriched stream and the second distillate enriched stream.

9. The process according to claim 8, wherein the distillate product has a chloride content less than about 10 ppm.

10. The process according to claim 8, wherein the distillate product comprises at least about 70 vol % of a distillation unit product stream.

11. The process according to claim 1, wherein the second hydrocarbon stream comprises a C_9-C_{18} Fischer-Tropsch condensate, and additionally comprises f) hydrotreating the C_9-C_{18} Fischer-Tropsch condensate to provide at least a portion of the second distillate enriched stream.

12. The process according to claim 11, wherein the third hydrocarbon stream comprises a Fischer-Tropsch wax, and step e) comprises hydrocracking the Fischer-Tropsch wax to provide at least a portion of the second distillate enriched stream.

13. The process according to claim 8, further comprising: i) via the distillation unit, separating a bottoms fraction from at least one of the dechlorinated distillate enriched stream and the second distillate enriched stream; j) recycling the bottoms fraction to the hydroprocessing zone; and k)

via the hydroprocessing zone, hydrocracking the bottoms fraction to provide a portion of the second distillate enriched stream.

14. The process of claim 1, wherein a yield of LPG and a yield of naphtha are decreased compared to an integrated Fischer-Tropsch process with hydroprocessing and without contacting the first hydrocarbon stream comprising C_2-C_8 olefins with the ionic liquid catalyst and the alkyl halide co-catalyst in the hydrocarbon conversion zone under oligomerization conditions.

15. The process of claim 1, additionally comprising decreasing a relative amount of the alkyl halide co-catalyst in the hydrocarbon conversion zone to cause an alkylation to be suppressed.

16. The process of claim 1, additionally comprising increasing a relative amount of the alkyl halide co-catalyst in the hydrocarbon conversion zone to favor an alkylation.

17. A process for increasing distillate yield, comprising: a) separating a product from a Fischer-Tropsch unit into: i) a first Fischer-Tropsch derived hydrocarbon stream, comprising a C_{8-} Fischer-Tropsch condensate comprising oxygenates; and ii) a second Fischer-Tropsch derived hydrocarbon stream, comprising a C_{9+} Fischer-Tropsch condensate; b) contacting the C_{8-} Fischer-Tropsch condensate comprising oxygenates with a dehydration catalyst in a dehydration zone under oxygenate dehydrating conditions to convert at least a portion of the oxygenates in the C_{8-} Fischer-Tropsch condensate to olefins and to provide an olefin enriched Fischer-Tropsch condensate; c) contacting the olefin enriched Fischer-Tropsch condensate with an ionic liquid catalyst and an alkyl halide co-catalyst in an oligomerization zone under oligomerization conditions to oligomerize the olefins and to provide a first distillate enriched stream including one or more halogenated components; d) contacting the first distillate enriched stream with a hydrodechlorination catalyst in the presence of hydrogen in a hydrodechlorination zone under hydrodechlorination conditions to provide a dechlorinated distillate enriched stream; e) contacting the second Fischer-Tropsch derived hydrocarbon stream, comprising a C_{9+} Fischer-Tropsch condensate, and a third Fischer-Tropsch derived hydrocarbon stream comprising Fischer-Tropsch wax with a hydroprocessing catalyst in a hydroprocessing zone under

hydroprocessing conditions to provide a second distillate enriched stream; wherein the hydroprocessing zone includes a hydrocracking zone; f) feeding the second distillate enriched stream and the dechlorinated distillate enriched stream to a distillation unit; and g) via the distillation unit, separating a distillate product from at least one of the dechlorinated distillate enriched stream and the second distillate enriched stream.

18. The process according to claim 17, wherein step e) comprises contacting each of the second Fischer-Tropsch derived hydrocarbon stream and the third Fischer-Tropsch derived hydrocarbon stream with the hydroprocessing catalyst in the hydroprocessing zone under hydroprocessing conditions, wherein the second Fischer-Tropsch derived hydrocarbon stream comprises a C_9-C_{18} Fischer-Tropsch condensate, and the third Fischer-Tropsch derived hydrocarbon stream comprises C_{19+} paraffins.

19. The process according to claim 17, additionally comprising: h) via the distillation unit, separating a bottoms fraction from at least one of the dechlorinated distillate enriched stream and the second distillate enriched stream; i) recycling the bottoms fraction to the hydroprocessing zone; and j) via the hydroprocessing zone, hydrocracking the bottoms fraction to provide a portion of the second distillate enriched stream.

20. The process according to claim 17, additionally comprising separating a syngas from the product from a Fischer-Tropsch unit and recycling the syngas to the Fischer-Tropsch unit.

21. The process according to claim 17, wherein a rate of withdrawal of a spent ionic liquid catalyst and concomitant replenishment with a fresh ionic liquid is controlled to adjust reaction conditions within the oligomerization zone.

22. The process according to claim 17, wherein a rate at which a used ionic liquid is fed to a catalyst regeneration unit is controlled to adjust the reaction conditions within the oligomerization zone.

23. The process according to claim 17, wherein the hydrodechlorination catalyst comprises an

element selected from the group consisting of elements of Groups 6, 8, 9, 10, and 11 of the Periodic Table, and combinations thereof, present as metals, oxides, or sulfides.

24. The process of claim 17, wherein a yield of LPG and a yield of naphtha are decreased compared to an integrated Fischer-Tropsch process with hydroprocessing and without contacting the olefin enriched Fischer-Tropsch condensate with the ionic liquid catalyst and the alkyl halide co-catalyst in the oligomerization zone under oligomerization conditions.

25. The process of claim 17, additionally comprising decreasing a relative amount of the alkyl halide co-catalyst in the oligomerization zone to cause an alkylation to be suppressed.

26. The process of claim 17, additionally comprising increasing a relative amount of the alkyl halide co-catalyst in the oligomerization zone to favor an alkylation.