Claims

1. A method for simultaneous production of components suitable for production of base oil and fuel components, comprising the steps of:

a) introducing a feedstock comprising fatty acids and/or fatty acid esters into a reaction zone, and

b) subjecting said feedstock to a ketonisation reaction in said reaction zone in the presence of a dual catalyst system configured to perform a ketonisation reaction and a hydrotreatment reaction, under hydrogen pressure, and

c) obtaining from said ketonisation reaction ketones in addition to linear hydrocarbons from said fatty acids and/or fatty acid esters.

2. The method according to claim 1, wherein said obtained ketones are further hydrodeoxygenated to form linear hydrocarbons.

3. The method according to claim 1 or 2, wherein said fatty acid esters are triglycerides.

4. The method according to any one of the claims 1-3, wherein said feedstock is at least partly, preferably completely, in liquid form when entered into said reaction zone.

5. The method according to any one of the claims 1-4, wherein the pressure in said reaction zone is less than 10 MPa, preferably from 0.1 to 5 MPa.

6. The method according to any one of the claims 1-5, wherein the temperature in said reaction zone is from 200 to 450 °C.

7. The method according to any one of the claims 1-6, wherein the ratio of hydrogen to feedstock is from 100 to 600 Nl/l, preferably from 100 to 500 Nl/l.

8. A method for simultaneous production of base oil components and fuel components, comprising the steps of

(i) introducing a feedstock comprising fatty acids and/or fatty acid esters into a reaction zone, and

(ii) subjecting said feedstock to a ketonisation reaction in said reaction zone in the presence of a dual catalyst system configured to perform a ketonisation reaction and a hydrotreatment reaction under hydrogen pressure, and

(iii) subjecting ketones resulting from step (ii) to a hydrodeoxygenation step to form linear hydrocarbons, and

(iv) introducing said linear hydrocarbons resulting from step (ii) and (iii) into an isomerization unit under isomerization conditions wherein a mixture of branched hydrocarbons is formed, and

(v) separating from said mixture of branched hydrocarbons components suitable for use as base oil, having a carbon number range from C24-C43, from hydrocarbons suitable for use as fuel components, having a carbon number range from C5 to C23.

9. A dual catalyst system configured to perform a ketonisation reaction and a hydrotreatment reaction, comprising

a metal oxide ketonisation catalyst in which the metal is selected from the group consisting of Na, Mg, K, Ca, Sc, Cr, Mn, Fe, Co, Ni, Cu, Zn, Sr, Ti, Y, Zr, Mo, Rh, Cd, Sn, La, Pb, Bi, Ti, V and other rare earth metals and any combination thereof; and

a metal hydrotreatment catalyst wherein the metal is selected from the group consisting of Fe, Pd, Pt, Ni, Mo, Co, Ru, Rh, W and any combination thereof.

10. The dual catalyst system according to claim 9, wherein said dual catalyst system comprises a mixture or combination of a ketonisation catalyst and a hydrotreatment catalyst.

11. The dual catalyst system according to claim 10, wherein said dual catalyst system contains 40 – 90 % by weight of said ketonisation catalyst, preferably 70 – 90 % by weight of said ketonisation catalyst.

12. The dual catalyst system according to any one of the claims 9-11, wherein said ketonisation catalyst is a metal oxide catalyst, in which the metal is selected from the group consisting of K, Ti, and a combination thereof.

13. The dual catalyst system according to any one of the claims 9-12, wherein the dual catalyst system is supported, preferably on alumina, silica or active carbon support.

14. The dual catalyst system according to any one of the claims 9-13, wherein said dual catalyst system comprises NiMo and K_2O/TiO_2 on a support.

15. The dual catalyst system according to any one of the claims 9-14, wherein said dual catalyst system comprises a sulfided hydrotreatment and/or ketonisation catalyst.

16. A production system for simultaneous production of base oil components and fuel components, comprising:

(a) at least one reaction unit comprising at least one reaction zone including a dual catalyst system configured to perform a ketonisation reaction and a hydrotreatment reaction under hydrogen pressure for producing ketones

and linear hydrocarbons; and

(b) at least one reaction unit comprising at least one reaction zone configured to perform hydrodeoxygenation to said ketones into linear hydrocarbons; and

(c) at least one reaction unit comprising at least one reaction zone configured to isomerize said linear hydrocarbons; and

(d) at least one distillation installation configured to separate base oil components from fuel components;

wherein at least one reaction unit (a) is connected to at least one reaction unit (b), and wherein at least one reaction unit (b) is connected to at least one distillation installation (c), and wherein at least one reaction unit (c) is connected to at least one distillation installation (d),

wherein the system further comprises a flow path for recycling hydrocarbons from unit (b), (c) or (d) back to unit (a).

Claims

1. A method for simultaneous production of components suitable for production of base oil and fuel components, comprising the steps of:

a) introducing a feedstock comprising fatty acids and/or fatty acid esters into a reaction zone, and

b) subjecting said feedstock to a ketonisation reaction in said reaction zone in the presence of a dual catalyst system configured to perform a ketonisation reaction and a hydrotreatment reaction, under hydrogen pressure, and

c) obtaining from said ketonisation reaction ketones in addition to linear hydro-carbons from said fatty acids and/or fatty acid esters.

2. The method according to claim 1, wherein said obtained ketones are further hydrodeoxygenated to form linear hydrocarbons.

3. The method according to claim 1, wherein said fatty acid esters are triglycerides.

4. The method according to claim 1, wherein said feedstock is at least partly in liquid form when entered into said reaction zone.

5. The method according to claim 1, wherein the pressure in said reaction zone is less than 10 MPa.

6. The method according to claim 1, wherein the temperature in said reaction zone is from 200 to 450°C.

7. The method according to claim 1, wherein the ratio of hydrogen to feedstock is from 100 to 600 Nl/l,.

8. A method for simultaneous production of base oil components and fuel components, comprising the steps of

(i) introducing a feedstock comprising fatty acids and/or fatty acid esters into a reaction zone, and

(ii) subjecting said feedstock to a ketonisation reaction in said reaction zone in the presence of a dual catalyst system configured to perform a ketonisation reaction and a hydrotreatment reaction under hydrogen pressure, and

(iii) subjecting ketones resulting from step (ii) to a hydrodeoxygenation step to form linear hydrocarbons, and

(iv) introducing said linear hydrocarbons resulting from step (ii) and (iii) into an isomerization unit under isomerization conditions wherein a mixture of branched hydrocarbons is formed, and

(v) separating from said mixture of branched hydrocarbons components suitable for use as base oil, having a carbon number range from C24-C43, from hydrocarbons suitable for use as fuel components, having a carbon number range from C5 to C23.

9. A production system for simultaneous production of base oil components and fuel components, comprising:

(a) at least one reaction unit comprising at least one reaction zone including a dual catalyst system configured to perform a ketonisation reaction and a hydrotreatment reaction under hydrogen pressure for producing ketones and linear hydrocarbons; and

(b) at least one reaction unit comprising at least one reaction zone configured to perform hydrodeoxygenation to said ketones into linear hydrocarbons; and

(c) at least one reaction unit comprising at least one reaction zone configured to isomerize said linear hydrocarbons; and

(d) at least one distillation installation configured to separate base oil components from fuel components;

wherein at least one reaction unit (a) is connected to at least one reaction unit (b), and wherein at least one reaction unit (b) is connected to at least one distillation installation (c), and wherein at least one reaction unit (c) is connected to at least one distillation installation (d),

wherein the system further comprises a flow path for recycling hydrocarbons from unit (b), (c) or (d) back to unit (a).

10. The method according to claim 1, wherein said feedstock is completely in liquid form when entered into said reaction zone.

11. The method according to claim 1, wherein the pressure in said reaction zone is from 0.1 to 5 MPa.

12. The method according to claim 1, wherein the ratio of hydrogen to feedstock is from 100 to 500 Nl/l.