Claims

1. A method for combined production of aviation fuel and marine fuel both of biological origin, the method comprising

providing feedstock of biological origin containing fatty acids and/or esters of fatty acids, and

subjecting the feedstock to hydrotreatment for removal of oxygen, and to isomerization for branching of hydrocarbon chain of hydrotreated feedstock having a carbon number distribution in the range of C10 to C20, and wherein the hydrotreatment is performed in the presence of one or more catalyst(s) selected from hydrogenation metal on a support, such as ~~using~~ a catalyst ~~comprising one or more catalyst(s)~~ selected from a group consisting of Pd, Pt, Ni, Co, Mo, Ru, Rh, W or any combination thereof, ~~CoMo, NiMo, NiW, CoNiMo on a support,~~ under hydrogen pressure from 10 to 150 bar, and at a temperature from ~~250~~200-~~380~~ 400 °C, and wherein the isomerization is performed in the presence of one or more catalyst(s) comprising a Group VIII metal on a support, and the support is selected from silica, alumina, clays, titanium oxide, boron oxide, zirconia, which can be used alone or as a mixture, preferably silica and/or alumina, at a temperature from ~~280~~200-~~370~~ 500 °C, and at a pressure of ~~20~~10-~~50~~ 150 bar, to obtain a paraffinic hydrocarbon intermediate, and

fractionating said paraffinic hydrocarbon intermediate into at least two fractions,

a lighter fraction fulfilling the specification ASTM D7566-20 Annex A2 for aviation fuel, and

a heavier fraction fulfilling the ~~specifications~~ requirements of ISO 8217(2017) standard for marine fuel,

wherein the production capacity of the lighter fraction and the production capacity of the heavier fraction are adjusted by selection of process conditions, preferably the isomerization process conditions, wherein yield of the lighter fraction is 60-90 wt-% of the total weight of the formed fractions, and yield of the heavier fraction is 10-40 wt-% of the total weight of the formed fractions, and

wherein a combined yield of the two fractions is at least 98 wt-% of the paraffinic hydrocarbon intermediate of biological origin.

2. The method according to claim 1, wherein the hydrotreatment, preferably hydrodeoxygenation, is performed under a hydrogen pressure from ~~30~~20 ~~-100~~ 120, such as 30-100 bar, and at a temperature from ~~280~~250 ~~-360~~ 380 °C, such as 280-360 °C.

3. The method according to claim 1 or 2, wherein the hydrotreatment is performed in the presence of a catalyst comprising one or more catalyst(s) selected from CoMo, NiMo, NiW, CoNiMo on a support, for example an alumina support.

4. The method according to any one of the claims 1-3, wherein the isomerization, preferably hydroisomerization, is performed at a temperature of 280-370 °C, and at a pressure of 20-50 bar.

~~3~~5. The method according to ~~claim 1 or 2~~any one of claims 1-4, wherein the feedstock is subjected, after hydrotreatment and isomerization, to stabilization at a pressure lower than the isomerization pressure.

~~4~~6. The method according to claim ~~3~~5, wherein during stabilization an overhead fraction comprising hydrocarbons in the naphtha range (C4-C8) is formed, and preferably an amount of 60 wt-% or more, such as 90 wt-% or more, such as from 90 to 95 wt-%, of the formed hydrocarbons in the naphtha range at the stabilization column overhead is recycled back to the stabilization.

~~5~~7. A marine fuel component of biological origin obtained by the method according to any one of claims 1-~~4,~~6, comprising 0-5 wt-% of n-paraffins in C16-C20 range and 90-97 wt-% isoparaffins in C16-C20 range, from 20 wt-% to 45 wt-% of C17 paraffins and from 50 wt-% to 75 wt-% of C18 paraffins.

~~6~~8. The marine fuel component of biological origin according to claim ~~5~~7, wherein the marine fuel component comprises 0-8 wt-% of n-paraffins in C17-C19 range, preferably 0-5 wt-%.

~~7~~9. The marine fuel component of biological origin according to claim ~~5~~ 7 or ~~6~~8, wherein the marine fuel component comprises 85-95 wt-% isoparaffins in C17-C20 range, preferably 88-95 wt-%.

~~8~~10. The marine fuel component of biological origin according to any one of claims ~~5~~7 -~~7~~9, wherein the marine fuel component comprises from 20 wt-% to 40 wt-% of C17 paraffins, preferably from 22 to 36 wt-%.

~~9~~11. The marine fuel component of biological origin according to any one of claims ~~5~~ 7 -~~8~~10, wherein the marine fuel component comprises from 45 wt-% to 75 wt-% of C18 paraffins, preferably from 53 wt% to 75 wt-%.

~~10~~12. The marine fuel component of biological origin according to any one of claims ~~5~~ 7 -~~9~~11, wherein the marine fuel component comprises 0-4 wt-% of n-paraffins in C17-C18 range and 85-90 wt% isoparaffins in C17-C18 range.

~~11~~13. The marine fuel component of biological origin according to any one of claims ~~5~~7 -~~10~~12, wherein the marine fuel component has one or more of the following properties

- oxidation stability (ISO 12205) less than of at least 25 g/m3, such as less than 10g/m3, or even such as less than 5 g/m3, or even ~~. Some of the~~ extremely low measured values ~~may be extremely low~~, such as less than 1 g/m3;
- density at 15°C ISO 12185 less than 890 kg/m3, such as less than 850 kg/m3, such as from 850 to 750 kg/m3, even such as from 820 to 770 kg/m3;
- total aromatics EN 12916 less than 1 ppm, such as less than 0.7 ppm, or even such as less than 0.6 ppm;
- kinematic viscosity at 40 °C ISO 3104 below 4.5 mm2/s, such as below 4.0 mm2/s, or such as below 3.8 mm2/s;
- flash point as measured according to ISO 2719 at least 100 °C, such as at least 120 °C, such as at least 130 °C, such as at least 145 °C;
- cloud point ISO 3015 less than -20 °C, such as less than -25 °C, such as less than -30 °C, or 32 °C or less;
- net heat of combustion ASTM D4809 within the range 33-36 MJ/l;
- modern carbon content (pMC, ASTM D6866) of about 100%;

● cetane index ISO 4264 at least 56, such as at least 70, or such as at least 90, or even more than 95;

● acid number ASTM D664 less than 0.5 mg KOH/g, such as less than 0.1 mg KOH/g, such as less than 0.001 mg KOH/g;

● pour point ISO 3016 lower than -20 °C, such as lower than -25 °C, such as lower than -30 °C, or even -40 °C or lower;

● amount of vanadium, sodium, aluminium, silicon, calcium and zinc are each below 1mg/kg, such as below 0.5 mg/kg, even below 0.1 mg/kg;

● sulphur content ISO 8754 less than 0.5 wt-%, such as less than 0.1 wt-%, such as less than 0.03 wt-%;

● hydrogen sulphide content IP 570 less than 2 mg/kg, such as less than 1 mg/kg;

● total sediment potential by ISO 10307-2 less than 0.1 wt-%, such as less than 0.01wt-%;

● CFPP IP309 less than -25 °C, such as less than -30°C.

14~~12~~. The marine fuel component of biological origin of any one of the claims ~~5~~7-~~11~~13, wherein the marine fuel component further comprises a lubricity additive.

~~13~~15. Use of the marine fuel component of biological origin according to any one of the claims ~~5~~7-~~12~~ 14 for a marine fuel blend fulfilling the requirements of ISO 8217(2017).

~~14~~16. Use of the marine fuel component according to any one of claims ~~5~~7-~~12~~ 14 for manufacturing a marine fuel blend comprising from 25 vol-% to 50 vol-% of said marine fuel component ~~and from 50 vol-% to 75 vol-% of an additional fossil marine fuel component, said additional marine fuel component selected from fossil marine fuel or HVO fuel or FAME or a combination thereof~~the remainder being fossil marine fuel or HVO fuel or FAME; or the remainder being a mixture of HVO fuel and fossil marine fuel; of the remainder being FAME and fossil marine fuel; or the remainder comprises a mixture of fossil marine fuel, HVO fuel and FAME.

~~15. Use of the marine fuel component according to any one of claims 5-12 for manufacturing a marine fuel blend comprising from 10 vol-% to 25 vol-% of the marine fuel component, the remainder being a mixture of HVO fuel and fossil marine fuel.~~

~~16. Use of the marine fuel blend according to any one of claims 5-12 for manufacturing a marine fuel blend comprising from 25 vol-% to 50 vol-% of said marine fuel component, the remainder being FAME and fossil marine fuel.~~

~~17. Use of the marine fuel component according to any one of claims 5-12 for manufacturing a marine fuel blend comprising from 25 vol-% to 50 vol-% of said marine fuel component, the remainder comprising a mixture of fossil marine fuel, HVO fuel and FAME.~~

~~18~~17. Use of the marine fuel component according to ~~any one of claims 13-17~~claim 15 or 16 or the marine fuel component of biological origin according to any one of claims ~~5~~7 ~~-12~~ 14 as fuel in marine engines and/or marine vessels.

~~19~~18. The use according to claim ~~18~~ 17 for reducing the GHG emissions at least 50 %, such as at least 70 %, or even such as at least 90 %, by gCO2eq/MJ calculated according to the EU Renewable Energy Directive 2009/28/EC.