CLAIMS

1. A method for upgrading a bio-based material, comprising the steps of:

(A) providing a bio-based fresh feed material of bio-renewable oils and/or fats having a glycerol-equivalent content of 2 wt.-% to 60 wt.-% relative to the total weight of the bio-based fresh feed material, wherein the glycerol-equivalent content is a content of glycerol and/or glycerol-based moieties in the bio-based fresh feed material and is calculated as follows:

glycerol-equivalent content =

(Molar amount of glycerol-based moieties [mol])* 89.07 g/mol /

(total mass of the bio-based fresh feed material [g]);

(B) subjecting a hydrotreatment feed comprising the bio-based fresh feed material and an optional diluent to a hydrotreatment comprising HDO in the presence of a sulphided metal catalyst and hydrogen (H_2), to provide a hydrotreated effluent, wherein the hydrotreatment feed comprises 10 - 10 000 wt.-ppm of sulphur-containing compound calculated as elemental S;

(C) subjecting the hydrotreated effluent to gas-liquid separation so as to provide a gaseous hydrotreated material comprising H_2, bio-propane, H_2O, H_2S, CO_2, and CO, and a liquid hydrotreated material comprising paraffinic hydrocarbons;

(D) subjecting the liquid hydrotreated material to fractionation, after an optional second hydrotreatment, and recovering at least diesel and/or kerosene range paraffinic hydrocarbon material;

(E) subjecting the gaseous hydrotreated material to a purification step for removing H_2S and CO_2 to obtain a H_2S and CO_2 depleted gaseous stream;

(F) subjecting the H_2S and CO_2 depleted gaseous stream to H_2 recovering and drying to obtain dried H_2S, CO_2 and H_2 depleted gaseous stream;

(G) fractionating the dried H_2S, CO_2 and H_2 depleted gaseous stream to recover a bio-propane gas composition, and optionally compressing the bio-propane gas composition to obtain a liquefied bio-propane composition.

2. The method according to claim 1, wherein

the bio-based fresh feed material has a glycerol-equivalent content of at least 3 wt.%, preferably at least 4 wt.%, more preferably at least 5 wt.%, even more preferably at least 6 wt.%, most preferably at least 7 wt.%, or at least 8 wt.%; and/or

the bio-based fresh feed material has a glycerol-equivalent content of 55 wt.% or less, preferably 50 wt.% or less, or 45 wt.% or less, or 40 wt.-% or less, or 35 wt.% or less, or 30 wt.-% or less, or 25 wt.% or less, or 20 wt.% or less; and/or

the bio-based fresh feed material has a glycerol-equivalent content of 4 wt.% to 50 wt.-%, preferably 6 wt.-% to 40 wt.-%, or 7 wt.-% to 30 wt.-%.

3. The method according to claim 1 or 2, wherein the hydrotreatment feed comprises 10 - 1 000 wt.-ppm, preferably 10 - 500 wt.-ppm, more preferably 10 - 300 wt.-ppm of Sulphur-containing compound calculated as elemental S.

4. The method according to any one of the preceding claims, comprising, in step (D), subjecting the liquid hydrotreated material to fractionation after a second hydrotreatment comprising hydroisomerization, and recovering at least diesel and/or kerosene range iso-paraffinic hydrocarbon material.

5. The method according to any one of the preceding claims, wherein the step (A) comprises a step (A') of pre-treating bio-renewable oil(s) and/or fat(s) for reducing contaminants in the oil(s) and/or fat(s) to produce the bio-based fresh feed material.

6. The method according to any one of the preceding claims, wherein the purification step (E) further comprises a step (E') of recovering the H_2S removed from the gaseous hydrotreated material and recycling the recovered H_2S to the hydrotreatment feed.

7. The method according to any one of the preceding claims, wherein the bio-propane gas composition and/or the liquefied bio-propane composition has a propane content of at least 90 wt.-%, at least 91 wt.-%, at least 92 wt.-%, at least 93 wt.-%, at least 94 wt.-%, at least 95 wt.-%, at least 96 wt.-%, or least 97 wt.-%.

8. The method according to any one of the preceding claims, further comprising a step of subjecting at least part of the bio-propane gas composition and/or the liquefied bio-propane composition to a conversion comprising catalytic dehydrogenation to obtain a dehydrogenation effluent, followed by recovering at least bio-propylene in the dehydrogenation effluent to obtain, after optional purification, a bio-propylene composition.

9. The method according to claim 8, further comprising (co)polymerizing at least bio-propylene of the bio-propylene composition and/or at least a derivative of bio-propylene of the bio-propylene composition, optionally together with other (co)monomer(s), to produce a bio-polymer.

10. A liquefied bio-propane composition having a vapour pressure of 1200-1500 kPa at 40°C and a density of 495-520 kg/m^3 at 15°C, and comprising:

at least 94 wt.-% of bio-propane;

at most 2000 wt.-ppm of CO_2;

at most 1000 wt.-ppm of CO;

at most 15 wt.-ppm of S-containing compounds, calculated as elemental S;

at most 1500 wt.-ppm of unsaturated hydrocarbons;

at most 5.5 wt.-% of hydrocarbons having more than 3 carbon atoms (C3+ hydrocarbons), whereof at most 1.4 wt.-% (relative to the liquefied bio-propane composition) are hydrocarbons having 5 or more carbon atoms,

and optionally at most 1500 wt.-ppm, preferably at most 1000 wt.-ppm, more preferably at most 800 wt.-ppm, even more preferably at most 500 wt.-ppm of propylene.

11. The liquefied bio-propane composition according to claim 10 which is produced by the method according to any one of claims 1 to 7.

12. A method for upgrading a bio-based material, comprising the steps of:

(A) providing a bio-based fresh feed material of bio-renewable oils and/or fats having a glycerol-equivalent content of 2 wt.-% to 60 wt.-% relative to the total weight of the bio-based fresh feed material, wherein the glycerol-equivalent content is a content of glycerol and/or glycerol-based moieties in the bio-based fresh feed material and is calculated as follows:

glycerol-equivalent content =

(Molar amount of glycerol-based moieties [mol])* 89.07 g/mol /

(total mass of the bio-based fresh feed material [g]);

(B) subjecting a hydrotreatment feed comprising the bio-based fresh feed material and an optional diluent to a hydrotreatment comprising HDO in the presence of a sulphided metal catalyst and hydrogen (H_2), to provide a hydrotreated effluent, wherein the hydrotreatment feed comprises 10 - 10 000 wt.-ppm of sulphur-containing compound calculated as elemental S;

(C) subjecting the hydrotreated effluent to gas-liquid separation so as to provide a gaseous hydrotreated material comprising H_2, bio-propane, H_2O, H_2S, CO_2, and CO, and a liquid hydrotreated material comprising paraffinic hydrocarbons;

(D) an optional step of subjecting the liquid hydrotreated material to fractionation, after an optional second hydrotreatment, and recovering at least diesel and/or kerosene range paraffinic hydrocarbon material;

(E) subjecting the gaseous hydrotreated material to a purification step for removing H_2S and CO_2 to obtain a H_2S and CO_2 depleted gaseous stream;

(F) subjecting the H_2S and CO_2 depleted gaseous stream to H_2 recovering and drying to obtain dried H_2S, CO_2 and H_2 depleted gaseous stream;

(G) fractionating the dried H_2S, CO_2 and H_2 depleted gaseous stream to recover a bio-propane gas composition, and optionally compressing the bio-propane gas composition to obtain a liquefied bio-propane composition;

(H) subjecting at least part of the bio-propane gas composition and/or the liquefied bio-propane composition to a conversion comprising catalytic dehydrogenation to obtain a dehydrogenation effluent comprising bio-propylene;

(I) recovering and optionally purifying a bio-propylene composition from the dehydrogenation effluent.

13. The method according to claim 12, further comprising derivatisation of at least part of the bio-propylene composition to obtain at least one bio-propylene derivative, preferably at least one bio-propylene derivative selected from the group consisting of bio-(meth)acrylic acid, bio-acrylonitrile, bio-acrolein and bio-propylene oxide.

14. The method according to claim 12 or 13, further comprising (co)polymerizing a mixture comprising at least part of the recovered bio-propylene composition and/or derivative(s) thereof and optionally co-monomer(s) and/or additive(s) to obtain a biopolymer composition.

15. A biopolymer composition obtainable by the method according to claim 14.