CLAIMS

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

pretreating bio-renewable oil(s) and/or fat(s) to provide a bio-renewable raw material, wherein the pretreatment step is a step of reducing contaminants containing S, N and/or P in the oil(s) and/or fat(s) to produce the bio-renewable raw material,

deoxygenating the bio-renewable raw material, followed by separation, to provide a propane feed, wherein the propane feed has a propane content of at least 80 wt.-%, and

subjecting the propane feed to catalytic dehydrogenation and to separation to provide a propylene material.

2. The method according to claim 1, wherein the deoxygenation comprises hydrodeoxygenation and the separation to provide a propane feed comprises separating the hydrodeoxygenated product into a gas stream and a liquid stream, wherein the gas stream comprises hydrogen that has not been used as well as propane.

3. The method according to claim 1 or 2, comprising the step of subjecting the C3+ components produced in the deoxygenation step and separated from the propane feed to cracking to produce more gases, followed by separation of at least propane in the gases and combining the thus obtained propane with the propane feed.

4. The method according to any one of the preceding claims, wherein the deoxygenation step is at least one selected from hydrodeoxygenation, decarboxylation, decarbonylation, and hydrocracking, preferably hydrodeoxygenation.

5. The method according to any one of the preceding claims, wherein the pretreatment comprises one or more selected from washing, degumming,

bleaching, distillation, fractionation, rendering, heat treatment, evaporation, filtering, adsorption, hydrodeoxygenation, centrifugation or precipitation.

6. The method according to any one of the preceding claims, wherein the step of pretreatment of the bio-renewable raw material comprises at least one of partial hydrogenation, partial deoxygenation, hydrolysis and transesterification.

7. The method according to any one of the preceding claims, wherein the bio-renewable raw material comprises glycerol and/or fatty acid esters.

8. The method according to any one of the preceding claims, wherein the propane feed has a propane content of at least 85 wt.-%, preferably at least 87 wt.-%, at least 88 wt.-%, at least 89 wt.-%, 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.-%.

9. The method according to any one of the preceding claims, wherein the bio-renewable raw material has a total sulfur content of at most 500 ppm, preferably at most 300 ppm, at most 200 ppm, at most 100 ppm, 60 ppm at most 40 ppm, at most 35 ppm, at most 30 ppm, at most 25 ppm, at most 20 ppm, at most 15 ppm, at most 10 ppm, or at most 5 ppm; and/or

wherein bio-renewable raw material has a total phosphorus content of at most 300 ppm, preferably at most 200 ppm, at most 100 ppm, at most 80 ppm, at most 50 ppm, at most 35 ppm, at most 30 ppm, at most 25 ppm, at most 20 ppm, at most 15 ppm, at most 10 ppm, or at most 5 ppm; and/or

wherein bio-renewable raw material has a total nitrogen content of at most 400 ppm, preferably at most 300 ppm, at most 200 ppm, at most 100 ppm, at most 60 ppm at most 40 ppm, at most 35 ppm, at most 30 ppm, at most 25 ppm, at most 20 ppm, at most 15 ppm, at most 10 ppm, or at most 5 ppm.

10. The method according to any one of the preceding claims, wherein providing the propane feed comprises a step of removing contaminants containing O, S, N and/or P, preferably one or more selected from amine wash, distillation, fractionation, polishing, steam distillation, membrane separation.

11. The method according to any one of the preceding claims, wherein the propylene material has a propylene content of at least 80 wt.-%, preferably at least 85 wt.-%, at least 87 wt.-%, at least 88 wt.-%, at least 89 wt.-%, 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.-%.

12. The method according to any one of the preceding claims, wherein the bio-renewable raw material in the deoxygenation step is blended with a diluent and the blend subjected to deoxygenation preferably contains at least 2 wt.-% of the bio-renewable raw material, more preferably at least 5 wt.-%, at least 10 wt.-%, at least 20 wt.-%, at least 25 wt.-%, at least 50 wt.-%, at least 75 wt.-%, at least 85 wt.-%, at least 90 wt.-%, at least 95 wt.-%, or at least 99 wt.-%, wherein the diluent preferably comprises recycled product from the deoxygenation step and the blend subjected to deoxygenation preferably contains at least 10 wt.-% of the recycled product from the deoxygenation step, preferably at least 25 wt.-%, at least 40 wt.-%, at least 60 wt.-%, at least 70 wt.-%, at least 80 wt.-%, or at least 85 wt.-%.

13. The method according to any one of the preceding claims, wherein the separation after the deoxygenation step to provide a propane feed comprises a step of separating at least propane from hydrogen, preferably using a membrane separation technique.

14. The method according to any one of the preceding claims, comprising the following steps:

a) providing bio-renewable oil(s) and/or fat(s) comprising a least one of glycerol, monoglycerides, diglycerides and triglycerides, preferably at least triglycerides;
b) pretreating the bio-renewable oil(s) and/or fat(s) to remove contaminant(s) and to provide a bio-renewable raw material, wherein the pretreatment optionally includes hydrolyzing and/or transesterifying the bio-renewable raw material, followed by separation to produce a C3 feed, preferably a glycerol feed, as the bio-renewable raw material;
c) deoxygenating, preferably hydrotreating the bio-renewable raw material to produce a bio-hydrocarbon feed, followed by separating the propane feed from the bio-hydrocarbon feed;
d) optionally cracking the deoxygenated C3+ stream separated from the bio-hydrocarbon feed, followed by separation of gases and combining at least propane in said gases with the propane feed;
e) subjecting the propane feed to dehydrogenation and to separation to provide a propylene material;
f) optionally polymerizing the propylene material or a derivative thereof to produce a polymer.

15. The method according to any one of the preceding claims, comprising a step of polymerizing the propylene material or a derivative thereof, optionally in the presence of co-polymerizable monomer(s) and/or additive(s), to produce a polymer, and optionally further comprising a step forming a polymer product, such as a film, a molded product, a coating composition, a coating, a packaging, a construction material, a rubber composition, a tire, a part of a tire, or a gasket, from the polymer optionally together with other components.