CLAIMS

1. A method for producing renewable C3-C8 hydrocarbons from a renewable feedstock, the method comprising
   a) providing the renewable feedstock,
   b) pre-treating the renewable feedstock by reducing the amount of impurities therein not to include: more than 10 w-ppm alkali metal and alkaline earth metal impurities, calculated as elemental alkali metals and alkaline earth metals; more than 10 w-ppm other metals, calculated as elemental metals; more than 1000 w-ppm nitrogen containing impurities, calculated as elemental nitrogen; more than 30 w-ppm phosphorus containing impurities, calculated as elemental phosphorus; more than 5 w-ppm silicon containing impurities, calculated as elemental silicon; to produce a pre-treated feedstock,
   c) subjecting the pre-treated feedstock to hydrodeoxygenation reaction to produce a hydrodeoxygenated stream, wherein the hydrodeoxygenation reaction comprises one or more of:
      a. a temperature in the range from 250 °C to 400 °C,
      b. a pressure in the range from 10 bar to 200 bar,
      c. a WHSV in the range from 0.25 to 3 h^{-1},
      d. a H_2 flow from 350 to 1500 N-L H_2/L feed, and
      e. a hydrodeoxygenation catalyst selected from Pd, Pt, Ni, Co, Mo, Ru, Rh, and W or any combination thereof, on a support,
   d) subjecting the hydrodeoxygenated stream to a gas-liquid separation thereby producing a gaseous stream and a hydrodeoxygenated liquid stream,
   e) subjecting the hydrodeoxygenated liquid stream to hydrocracking reaction comprising a temperature in the range from 250 °C to 420 °C, hydrogen, and a catalyst comprising
      i. a hydrogenation metal,
      ii. a mesoporous molecular sieve embedded with zeolite, wherein the zeolite is selected from ZSM-23 zeolite and Beta zeolite, and
      iii. a carrier

      to yield a hydrocracked stream, and

f) separating the renewable C3-C8 hydrocarbons from the hydrocracked stream.

2. The method according to claim 1 wherein the temperature of step e) is 250-400 °C, preferably 250-370 °C, more preferably 250-350 °C, most preferably 250-340°C.

3. The method according to claim 1 or 2 wherein in step c) temperature is from 260 °C to 380 °C, preferably from 280 °C to 360 °C, such as from 300 °C to 330 °C, pressure is from 20 bar to 100 bar, preferably from 20 bar to 80 bar, a weight hourly space velocity (WHSV) is in the range from 0.5 h^{-1} to 3.0 h^{-1}, preferably from 0.7 h^{-1} to 2.5 h^{-1}, most preferably from 1.0 h^{-1} to 2.0 h^{-1} and H_2 flow is in the range from 350 to 1100 N-L H_2/L feed, preferably from 350 to 1000 N-L H_2/L feed.

4. The method according to any one of claims 1-3 comprising fractionating the renewable C3-C8 hydrocarbons at least to
   i. a fraction rich in renewable C5-C8 hydrocarbons, and optionally also
   ii. a fraction rich in renewable C3 hydrocarbons, and
   iii. a fraction rich in renewable C4 hydrocarbons.

5. The method according to any one of claims 1 to 4, wherein the hydrogenation metal is selected from platinum, palladium, nickel, cobalt, and iridium and any combinations thereof, preferably platinum.

6. The method according to any one of claims 1-5, wherein the mesoporous molecular sieve is MCM-41.

7. The method according to any one of claims 1-6, wherein the carrier is selected from clay, alumina, silica, and zirconia.

8. The method according to any one of claims 1-7, wherein the hydrogen of step e) is at pressure of 10-50 bar.

9. The method according to any one of claims 1-8, wherein the hydrodeoxygenation catalyst is selected from a group consisting of CoMo, NiMo, NiW, and CoNiMo on a support, wherein the support is preferably alumina and/or silica.

10. The method according to any one of claims 1-9, wherein the hydrodeoxygenation reaction comprise temperature in the range from 250 °C to 400 °C, pressure in the range from 20 bar to 80 bar, a WHSV in the range from 0.5 h^{-1} to 3 h^{-1}, and H_2 flow of 350-1500 N-L H_2/L feed, preferably from 350 to 1100 N-L H_2/L feed, most preferably from 350 to 1000 N-L H_2/L feed, and a hydrodeoxygenation catalyst.

11. The method according to any one of claims 1-10, wherein the hydrodeoxygenated stream comprises at least 92 wt-%, preferably at least 95 wt-%, more preferably at least 99 wt-% paraffins based on total weight of hydrocarbon products.

12. The method according to any one of claims 1-11, wherein the feedstock is selected from waste and residues of animal fat or oil, plant fat or oil, and fish fat or oil, and mixtures thereof, preferably the feedstock is selected from palm oil residues and wastes, such as palm effluent sludge, palm oil mill effluent, sludge palm oil, palm oil fatty acid, tall oil material, used cooking oil, acid oils, animal fats, such as brown grease, spent bleaching earth oil, technical corn oil.

13. The method according to any one of claims 1-12, wherein the feedstock comprises triglycerides and/or fatty acids.

14. The method according to any one of claims 1-13 wherein the catalyst of step e) is platinum impregnated mesoporous molecular sieve embedded with ZSM-23, and wherein the catalyst has one of more of the following features

- Si to Al molar ratio is from 12 to 140, preferably from 15 to 50, more preferably from 32 to 40,
- BET surface area is from 675 m^2/g to 810 m^2/g determined by nitrogen physisorption,
- BJH pore area is from 600 m^2/g to 800 m^2/g determined by nitrogen physisorption,
- acidity is from 70 µmol/g to 250 µmol/g measured with NH_3-TPD method, wherein acidity is calculated from the amount of NH_3 adsorbed at 200 °C and desorbed between 100 °C and 500 °C,
- total pore volume is from 0.65 cm^3/g to 0.81 cm^3/g,

- volume of the mesopores is from 0.56 cm^3/g to 0.75 cm^3/g as determined by the nitrogen physisorption, and
- crystallinity is 35 % or less, such as from 25 to 35% by X-ray diffraction (XRD) according to ASTM D5758-01 (2021).

15. The method according to any one of claims 1-13, wherein the catalyst of step e) is platinum impregnated mesoporous molecular sieve embedded with Beta zeolite and wherein the catalyst has one of more of the following features

- Si to Al molar ratio is from 6 to 40, preferably from 19 to 21,
- BET surface area is from 620 m^2/g to 880 m^2/g, determined by nitrogen physisorption,
- BJH pore area is from 565 m^2/g to 900 m^2/g, determined by nitrogen physisorption,
- acidity is from 110 µmol/ to 430 µmol/g measured with NH_3-TPD method, wherein acidity is calculated from the amount of NH_3 adsorbed at 200 °C and desorbed between 100 °C and 500 °C,
- total pore volume is from 0.50 cm^3/g to 0.94 cm^3/g,
- volume of the mesopores is from 0.41 cm^3/g to 0.74 cm^3/g as determined by the nitrogen physisorption, and
- crystallinity is 35 % or less, such as from 25 to 35% measured by X-ray diffraction (XRD) according to ASTM D5758-01 (2021).

16. The method according to any one of claims 1 to 15 wherein the mesoporous molecular sieve is MCM-14.

17. Use of a catalyst comprising a hydrogenation metal, mesoporous molecular sieve embedded with ZSM-23 zeolite or Beta zeolite, and a carrier for producing renewable C3-C8 hydrocarbons from a renewable paraffinic feed by hydrocracking at a temperature from 250 °C to 420 °C in the presence of a hydrogen flow.

18. The use according to claim 17, wherein the mesoporous molecular sieve is MCM-41.

19. The use according to claim 17 or 18, wherein the hydrogenation metal is selected from platinum, palladium, nickel, cobalt, and iridium and any combinations thereof, preferably platinum.

20. The use according to any one of claims 17 to 19, wherein the catalyst is platinum impregnated MCM-14 embedded with ZSM-23.

21. The use according to any one of claims 17 to 19, wherein the catalyst is platinum-impregnated MCM-14 embedded with Beta zeolite.

22. The use according to claim 20, wherein the catalyst has one or more of the following features

- Si to Al molar ratio is from 12 to 140, preferably from 15 to 50, more preferably from 32 to 40,
- BET surface area is from 675 m^2/g to 810 m^2/g, determined by nitrogen physisorption,
- BJH pore area is from 600 m^2/g to 800 m^2/g determined by nitrogen physisorption,
- acidity is from 70 µmol/ to 250 µmol/g measured with NH_3-TPD method, wherein acidity is calculated from the amount of NH_3 adsorbed at 200 °C and desorbed between 100 °C and 500 °C,
- total pore volume is from 0.65 cm^3/g to 0.81 cm^3/g,
- volume of the mesopores is from 0.56 cm^3/g to 0.75 cm^3/g as determined by the nitrogen physisorption, and
- crystallinity is 35 % or less, such as from 25 to 35% measured by X-ray diffraction (XRD) according to ASTM D5758-01 (2021).

23. The use according to claim 21, wherein catalyst has one of more of the following features

- Si to Al molar ratio is from 6 to 40, preferably from 19 to 21,
- BET surface area is from 620 m^2/g to 880 m^2/g determined by nitrogen physisorption,
- BJH pore area is from 565 m^2/g to 900 m^2/g, determined by nitrogen physisorption,
- acidity is from 110 µmol/ to 430 µmol/g measured with NH_3-TPD method, wherein acidity is calculated from the amount of NH_3 adsorbed at 200 °C and desorbed between 100 °C and 500 °C,
- total pore volume is from 0.50 cm^3/g to 0.94 cm^3/g,

- volume of the mesopores is from 0.41 cm^3/g to 0.74 cm^3/gas determined by the nitrogen physisorption,
- crystallinity 35 % or less, such as from 25 to 35% measured by X-ray diffraction (XRD) according to ASTM D5758-01 (2021).

24. The use according to any one of claims 17 to 23, wherein the hydrocracking temperature is 250-400 °C, preferably 250-370 °C, more preferably 250-350 °C, most preferably 250-340°C.