CLAIMS:

1. A method of processing a renewable bio-based material comprising the step of:

reacting the bio-based material with hydrogen in the presence of a catalyst on a support in a reactor to form a treated oil;

(i) passing the treated oil through a distillation unit and an adsorption unit to form green diesel; and/or (ii) passing the treated oil through at least one distillation column to separate the treated oil into at least one component and passing the at least one component through an adsorption column;

wherein the reactor comprises a cooling function for controlling the temperature of the reactor; wherein the cooling function is at least one of an internal cooling function and an external cooling function.

2. The method of claim 1, wherein the support is alumina (Al_2O_3), silica (SiO_2) or alumina-silica (Al_2O_3-SiO_2).

3. The method of claim 1 or 2, wherein the treated oil comprises at least one kind of n-paraffin and at least one kind of isoparaffin and wherein the method further comprises the step of selecting the catalyst depending on whether a low volume of isoparaffins or a high volume of isoparaffins is desired.

4. The method of claim 3, wherein the support is Al_2O_3 and the catalyst on Al_2O_3 is selected from the group consisting of NiMo/Al_2O_3 and NiW/Al_2O_3.

5. The method of claim 3, wherein the support is Al_2O_3 and the catalyst on Al_2O_3 is selected from the group consisting of NiCoMo/Al_2O_3, NiMoP/Al_2O_3 and CoMo/Al_2O_3.

6. The method of any one of claims 1 to 5, wherein the temperature in the reactor is 200°C to 400°C.

7. The method of claim 6, wherein the temperature in the reactor is 250°C to 350°C.

8. The method of any one of claims 1 to 7, wherein the pressure in the reactor is 25 bar to 40 bar.

9. The method of claim 8, wherein the pressure in the reactor is 30 bar to 40 bar.

10. The method of any one of claims 1 to 9, wherein the ratio of hydrogen to the bio-based material is 0.03g hydrogen/g bio-based material to 0.10g hydrogen/g bio-based material.

11. The method of claim 10, wherein the ratio of hydrogen to the bio-based material is 0.05g hydrogen/g bio-based material to 0.07g hydrogen/g bio-based material.

12. The method of any one of claims 1 to 11, wherein the space velocity is 0.5 h^{-1} to 2 h^{-1}.

13. The method of any one of the preceding claims, further comprising the step of purifying the treated oil.

14. The method of claim 13, wherein the step of purifying the treated oil comprises the step of passing the treated oil through a high-pressure separator followed by the step of passing through a low-pressure separator.

15. The method of any one of the preceding claims, wherein the reactor is a trickle bed reactor or a packed bed reactor.

16. The method of any one of the preceding claims, wherein the internal cooling function comprises adding a cooling substance into the reactor.

17. The method of any one of the preceding claims, wherein the external cooling function is a multi tube or a shallow bed reactor with a heat transfer unit.

18. The method of any one of the preceding claims, wherein the adsorption unit comprises at least one adsorbent selected from the group consisting of activated carbon, ion exchange resin, molecular sieve and chemical adsorbent.

19. The method of any one of the preceding claims, wherein the at least one component is selected from the group consisting of n-paraffin having less than 16 carbon atoms, n-hexadecane, n-heptadecane, n-octadecane and n-paraffin having more than 18 carbon atoms.

20. The method of any one of the preceding claims, wherein the adsorption column comprises at least one adsorbent selected from the group consisting of activated carbon, ion exchange resin, molecular sieve and chemical adsorbent.

21. A system for processing a renewable bio-based material comprising:

a reactor for reacting the bio-based material with hydrogen in the presence of a catalyst on a support to form a treated oil;

(i) a distillation unit for passing the treated oil through to form green diesel and an adsorption unit for passing the green diesel through; and/or

(ii) at least one distillation column to separate the treated oil into at least one component and an adsorption column for passing the at least one component through; and

wherein the reactor comprises a cooling function for controlling the temperature of the reactor; wherein the cooling function is at least one of an internal cooling function and an external cooling function.

22. The system of claim 21, wherein the internal cooling function comprises a cooling substance selected from the group consisting of a fresh amount of the bio-based material, a fresh amount of hydrogen, a portion of the treated oil and a combination thereof.

23. The system of claim 21 or 22, further comprising a high-pressure separator and a low-pressure separator for passing the treated oil through.

24. The system of any one of claims 21 to 23, wherein the external cooling function comprises a multi tube or a shallow bed reactor with a heat transfer unit.

25. The system of claim 24, wherein the external cooling function further comprises a coolant selected from the group consisting of a fresh amount of the bio-based material, a fresh amount of hydrogen, a portion of the treated oil, a combination thereof and a heat transfer fluid.