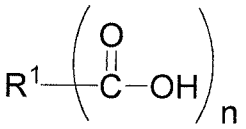
CLAIMS:

1. A method for producing a lube basestock, the method comprising:

contacting a compound of Formula (I) and a feedstock of biological origin to form a ketone in the presence of a first catalyst comprising a basic material:



Formula (I)

wherein R^1 is selected from the group consisting of cyclic hydrocarbyl and aryl, wherein R^1 has one or more optional substitutions selected from the group consisting of $--R^a--OR^a$, $--C(O)R^a$, and $--C(O)OR^a$, wherein R^a is H or C_1-C_6 alkyl group, and n is 3, 4 or 5; and

hydrogenating the ketone to a hydrocarbon in the presence of water and a second catalyst comprising a hydrogenation catalyst and a hydrothermally stable binder, wherein the hydrocarbon is a lube basestock.

2. The method according to claim 1, wherein the hydrothermally stable binder comprises TiO_2, ZrO_2 or CeO_2.

3. The method according to claim 1, further comprising hydroisomerizing the hydrocarbon formed by hydrogenating the ketone.

4. The method according to claim 1, wherein n is 3.

5. The method according to claim 1, wherein the feedstock of biological origin comprises one or more components selected from the group consisting of fatty acid, fatty acid ester, fatty alcohol, fatty olefin, mono-glyceride, di-glyceride, tri-glyceride, phospholipid and saccharolipid.

6. The method according to claim 5, wherein the feedstock of biological origin is selected from the group consisting of rapeseed oil, soy bean oil, palm oil, camelina oil, jatropha oil, jojoba oil, fish oil, lard, beef tallow, and algae oil.

7. The method according to claim 1, comprising providing the feedstock of biological origin as a solution in a hydrocarbon solvent.

8. The method according to claim 1, wherein R^1 is phenyl or naphthalenyl and n is 3.

9. The method according to claim 1, wherein the feedstock of biological origin comprises stearic acid or tristearin.

10. The method according to claim 1, wherein the first catalyst is selected from the group consisting of basic clay, alkali impregnated support, basic metal oxide, and a mixture thereof.

11. The method according to claim 10, wherein the first catalyst comprises a basic metal oxide selected from the group consisting of hydrotalcite, MgO, CaO, BaO, ZnO, MnO_2, K_2CO_3 supported on SiO_2, K_2CO_3 supported on ZrO_2, and K_2CO_3 supported on TiO_2.

12. The method according to claim 10, wherein the first catalyst comprises a basic metal oxide selected from the group consisting of La_2O_3, CeO_2, Y_2O_3, Sm_2O_3, Pr_2O_3, La_2O_3/ZrO_2, ZnO/La_2O_3, Y_2O_3/ZrO_2, CeO_2/ZrO_2, and La_2O_3/SiO_2.

13. The method according to claim 1, wherein the hydrogenation catalyst comprises a metal hydrogenation component selected from the group consisting of Ni, Co, Pd, Pt, Ru, Rh, Co--Mo, Ni--Mo, Ni--W, and Co--W, and wherein the metal hydrogenation component is supported on an inorganic support selected from the group consisting of silica, alumina, titania, zirconia, zeolite, carbon, and gamma-alumina.

14. The method according to claim 13, wherein the hydrogenation catalyst is Pt supported on a support selected from the group consisting of zeolite of the faujasite, beta, or MWW family, 10-ring zeolite, and 8-ring zeolite.

15. The method according to claim 13, wherein the hydrogenation catalyst is selected from the group consisting of Ni or Pd supported on silica or carbon; Co--Mo or Co--W supported on gamma-alumina; and Ni--Mo or Ni--W on gamma-alumina.

16. The method according to claim 1, wherein the method is carried out at a temperature of from 275 to 400°C, a pressure of from 300 to 700 psig, and a liquid hourly space velocity of from 0.1 to 10 v/v/h under static or flowing gas comprising N_2 or H_2.

17. The method according to claim 1, wherein the basic material comprises La_2O_3/ZrO_2, La_2O_3/ZnO, Y_2O_3/ZrO_2, or a combination thereof

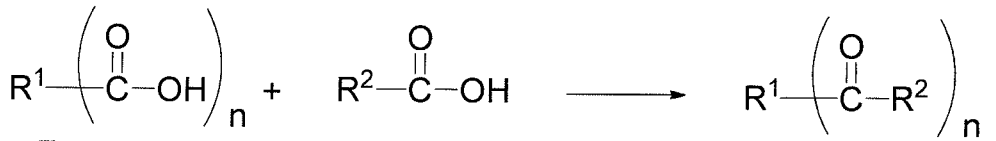
wherein the hydrogenation catalyst is Pt supported on ZSM-48 or Pt supported on ZSM-48/$NiWO_x$,

wherein the hydrothermally stable binder comprises TiO_2, ZrO_2 or a mixture thereof, and

wherein the method is carried out at a temperature of from 300 to 400°C under H_2 partial pressure of from 500 to 800 psig.

18. A method for producing a lube basestock, the method comprising:

coupling a compound of Formula (I) and a compound of Formula (II) in the presence of a first catalyst component comprising a basic material to produce a ketone of Formula (III):



Formula (I) Formula (II) Formula (III),

wherein each of R^1 and R^2 is independently selected from the group consisting of acyclic hydrocarbyl, cyclic hydrocarbyl, and aryl, wherein each of R^1 and R^2 independently has one or more optional substitutions selected from the group consisting of --R^a, --OR^a, --$C(O)R^a$, and --$C(O)OR^a$, wherein R^a is H or C_1-C_6 alkyl group, and n is 3, 4 or 5; and

hydrogenating the ketone of Formula (II) to a hydrocarbon with a second catalyst comprising a hydrogenation catalyst and a hydrothermally stable binder wherein the hydrocarbon is a lube basestock.

19. The method according to claim 18, wherein the hydrothermally stable binder comprises TiO_2, ZrO_2 or CeO_2.

20. The method according to claim 18, wherein R^1 is phenyl or naphthalenyl and n is 3.

21. The method according to claim 18, wherein the compound of Formula (I) is selected from the group consisting of 1,2,3-propanetricarboxylic acid and citric acid; the compound of Formula (II) is a saturated or unsaturated C_{10}-C_{22} fatty acid; and the first catalyst comprises MgO or hydrotalcite.

22. The method according to claim 21, wherein the compound of Formula (II) is selected from the group consisting of capric acid, lauric acid, myristic acid, palmitic acid, stearic acid, oleic acid, linoleic acid, arachidic acid, and behenic acid.

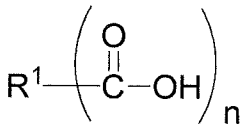
23. The method according to claim 18, wherein the first catalyst comprises a basic material selected from the group consisting of hydrotalcites; a basic metal oxide comprising MgO, CaO, BaO, ZnO, MnO_2, K_2CO_3 supported on SiO_2, K_2CO_3 supported on ZrO_2, or a combination thereof; K_2CO_3 supported on TiO_2; and a mixed rare earth metal oxide comprising La_2O_3, CeO_2, Y_1O_3, Sm_2O_3, Pr_2O_3, La_2O_3/ZrO_2, ZnO/La_2O_3, Y_2O_3/ZrO_2, CeO_2/ZrO_2, La_2O_3/SiO_2, or a combination thereof.

24. The method according to claim 18, wherein the second catalyst comprises a metal hydrogenation component selected from the group consisting of Ni, Co, Pd, Pt, Ru, Rh, Co--Mo, Ni--Mo, Ni--W, and Co--W, and wherein the metal hydrogenation component is supported on zeolite selected from the group consisting of ZSM-22, ZSM-12, ZSM-23, ZSM-4, ZSM-48 and ZSM-50.

25. The method according to claim 18, wherein the method is carried out at a temperature of from 275 to 400°C, a pressure of from 300 to 700 psig, and a liquid hourly space velocity of from 0.1 to 10 v/v/h under static or flowing gas comprising N_2 or H_2.

26. A method for producing a lube basestock, the method comprising:

contacting a compound of Formula (I) and the feedstock of biological origin in the presence of a first catalyst comprising a basic material and a second catalyst comprising a hydrogenation catalyst and a hydrothermally stable binder in a single reactor, the compound of Formula (I) and a feedstock of biological origin being contacted with the second catalyst in the presence of water:



Formula (I)

wherein R^1 is selected from the group consisting of acyclic hydrocarbyl, cyclic hydrocarbyl, and aryl, wherein R^1 has one or more optional substitutions selected from the group consisting of --R^a, --OR^a, --$C(O)R^a$, and --$C(O)OR^a$, wherein R^a is H or C_1-C_6 alkyl group, and n is 3, 4 or 5, wherein said contacting produces a lube basestock.

27. The method according to claim 26, wherein the hydrothermally stable binder comprises TiO_2, ZrO_2 or CeO_2.

28. The method according to claim 26, comprising contacting the feedstock of biological origin sequentially with the first catalyst in a first zone of the reactor and with the hydrogenation catalyst in a second zone of the reactor.

29. The method according to claim 26, wherein R^1 is phenyl or naphthalenyl and n is 3.

30. The method according to claim 26, wherein the compound of Formula (I) is selected from the group consisting of 1,2,3-propanetricarboxylic acid and citric acid; the feedstock of biological origin is selected from the group consisting of rapeseed oil,

soy bean oil, palm oil, camelina oil, jatropha oil, jojoba oil, fish oil, lard, beef tallow, and algae oil; and the first catalyst comprises MgO or hydrotalcite.

31. The method according to claim 26, wherein the feedstock of biological origin comprises stearic acid or tristearin.

32. The method according to claim 26, wherein the first catalyst comprises a basic catalyst selected from the group consisting of hydrotalcites; a basic metal oxide comprising MgO, CaO, BaO, ZnO, MnO_2, K_2CO_3 supported on SiO_2, K_2CO_3 supported on ZrO_2, or a combination thereof; K_2CO_3 supported on TiO_2; and a mixed rare earth metal oxide comprising La_2O_3, CeO_2, Y_2O_3, Sm_2O_3, Pr_2O_3, La_2O_3/ZrO_2, ZnO/La_2O_3, Y_2O_3/ZrO_2, CeO_2/ZrO_2, La_2O_3/SiO_2, or a combination thereof.

33. The method according to claim 26, wherein the second catalyst comprises a metal hydrogenation component selected from the group consisting of Ni, Co, Pd, Pt, Ru, Rh, Co--Mo, Ni--Mo, Ni--W, and Co--W, and wherein the metal hydrogenation component is supported on zeolite selected from the group consisting of ZSM-22, ZSM-12, ZSM-23, ZSM-4, ZSM-48 and ZSM-50.

34. The method according to claim 26, wherein the method is carried out at a temperature of from 275 to 400°C, a pressure of from 300 to 700 psig, and a liquid hourly space velocity of from 0.1 to 10 v/v/h under static or flowing gas comprising N_2 or H_2.