

WHAT IS CLAIMED IS:

1. ~~A method for producing a diesel fuel and a lubricant basestock,~~
comprising: contacting a feedstock with a hydrotreating catalyst under effective hydrotreating conditions to produce a hydrotreated effluent; separating the hydrotreated effluent to form a gas phase portion and a remaining portion having at least a liquid phase: dewaxing the remaining portion of the hydrotreated effluent under effective catalytic dewaxing conditions to produce a dewaxed effluent, the dewaxing catalyst includes at least one non-dealuminated, unidimensional, 10-member ring pore zeolite, and at least one Group VI metal, Group VIII metal or combination thereof; hydrocracking the dewaxed effluent under effective hydrocracking conditions; and fractionating the hydrocracked, dewaxed effluent to form at least a naphtha product fraction, a diesel product fraction and a lubricant base oil product fraction.

2. The method of claim 1, wherein a hydrogen gas introduced as part of effective hydrocracking conditions or as part of effective catalytic dewaxing conditions is chosen from a hydrotreated gas effluent, a clean hydrogen gas, a recycle gas and combinations thereof.

3. The method of any one of the preceding claims, wherein the dewaxing catalyst comprises a molecular sieve having a $\text{SiO}_2:\text{Al}_2\text{O}_3$ ratio of 200:1 to 30:1 and comprises from 0.1 wt% to 3.33 wt% framework Al_2O_3 content, the dewaxing catalyst including from 0.1 to 5 wt% platinum.

4. The method of any one of the preceding claims, wherein the molecular sieve is EU-1, ZSM-35, ZSM-11, ZSM-57, NU-87, ZSM-22, EU-2, EU-11, ZBM-30, ZSM-48, ZSM-23, or a combination thereof.

5. The method of any one of the preceding claims, wherein the dewaxing catalyst comprises at least one high surface area or low surface area

~~metal oxide, refractory binder, the binder being silica, alumina, titania, zirconia, or silica-alumina.~~

6. The method of any one of the preceding claims, wherein the metal oxide, refractory binder further comprises a second metal oxide, refractory binder different from the first metal oxide, refractory binder.

7. The method of any one of the preceding claims, wherein the dewaxing catalyst comprises a micropore surface area to total surface area ratio of greater than or equal to 25%, wherein the total surface area equals the surface area of the external zeolite plus the surface area of the binder, the surface area of the binder being 100 m²/g or less.

8. The method of any one of the preceding claims, wherein the hydrocracking catalyst is a zeolite Y based catalyst.

9. A method for producing a diesel fuel and a lubricant basestock, comprising: contacting a feedstock with a hydrotreating catalyst under first effective hydrotreating conditions to produce a hydrotreated effluent; dewaxing the hydrotreated effluent under first effective catalytic dewaxing conditions to produce a dewaxed effluent, the dewaxing catalyst includes at least one non-dealuminated, unidimensional, 10-member ring pore zeolite, and at least one Group VI metal, Group VIII metal or combination thereof; hydrocracking at least a portion of the dewaxed effluent under first effective hydrocracking conditions to form a hydrocracked effluent; exposing at least a portion of the hydrocracked effluent to at least one additional hydroprocessing catalyst under one or more effective hydroprocessing conditions to form a hydroprocessed effluent, the one or more effective hydroprocessing conditions being selected from second effective dewaxing conditions and second effective hydrocracking conditions; and fractionating the hydroprocessed effluent to form at least a naphtha product fraction, a diesel product fraction, and a lubricant base oil product fraction.

~~10. The method of claim 9, wherein the entire dewaxed effluent is cascaded to said hydrocracking step under first effective hydrocracking conditions.~~

11. The method of claims 9 or 10, wherein hydrocracking at least a portion of the dewaxed effluent comprises separating the dewaxed effluent to form a gas phase portion and a remaining portion having at least a liquid phase, and hydrocracking the remaining portion of the dewaxed effluent.

12. The method of claims 9, 10 or 11, wherein exposing at least a portion of the hydrocracked effluent to at least one additional hydroprocessing catalyst comprises separating the hydrocracked effluent to form a gas phase portion and a remaining portion having at least a liquid phase, and hydroprocessing the remaining portion of the hydrocracked effluent.

13. The method of claims 9, 10, 11 or 12 further comprising hydrofinishing the hydroprocessed effluent under effective hydrofinishing conditions prior to fractionation.

14. A method for producing a diesel fuel and a lubricant basestock, comprising: contacting a feedstock with a hydrotreating catalyst under effective hydrotreating conditions to produce a hydrotreated effluent; separating the hydrotreated effluent to form a first gas phase portion and a first remaining portion having at least a liquid phase; dewaxing the first remaining portion of the hydrotreated effluent under effective catalytic dewaxing conditions to produce a dewaxed effluent, the dewaxing catalyst includes at least one non-dealuminated, unidimensional, 10-member ring pore zeolite, and at least one Group VI metal, Group VIII metal or combination thereof; separating the dewaxed hydrotreated effluent to form a second gas phase portion and a second remaining portion having at least a liquid phase; hydrocracking the second remaining portion of the dewaxed hydrotreated effluent under effective hydrocracking conditions to form a

~~hydrocracked dewaxed hydrotreated effluent; and fractionating the hydrocracked dewaxed hydrotreated effluent to form at least a naphtha product fraction, a diesel product fraction and a lubricant base oil product fraction.~~

15. The method of claim 14, wherein a portion of the hydrocracked dewaxed hydrotreated effluent is recycled back to the dewaxing the first remaining portion of the hydrotreated effluent step.

16. The method of claims 14 or 15, wherein a portion of the hydrocracked dewaxed hydrotreated effluent is recycled back to the separating the dewaxed hydrotreated effluent step.

17. The method of claims 14, 15, or 16 further including hydrofinishing the hydrocracked dewaxed hydrotreated effluent under effective hydrofinishing conditions prior to the fractionating step.

18. The method of claims 14, 15, 16, or 17, wherein the first remaining portion of the hydrotreated effluent has a total sulfur content in liquid and gaseous forms of at least 1000 wppm.

19. A method for producing a diesel fuel and a lubricant basestock, comprising: contacting a feedstock with a hydrotreating catalyst under effective hydrotreating conditions to produce a hydrotreated effluent; dewaxing the hydrotreated effluent under effective catalytic dewaxing conditions to produce a dewaxed effluent, the dewaxing catalyst includes at least one non-dealuminated, unidimensional, 10-member ring pore zeolite, and at least one Group VI metal, Group VIII metal or combination thereof; separating the dewaxed hydrotreated effluent to form a gas phase portion and a remaining portion having at least a liquid phase; hydrocracking the remaining portion of the dewaxed hydrotreated effluent under effective hydrocracking conditions to form a hydrocracked dewaxed hydrotreated effluent; and fractionating the hydrocracked dewaxed

~~hydrotreated effluent to form at least a naphtha product fraction, a diesel product fraction and a lubricant base oil product fraction.~~

20. A method for producing a diesel fuel and a lubricant basestock, comprising: contacting a feedstock with a hydrotreating catalyst under first effective hydrotreating conditions to produce a hydrotreated effluent; dewaxing the hydrotreated effluent under first effective catalytic dewaxing conditions to produce a dewaxed effluent, the dewaxing catalyst includes at least one non-dealuminated, unidimensional, 10-member ring pore zeolite, and at least one Group VI metal, Group VIII metal or combination thereof; separating the dewaxed effluent to form a gas phase portion and a remaining portion having at least a liquid phase; hydrocracking at least a portion of the remaining portion of the dewaxed effluent under first effective hydrocracking conditions to form a hydrocracked effluent; exposing at least a portion of the hydrocracked effluent to at least one additional hydroprocessing catalyst under one or more effective hydroprocessing conditions to form a hydroprocessed effluent, the one or more effective hydroprocessing conditions being selected from second effective dewaxing conditions and second effective hydrocracking conditions; and fractionating the hydroprocessed effluent to form at least a naphtha product fraction, a diesel product fraction, and a lubricant base oil product fraction.

WHAT IS CLAIMED IS:

1. A method for producing a diesel fuel and a lubricant basestock, comprising:
contacting a feedstock with a hydrotreating catalyst under effective hydrotreating conditions to produce a hydrotreated effluent;
separating the hydrotreated effluent to form a gas phase portion and a remaining portion having at least a liquid phase:
dewaxing the remaining portion of the hydrotreated effluent under effective catalytic dewaxing conditions to produce a dewaxed effluent, the dewaxing catalyst includes at least one non-dealuminated, unidimensional, 10-member ring pore zeolite, and at least one Group VI metal, Group VIII metal or combination thereof;
hydrocracking the dewaxed effluent under effective hydrocracking conditions;
and
fractionating the hydrocracked, dewaxed effluent to form at least a naphtha product fraction, a diesel product fraction and a lubricant base oil product fraction.
2. The method of claim 1, wherein a hydrogen gas introduced as part of effective hydrocracking conditions or as part of effective catalytic dewaxing conditions is chosen from a hydrotreated gas effluent, a clean hydrogen gas, a recycle gas and combinations thereof.
3. The method of claim 1, wherein the dewaxing catalyst comprises a molecular sieve having a $\text{SiO}_2:\text{Al}_2\text{O}_3$ ratio of 200:1 to 30:1 and comprises from 0.1 wt% to 3.33 wt% framework Al_2O_3 content, the dewaxing catalyst including from 0.1 to 5 wt% platinum.
4. The method of claim 3, wherein the molecular sieve is EU-1, ZSM-35, ZSM-11, ZSM-57, NU-87, ZSM-22, EU-2, EU-11, ZBM-30, ZSM-48, ZSM-23, or a combination thereof.
5. The method of claim 4, wherein the molecular sieve is ZSM-48, ZSM-23, or a combination thereof.
6. The method of claim 1, wherein the dewaxing catalyst comprises at least one high surface area or low surface area metal oxide, refractory binder, the binder being silica,

alumina, titania, zirconia, or silica-alumina.

7. The method of claim 6, wherein the metal oxide, refractory binder further comprises a second metal oxide, refractory binder different from the first metal oxide, refractory binder.

8. The method of claim 6, wherein the dewaxing catalyst comprises a micropore surface area to total surface area ratio of greater than or equal to 25%, wherein the total surface area equals the surface area of the external zeolite plus the surface area of the binder, the surface area of the binder being $100 \text{ m}^2/\text{g}$ or less.

9. The method of claim 1, wherein the hydrocracking catalyst is a zeolite Y based catalyst.

10. A method for producing a diesel fuel and a lubricant basestock, comprising:
contacting a feedstock with a hydrotreating catalyst under first effective hydrotreating conditions to produce a hydrotreated effluent;
dewaxing the hydrotreated effluent under first effective catalytic dewaxing conditions to produce a dewaxed effluent, the dewaxing catalyst includes at least one non-dealuminated, unidimensional, 10-member ring pore zeolite, and at least one Group VI metal, Group VIII metal or combination thereof;
hydrocracking at least a portion of the dewaxed effluent under first effective hydrocracking conditions to form a hydrocracked effluent;
exposing at least a portion of the hydrocracked effluent to at least one additional hydroprocessing catalyst under one or more effective hydroprocessing conditions to form a hydroprocessed effluent, the one or more effective hydroprocessing conditions being selected from second effective dewaxing conditions and second effective hydrocracking conditions; and
fractionating the hydroprocessed effluent to form at least a naphtha product fraction, a diesel product fraction, and a lubricant base oil product fraction.

11. The method of claim 10, wherein the entire dewaxed effluent is cascaded to said hydrocracking step under first effective hydrocracking conditions.

12. The method of claim 10, wherein hydrocracking at least a portion of the dewaxed effluent comprises separating the dewaxed effluent to form a gas phase portion and a remaining portion having at least a liquid phase, and hydrocracking the remaining portion of the dewaxed effluent.

13. The method of claim 10, wherein the entire hydrocracked effluent is cascaded to a stage for said exposing to at least one additional catalyst under effective hydroprocessing conditions.

14. The method of claim 10, wherein exposing at least a portion of the hydrocracked effluent to at least one additional hydroprocessing catalyst comprises separating the hydrocracked effluent to form a gas phase portion and a remaining portion having at least a liquid phase, and hydroprocessing the remaining portion of the hydrocracked effluent.

15. The method of claim 10, wherein the second effective dewaxing conditions include a temperature at least 20°C lower than the first effective dewaxing conditions.

16. The method of claim 10, wherein the second effective hydrocracking conditions include a temperature at least 20°C lower than the first effective hydrocracking conditions.

17. The method of claim 10, further comprising hydrofinishing the hydroprocessed effluent under effective hydrofinishing conditions prior to fractionation.

18. The method of claim 10, wherein fractionating to form a lubricant base oil product fraction comprises forming a plurality of lubricant base oil products, including a lubricant base oil product having a viscosity of at least 2cSt, and a lubricant base oil product having a viscosity of at least 4 cSt suitable for use in engine oils made according to SAE J300 in OW-, 5W-, or 10W- grades.

19. The method of claim 10, wherein the first effective hydrocracking conditions include a temperature of 200°C to 450°C, a hydrogen partial pressure of 250 psig to 5000 psig

(1.8 MPa to 34.6 MPa), a liquid hourly space velocity of 0.2 hr^{-1} to 10 hr^{-1} and a hydrogen treat gas rate of $35.6 \text{ m}^3/\text{m}^3$ to $1781 \text{ m}^3/\text{m}^3$ (200 SCF/B to 10,000 SCF/B).

20. The method of claim 10, wherein the first effective dewaxing conditions include a temperature of from 200°C to 450°C , a hydrogen partial pressure of from 1.8 MPa to 34.6 MPa (250 psi to 5000 psi), a liquid hourly space velocity of from 0.2 to 10 hr^{-1} , and a hydrogen circulation rate of from 35.6 to $1781 \text{ m}^3/\text{m}^3$ (200 to 10,000 scf/B).

21. A method for producing a diesel fuel and a lubricant basestock, comprising:
contacting a feedstock with a hydrotreating catalyst under effective hydrotreating conditions to produce a hydrotreated effluent;
separating the hydrotreated effluent to form a first gas phase portion and a first remaining portion having at least a liquid phase;
dewaxing the first remaining portion of the hydrotreated effluent under effective catalytic dewaxing conditions to produce a dewaxed effluent, the dewaxing catalyst includes at least one non-dealuminated, unidimensional, 10-member ring pore zeolite, and at least one Group VI metal, Group VIII metal or combination thereof;
separating the dewaxed hydrotreated effluent to form a second gas phase portion and a second remaining portion having at least a liquid phase;
hydrocracking the second remaining portion of the dewaxed hydrotreated effluent under effective hydrocracking conditions to form a hydrocracked dewaxed hydrotreated effluent; and
fractionating the hydrocracked dewaxed hydrotreated effluent to form at least a naphtha product fraction, a diesel product fraction and a lubricant base oil product fraction.

22. The method of claim 21, wherein a hydrogen gas introduced as part of effective hydrotreating conditions, effective dewaxing conditions, or effective hydrocracking conditions is chosen from a hydrotreated gas effluent, a clean hydrogen gas, a recycle gas and combinations thereof.

23. The method of claim 21, wherein the dewaxing catalyst comprises a molecular sieve having a $\text{SiO}_2:\text{Al}_2\text{O}_3$ ratio of 200:1 to 30:1 and comprises from 0.1 wt% to 3.33 wt% framework Al_2O_3 content, the dewaxing catalyst including from 0.1 to 5 wt% platinum.

24. The method of claim 23, wherein the molecular sieve is EU-1, ZSM-35, ZSM-11, ZSM-57, NU-87, ZSM-22, EU-2, EU-11, ZBM-30, ZSM-48, ZSM-23, or a combination thereof.

25. The method of claim 24, wherein the molecular sieve is ZSM-48, ZSM-23, or a combination thereof.

26. The method of claim 21, wherein the dewaxing catalyst comprises at least one high surface area or one low surface area metal oxide, refractory binder, the binder being silica, alumina, titania, zirconia, or silica-alumina.

27. The method of claim 26, wherein the metal oxide, refractory binder further comprises a second metal oxide, refractory binder different from the first metal oxide, refractory binder.

28. The method of claim 26, wherein the dewaxing catalyst comprises a micropore surface area to total surface area ratio of greater than or equal to 25%, wherein the total surface area equals the surface area of the external zeolite plus the surface area of the binder, the surface area of the binder being 100 m²/g or less.

29. The method of claim 21, wherein the hydrocracking catalyst is a zeolite Y based catalyst.

30. The method of claim 21, wherein a portion of the hydrocracked dewaxed hydrotreated effluent is recycled back to the dewaxing the first remaining portion of the hydrotreated effluent step.

31. The method of claim 21, wherein a portion of the hydrocracked dewaxed hydrotreated effluent is recycled back to the separating the dewaxed hydrotreated effluent step.

32. The method of claim 21 further including hydrofinishing the hydrocracked dewaxed hydrotreated effluent under effective hydrofinishing conditions prior to the

fractionating step.

33. The method of claim 21, wherein the first remaining portion of the hydrotreated effluent has a total sulfur content in liquid and gaseous forms of at least 1000 wppm.

34. The method of claim 21, wherein the effective hydrotreating conditions include a temperature of from 200°C to 450°C, hydrogen partial pressure of from 1.8 MPa to 34.6 MPa (250 psi to 5000 psi), a liquid hourly space velocity of from 0.2 to 10 hr⁻¹, and a hydrogen circulation rate of from 35.6 to 1781 m³/m³ (200 to 10,000 scf/B).

35. The method of claim 21, wherein the effective catalytic dewaxing conditions include a temperature of from 200°C to 450°C, a hydrogen partial pressure of from 1.8 MPa to 34.6 MPa (250 psi to 5000 psi), a liquid hourly space velocity of from 0.2 to 10 hr⁻¹, and a hydrogen circulation rate of from 35.6 to 1781 m³/m³ (200 to 10,000 scf/B).

36. The method of claim 21, wherein the effective hydrocracking conditions include a temperature of 200°C to 450°C, a hydrogen partial pressure of 250 psig to 5000 psig (1.8 MPa to 34.6 MPa), a liquid hourly space velocity of 0.2 hr⁻¹ to 10 hr⁻¹, and a hydrogen treat gas rate of 35.6 m³/m³ to 1781 m³/m³ (200 SCF/B to 10,000 SCF/B).

37. The method of claim 21, wherein fractionating to form a lubricant base oil product fraction comprises forming a plurality of lubricant base oil products, including a lubricant base oil product having a viscosity of at least 2cSt, and a lubricant base oil product having a viscosity of at least 4 cSt suitable for use in engine oils made according to SAE J300 in OW-, 5W-, or 10W- grades.

38. A method for producing a diesel fuel and a lubricant basestock, comprising:
contacting a feedstock with a hydrotreating catalyst under effective hydrotreating conditions to produce a hydrotreated effluent;
dewaxing the hydrotreated effluent under effective catalytic dewaxing conditions to produce a dewaxed effluent, the dewaxing catalyst includes at least one non-

dealuminated, unidimensional, 10-member ring pore zeolite, and at least one Group VI metal, Group VIII metal or combination thereof;

separating the dewaxed hydrotreated effluent to form a gas phase portion and a remaining portion having at least a liquid phase;

hydrocracking the remaining portion of the dewaxed hydrotreated effluent under effective hydrocracking conditions to form a hydrocracked dewaxed hydrotreated effluent; and

fractionating the hydrocracked dewaxed hydrotreated effluent to form at least a naphtha product fraction, a diesel product fraction and a lubricant base oil product fraction.

39. A method for producing a diesel fuel and a lubricant basestock, comprising:

contacting a feedstock with a hydrotreating catalyst under first effective hydrotreating conditions to produce a hydrotreated effluent;

dewaxing the hydrotreated effluent under first effective catalytic dewaxing conditions to produce a dewaxed effluent, the dewaxing catalyst includes at least one non-dealuminated, unidimensional, 10-member ring pore zeolite, and at least one Group VI metal, Group VIII metal or combination thereof;

separating the dewaxed effluent to form a gas phase portion and a remaining portion having at least a liquid phase;

hydrocracking at least a portion of the remaining portion of the dewaxed effluent under first effective hydrocracking conditions to form a hydrocracked effluent;

exposing at least a portion of the hydrocracked effluent to at least one additional hydroprocessing catalyst under one or more effective hydroprocessing conditions to form a hydroprocessed effluent, the one or more effective hydroprocessing conditions being selected from second effective dewaxing conditions and second effective hydrocracking conditions; and

fractionating the hydroprocessed effluent to form at least a naphtha product fraction, a diesel product fraction, and a lubricant base oil product fraction.