

CLAIMS:

1. A method for making lubricant base stock, comprising: performing solvent deasphalting under effective solvent deasphalting conditions on a feedstock having a T5 boiling point of 370°C or more and a T50 of 510°C or more, the effective solvent deasphalting conditions producing a yield of deasphalted oil of 40 wt% or more of the feedstock (or 50 wt% or more), the solvent deasphalting optionally being performed using a C₄+ solvent; hydroprocessing at least a portion of the deasphalted oil under first effective hydroprocessing conditions to form a hydroprocessed effluent, the at least a portion of the deasphalted oil having an aromatics content of 60 wt% or more, the hydroprocessed effluent comprising a sulfur content of 300 wppm or less, a nitrogen content of 100 wppm or less, or a combination thereof; separating, from the hydroprocessed effluent, at least a fuels boiling range fraction, a first fraction comprising polynuclear aromatics and having a T₅ distillation point of at least 370°C, and a second fraction having a T₅ distillation point of at least 370°C, the second fraction having a higher kinematic viscosity at 100°C than the first fraction; hydroprocessing i) at least a portion of the first fraction under second effective hydroprocessing conditions and/or ii) at least a portion of the second fraction under second effective hydroprocessing conditions, the second effective hydroprocessing conditions comprising catalytic dewaxing conditions, to form a twice-hydroprocessed effluent comprising a 370°C+ portion having a first kinematic viscosity at 100°C; and i) exposing the at least a portion of the first fraction, prior to the hydroprocessing under second effective hydroprocessing conditions, to an adsorbent under aromatic adsorbent conditions to form an adsorbent effluent having a reduced content of polynuclear aromatics relative to the at least a portion of the first fraction prior to the exposing; ii) exposing at least a portion of the twice-hydroprocessed effluent, during or after the hydroprocessing under second effective hydroprocessing conditions, to an adsorbent under aromatic adsorbent conditions to form an adsorbent effluent having a reduced content of polynuclear aromatics relative to the at least a portion of the twice-hydroprocessed effluent prior to the exposing; or iii) a combination of i) and ii).
2. The method of claim 1, wherein the at least a portion of the first fraction is hydroprocessed under the second effective hydroprocessing conditions, and i) after the exposing, the at least a portion of the twice-hydroprocessed effluent (or the at least a portion of the first fraction) has a Saybolt color this is greater than the Saybolt color of the at least a portion of the twice-hydroprocessed effluent (or the at least a portion of the first fraction) by two or more (or four or more); or ii) after the exposing and the hydroprocessing under second effective hydroprocessing conditions, the at least a portion of the twice-hydroprocessed effluent has a Saybolt color of 15 or more (or 18 or more, or 20 or more); or iii) after the hydroprocessing under second effective

hydroprocessing conditions and prior to the exposing, the at least a portion of the twice-hydroprocessed effluent has a Saybolt color of 14 or less (or 16 or less); or iv) a combination of two or more of i), ii) and iii).

3. The method of claim 1, wherein the at least a portion of the first fraction is hydroprocessed under the second effective hydroprocessing conditions, and prior to the exposing, the at least a portion of the twice-hydroprocessed effluent has a turbidity of 2 NTU or more.

4. The method of any of the above claims, wherein the second effective hydroprocessing conditions further comprise hydrotreating conditions, hydrocracking conditions, and aromatic saturation conditions, and wherein the exposing at least a portion of the twice-hydroprocessed effluent to an adsorbent under aromatic adsorbent conditions during the hydroprocessing under second effective hydroprocessing conditions comprises performing the exposing a) after the hydrotreating and prior to the hydrocracking; b) after the hydrocracking and prior to the catalytic dewaxing; or c) after the catalytic dewaxing and prior to the aromatic saturation.

5. The method of any of the above claims, further comprising separating a third fraction and a fourth fraction from the twice-hydroprocessed effluent, the fourth fraction having a higher kinematic viscosity at 100°C than the third fraction, the fourth fraction comprising the at least a portion of the twice-hydroprocessed effluent.

6. The method of any of claims 1 – 4, further comprising separating a third fraction and a fourth fraction from the at least a portion of the twice-hydroprocessed effluent, the fourth fraction having a higher kinematic viscosity at 100°C than the third fraction; and adding a diluent stream to the twice-hydroprocessed effluent or the at least a portion of the twice-hydroprocessed effluent prior to separating the third fraction and the fourth fraction, the diluent stream optionally comprising at least a portion of fuels boiling range fraction, at least a portion of the third fraction, or a combination thereof.

7. The method of any of the above claims, further comprising hydroprocessing at least a portion of the second fraction under third effective hydroprocessing conditions, the third effective hydroprocessing conditions comprising catalytic dewaxing conditions, to form a second twice-hydroprocessed effluent comprising a 370°C+ portion having a second kinematic viscosity at 100°C; separating from at least a portion of the second twice-hydroprocessed effluent a fifth fraction and a sixth fraction, the sixth fraction having a higher kinematic viscosity at 100°C than the fifth fraction; and exposing, at least a portion of the fifth fraction to an adsorbent under aromatic adsorbent conditions to form an effluent having a reduced content of polynuclear aromatics relative to the at least a portion of the fifth fraction.

8. The method of any of the above claims, wherein i) the exposing the at least a portion of the first fraction, ii) the exposing at least a portion of the twice-hydroprocessed effluent, or iii) a combination of i) and ii) to an adsorbent under aromatic adsorbent conditions comprises exposing the at least a portion of the twice-hydroprocessed effluent to an adsorbent comprising one or more of activated carbon, hydroxyl-modified activated carbon, attapulgus clay, an adsorbent clay, silica or alumina with greater than 10 m²/g BET surface area, porous polymer, porous resin, diatomaceous earth, and zeolite.
9. The method of claim 1, wherein a) the at least a portion of the twice-hydroprocessed effluent comprises a viscosity of 10 cP to 13 cP at 150°C and the aromatic adsorbent conditions comprise an exposure temperature of 120°C to 160°C; b) the at least a portion of the twice-hydroprocessed effluent comprises a viscosity of 13 cP to 15 cP at 150°C and the aromatic adsorbent conditions comprise an exposure temperature of 160°C to 200°C; or c) the at least a portion of the twice-hydroprocessed effluent comprises a viscosity of 8 cP to 10 cP at 150°C and the aromatic adsorbent conditions comprise an exposure temperature of 80°C to 120°C.
10. The method of any of the above claims, wherein the yield of deasphalted oil is 65 wt% or less, or wherein the deasphalted oil has an aromatics content of 70 wt% or more, or a combination thereof.
11. The method of any of the above claims, wherein the C₄₊ solvent comprises a C₅₊ solvent, a mixture of two or more C₅ isomers, or a combination thereof.
12. The method of any of the above claims, wherein the first effective hydroprocessing conditions comprise ebullated bed processing conditions, slurry hydroprocessing conditions, or a combination thereof; or wherein the first hydroprocessing conditions further comprise first aromatic saturation conditions, the first aromatic saturation conditions comprising exposing the at least a portion of the deasphalted oil to a hydrocracking catalyst and a demetallization catalyst, the at least a portion of the deasphalted oil being exposed to the demetallization catalyst after exposing the at least a portion of the deasphalted oil to the hydrocracking catalyst; or a combination thereof.
13. The method of any of the above claims, wherein separating the hydroprocessed effluent further comprises forming an additional fraction having a T₅ distillation point of at least 370°C, the method further comprising: hydroprocessing at least a portion of the additional fraction under third effective hydroprocessing conditions, the third effective hydroprocessing conditions comprising catalytic dewaxing conditions, to form a third catalytically dewaxed effluent comprising a 370°C+ portion having a kinematic viscosity at 100°C of 3.5 cSt or more.
14. The method of any of the above claims, wherein a ratio of non-aromatic carbon to aromatic carbon in aromatics in the at least a portion of the twice-hydroprocessed effluent is 1 : 4 or less; or

wherein a ratio of non-aromatic carbon to aromatic carbon in polynuclear aromatics in the at least a portion of the twice-hydroprocessed effluent is 1 : 6 or less; or a combination thereof.

15. The method of any of the above claims, wherein the adsorbent effluent has a reduced content of polynuclear aromatics comprising four or more rings (or six or more rings) relative to the at least a portion of the twice-hydroprocessed effluent.

16. The method of any of the above claims, further comprising adding a diluent to the first fraction, adding a diluent to the at least a portion of the first fraction, adding a diluent to the second fraction, adding a diluent to the at least a portion of the second fraction, or a combination thereof.

17. A method for making lubricant base stock, comprising: performing solvent deasphalting under effective solvent deasphalting conditions on a feedstock having a T5 boiling point of 370°C or more and a T50 of 510°C or more, the effective solvent deasphalting conditions producing a yield of deasphalted oil of 40 wt% or more of the feedstock; hydroprocessing at least a portion of the deasphalted oil, under hydroprocessing conditions comprising an average hydroprocessing temperature of 400°C or more and a LHSV of 1.0 hr⁻¹ or less (or 0.5 hr⁻¹ or less), to form a hydroprocessed effluent, the at least a portion of the deasphalted oil comprising a sulfur content of 1000 wppm or more and an aromatics content of 60 wt% or more (or 70 wt% or more), the hydroprocessed effluent comprising a sulfur content of 300 wppm or less; and exposing at least a portion of the hydroprocessed effluent to an adsorbent under aromatic adsorbent conditions to form an adsorbent effluent having a reduced content of polynuclear aromatics relative to the at least a portion of the hydroprocessed effluent prior to the exposing, the hydroprocessing conditions optionally comprising hydrotreating conditions, hydrocracking conditions, or a combination thereof; the at least a portion of the deasphalted oil optionally comprising 1000 wppm or more of sulfur.

18. A lubricant boiling range composition comprising a T5 boiling point of 370°C or more, a T50 of 510°C or more, a viscosity index of 80 or more (or 90 to 120), a kinematic viscosity at 100°C of 6.0 cSt to 16 cSt, a pour point of -15°C or less, and a polynuclear aromatics content of 0.01 wppm to 100 wppm (or 1.0 wppm to 100 wppm, or 0.1 wppm to 10 wppm).