WHAT IS CLAIMED IS:

1. A process for producing a low aromatic base oil comprising:

contacting a first SSZ-91 isomerized stream comprising an amount of residual refractory sulfur compounds with a base metal catalyst comprising nickel under conditions to provide a second isomerized stream comprising a lesser amount of residual refractory sulfur compounds than the first isomerized stream; and

contacting the second isomerized stream with a noble metal hydrofinishing catalyst under hydrofinishing conditions to provide a hydrofinished stream, wherein the isomerized stream comprising residual refractory sulfur compounds is produced by contacting a hydrocarbon feedstock with hydrogen and a noble metal hydroisomerization catalyst under hydroisomerization dewaxing conditions to provide the isomerized stream.

2. The process of claim 1, wherein a base oil produced by the process comprises:

(i) less than 0.4% by weight aromatics, or

(ii) a pour point of from -5°C to -20°C.

3. The process of claim 1, wherein the total aromatics in a base oil produced by the process are at least 60% less than a comparable process lacking the step of contacting a first isomerized stream comprising residual refractory sulfur compounds with a base metal catalyst under conditions to provide a second isomerized stream comprising a lesser amount of residual refractory sulfur compounds than the first isomerized stream.

4. The process of claim 1, wherein the noble metal hydroisomerization catalyst comprises a crystalline molecular sieve SSZ-91 and platinum.

5. The process of claim 1, wherein the noble metal hydrofinishing catalyst:

(i) comprises a silica alumina support and a noble metal selected from palladium, platinum, or a combination thereof, or

(ii) a noble metal content from 0.1 to 1.0 wt. %.

6. The process of claim 1, wherein the hydrofinishing conditions comprise a temperature of from 350°F (177 °C) to 500°F (260 °C).

7. The process of claim 1, wherein the first isomerized stream comprising an amount of residual refractory sulfur compounds is contacted with the base metal catalyst at a temperature of from 130°F (54°C) to 230°F (130°C).

8. The process of claim 1, wherein the hydroisomerization dewaxing conditions comprise:

(i) a temperature of from 550°F (288°C) to 700°F (371°C), or

(ii) a pressure in the range from 15 (0.20 MPa) to 3000 psig (20.79MPa).

9. The process of claim 1, wherein the hydroisomerization dewaxing conditions comprise a hydrocarbon feedstock feed rate in the range of from 0.1 to 20 hr^{-1} LHSV in the presence of hydrogen wherein the hydrogen to hydrocarbon ratio is in a range from 2000 (356.2 m^3/m^3) to 10,000 standard cubic feet per barrel hydrocarbon (1781.1 m^3/m^3) .

10. The process of claim 1, wherein the hydrofinishing conditions comprise a pressure in the range from 15 (0.20 MPa) to 3000 psig (20.79 MPa).

11. The process of claim 1, wherein the hydrofinishing conditions comprise a hydrofinished stream feed rate of from 0.1 to 20 hr^{-1} LHSV.

12. The process of claim 1, wherein the contacting of the first isomerized stream comprising an amount of residual refractory sulfur compounds with the base metal catalyst is conducted in the same reactor as the contacting of the second isomerized stream with the noble metal hydrofinishing catalyst.

13. The process of claim 1, wherein the contacting of the first isomerized stream comprising an amount of residual refractory sulfur compounds with the base metal catalyst is conducted in a different reactor as the contacting of the second isomerized stream with the noble metal hydrofinishing catalyst.

14. The process of claim 1, further comprising distilling and debutanizing the hydrofinished stream.

15. The process of claim 1, wherein the conditions to provide a second isomerized stream comprise a temperature of from 130°F (54°C) to 230°F (110 °C);

the noble metal hydrofinishing catalyst comprises a silica alumina support and a noble metal selected from palladium, platinum, or a combination thereof wherein the noble metal content is from 0.1 to 1.0 wt. %; the hydrofinishing conditions comprise a pressure in the range from 15 (0.20 MPa) to 3000 psig (20.79MPa) and a temperature of from 350°F (177°C) to 500°F (260°C);

wherein a base oil produced by the process comprises less than 0.4% by weight aromatics.