CLAIMS:

~~1. A process for hydrotreating a feedstock having a high nitrogen content,~~ comprising:

(a) contacting a hydrocarbon feedstock having a nitrogen content of at least about 3000 wppm with a supported hydrotreating catalyst under first hydrotreating conditions; and

(b) contacting the hydrotreated hydrocarbon feedstock with a sulfided bulk metal catalyst under second hydrotreating conditions to produce a hydrotreated effluent, said catalyst comprising a non-noble Group VIII metal molybdate in which at least a portion, but less than all, of the molybdenum has been replaced by tungsten,

wherein the bulk metal catalyst, prior to sulfidation, is represented by the formula: $(X)_b(Mo)_c(W)_dO_z$, wherein X is a non-noble Group VIII metal, the molar ratio of b:(c+d) is from about 0.5:1 to about 3:1, the molar ratio of c:d is greater than about 0.01:1, and $z = [2b+6(c+d)] / 2$.

2. A process for hydrotreating a feedstock having a high nitrogen content, comprising:

(a) contacting a hydrocarbon feedstock having a nitrogen content of at least about 3000 wppm with a supported hydrotreating catalyst under first hydrotreating conditions;

(b) contacting the hydrotreated hydrocarbon feedstock with a sulfided bulk metal catalyst under second hydrotreating conditions to produce a twice hydrotreated feedstock, said catalyst comprising a non-noble Group VIII metal molybdate in which at least a portion, but less than all, of the molybdenum has been replaced by tungsten, wherein the bulk metal catalyst, prior to sulfidation, is represented by the formula: $(X)_b(Mo)_c(W)_dO_z$, wherein X is a non-noble Group VIII metal, the molar ratio of b:(c+d) is from about 0.5:1 to about 3:1, the molar ratio of c:d is greater than about 0.01:1, and $z = [2b+6(c+d)] / 2$;

(c) contacting the twice hydrotreated feedstock with a supported hydrotreating catalyst under third hydrotreating conditions to produce at least a thrice hydrotreated effluent; and

~~(d) delivering the thrice hydrotreated effluent to a fluid catalytic cracking stage.~~

~~3. The process of claim 1 or claim 2, wherein the hydrocarbon feedstock has an~~ API gravity of at least about 20.

4. The process of any one of the previous claims, wherein the hydrocarbon feedstock has a T10 boiling point of at least about 300°F (about 149°C).

5. The process of any one of the previous claims, wherein the hydrotreated effluent has an API gravity greater than an API gravity of the hydrocarbon feedstock, and preferably wherein the hydrotreated effluent has an API gravity greater than about 25.

6. The process of any one of the previous claims, wherein the molar ratio of b:(c+d) is from about 0.75:1 to about 1.25:1.

7. The process of any one of the previous claims, wherein the molar ratio of c:d is from about 1:10 to 10:1.

8. The process of any one of the previous claims, wherein the hydrocarbon feedstock has a nitrogen content of at least about 4000 wppm.

9. The process of any one of the previous claims, wherein at least one of the first hydrotreating conditions, the second hydrotreating conditions, and the third hydrotreating conditions include an LHSV from about 0.1 hr^{-1} to about 2.0 hr^{-1}, a total pressure from about 800 psig (about 5.5 MPag) to about 3000 psig (about 20.7 MPag), a treat gas rate of at least about 1000 scf/b (about 170 Nm^3/m^3) using at least 80% hydrogen, and a temperature from about 600°F (about 316°C) to about 800°F (about 427°C).

10. The process of any one of the previous claims, wherein at least one of the first hydrotreating conditions, the second hydrotreating conditions, and the third hydrotreating conditions include an LHSV from about 0.5 hr^{-1} to about 1.5 hr^{-1}, a total pressure from about 1400 psig (about 9.7 MPag) to about 2000 psig (about 13.8 MPag), a hydrogen treat gas rate from about 2000 scf/b (about 340 Nm^3/m^3) to about 5000 scf/b (about 840 Nm^3/m^3) using at least 80% hydrogen, and a temperature from about 650°F (about 343°C) to about 750°F (about 399°C).

~~11. The process of any one of the previous claims, wherein X comprises Ni or Co.~~

12. A method for effectively utilizing heteroatom removal capability of a bulk catalyst in removing heteroatoms from a hydrocarbon feedstock, the method comprising:

hydrotreating a first hydrocarbon feedstock by contacting the first feedstock with a bulk catalyst containing at least three of the following metals: cobalt, nickel, molybdenum, and tungsten, said bulk catalyst in its unused state having a relative volumetric catalytic activity for hydrodesulfurization and/or hydrodenitrogenation, with the contacting being done under conditions effective to at least partially hydrodesulfurize and/or hydrodenitrogenate the first feedstock, wherein the contacting continues until the bulk catalyst exhibits a relative volumetric hydrodesulfurization activity of not more than 60% of the relative volumetric hydrodesulfurization activity in its unused state;

isolating the hydrotreated first hydrocarbon feedstock;

hydrotreating a second hydrocarbon feedstock by contacting the second feedstock with the bulk catalyst whose relative volumetric hydrodesulfurization activity is not more than 60% of the relative volumetric hydrodesulfurization activity in its unused state, with the contacting being done under conditions effective to at least partially hydrodesulfurize and/or hydrodenitrogenate the second feedstock, as well as to hydrodeoxygenate the second feedstock; and

isolating the hydrotreated second hydrocarbon feedstock,

wherein:

the second hydrocarbon feedstock contains at least 10 wt% more biocomponent content than the first hydrocarbon feedstock;

the first hydrocarbon feedstock has a pre-treated sulfur content, the hydrotreated first hydrocarbon feedstock has a post-treated sulfur content, and the post-treated sulfur content is no more than 3.0% of the pre-treated sulfur content;

the second hydrocarbon feedstock has a pre-treated oxygen content and a pre-treated sulfur content, the hydrotreated second hydrocarbon feedstock has a post-treated oxygen content and a post-treated sulfur content, the post-treated oxygen content is no more than 1.0% of the pre-treated oxygen content, and the pre-treated sulfur content is no more than 3.0% of the post-treated sulfur

content; and the isolated hydrotreated first hydrocarbon feedstock and the isolated hydrotreated second hydrocarbon feedstock are both combined with a fuel pool.

13. The method of claim 12, wherein the first hydrocarbon feedstock has a sulfur content of at least 500 wppm and is comprised of from 80 wt% to 100 wt% of a diesel boiling range mineral feedstock and from 0 wt% to 20 wt% of a diesel boiling range biocomponent feedstock; wherein the second hydrocarbon feedstock has a sulfur content of at least 500 wppm and an oxygen content of at least 1 wt% and is comprised of from 10 wt% to 80 wt% of a diesel boiling range mineral feedstock and from 20 wt% to 90 wt% of a diesel boiling range biocomponent feedstock; and wherein the contacting in the first hydrotreatment step continues until the bulk catalyst exhibits a relative volumetric hydrodesulfurization activity of not more than 50% of the relative volumetric hydrodesulfurization activity in its unused state.

What is claimed is:

1. A process for hydrotreating a feedstock having a relatively high nitrogen content, comprising:

contacting a hydrocarbon feedstock having a nitrogen content of at least about 3000 wppm with a supported hydrotreating catalyst under first hydrotreating conditions; and

contacting the hydrotreated hydrocarbon feedstock with a sulfided bulk metal catalyst under second hydrotreating conditions to produce a hydrotreated effluent, said catalyst comprising a non-noble Group VIII metal molybdate in which at least a portion, but less than all, of the molybdenum has been replaced by tungsten, the hydrotreated effluent having a sulfur content of at least about 100 wppm and a nitrogen content of at least about 100 wppm,

wherein the bulk metal catalyst, prior to sulfidation, is represented by the formula: $(X)_b(Mo)_c(W)_dO_z$, wherein X is a non-noble Group VIII metal, the molar ratio of b:(c+d) is from about 0.5:1 to about 3:1, the molar ratio of c:d is greater than about 0.01:1, and $z=[2b+6(c+d)]/2$.

2. The process of claim 1, wherein the hydrocarbon feedstock has a nitrogen content of at least about 4000 wppm.

3. The process of claim 1, wherein the hydrocarbon feedstock has an API gravity of at least about 20.

4. The process of claim 1, wherein the hydrocarbon feedstock has a T10 boiling point of at least about 300°F (about 149°C).

5. The process of claim 1, wherein the hydrotreated effluent has an API gravity greater than about 25.

6. The process of claim 1, wherein the molar ratio of b:(c+d) is from about 0.75:1 to about 1.25:1.

7. The process of claim 1, wherein the molar ratio of c:d is from about 1:10 to about 10:1.

8. The process of claim 1, wherein at least one of the first hydrotreating conditions and the second hydrotreating conditions include an LHSV from about 0.1 hr^{-1} to about 2.0 hr^{-1}, a total pressure from about 800 psig (about 5.5 MPag) to about 3000 psig (about 20.7 MPag), a treat gas rate of at least about 1000 scf/b (about 170 Nm^3/m^3) using at least 80% hydrogen, and a temperature from about 600°F (about 316°C) to about 800°F (about 427°C).

9. The process of claim 1, wherein at least one of the first hydrotreating conditions and the second hydrotreating conditions include an LHSV from about 0.5 hr^{-1} to about 1.5 hr^{-1}, a total pressure from about 1400 psig (about 9.7 MPag) to about 2000 psig (about 13.8 MPag), a hydrogen treat gas rate from about 2000 scf/b (about 340 Nm^3/m^3) to about 5000 scf/b (about 840Nm^3/m^3) using at least 80% hydrogen, and a temperature from about 650°F (about 343°C) to about 750°F (about 399°C).

10. The process of claim 1, wherein X comprises Ni, Co, or both.

11. The process of claim 1, wherein X is Ni.

12. A process for hydrotreating a feedstock having a relatively high nitrogen content, comprising:

contacting a hydrocarbon feedstock having a nitrogen content of at least about 3000 wppm with a supported hydrotreating catalyst under first hydrotreating conditions;

contacting the hydrotreated hydrocarbon feedstock with a sulfided bulk metal catalyst under second hydrotreating conditions to produce a twice hydrotreated feedstock, said catalyst comprising a non-noble Group VIII metal molybdate in which at least a portion, but less than all, of the molybdenum has been replaced by tungsten, wherein the bulk metal catalyst, prior to sulfidation, is represented by the formula: $(X)_b(Mo)_c(W)_dO_z$, wherein X is a non-noble Group VIII metal, the molar ratio of

b:(c+d) is from about 0.5:1 to about 3:1, the molar ratio of c:d is greater than about 0.01:1, and z=[2b+6(c+d)]/2;

contacting the twice hydrotreated feedstock with a supported hydrotreating catalyst under third hydrotreating conditions to produce at least a thrice hydrotreated effluent; and

delivering the thrice hydrotreated effluent to a fluid catalytic cracking stage,

wherein the thrice hydrotreated effluent has a sulfur content of at least about 100 wppm and a nitrogen content of at least about 100 wppm.

13. The process of claim 12, wherein at least one of the first hydrotreating conditions, the second hydrotreating conditions, and the third hydrotreating conditions include an LHSV from about 0.1 hr^{-1} to about 2.0 hr^{-1}, a total pressure from about 800 psig (about 5.5 MPag) to about 3000 psig (about 20.7 MPag), a treat gas rate of at least about 1000 scf/b (about 170 Nm^3/m^3) using at least 80% hydrogen, and a temperature from about 600°F (about 316°C) to about 800°F (about 427°C).

14. The process of claim 12, wherein at least one of the first hydrotreating conditions, the second hydrotreating conditions, and the third hydrotreating conditions include an LHSV from about 0.5 hr^{-1} to about 1.5 hr^{-1}, a total pressure from about 1400 psig (about 9.7 MPag) to about 2000 psig (about 13.8 MPag), a hydrogen treat gas rate from about 2000 scf/b (about 340 Nm^3/m^3) to about 5000 scf/b (about 840 Nm^3/m^3) using at least 80% hydrogen, and a temperature from about 650°F (about 343°C) to about 750°F (about 399°C).

15. The process of claim 12, wherein the hydrocarbon feedstock has a nitrogen content of at least about 4000 wppm.

16. The process of claim 12, wherein the hydrocarbon feedstock has an API gravity of at least about 20.

17. The process of claim 12, wherein the hydrocarbon feedstock has a T10 boiling point of at least about 300°F (about 149°C).

18. The process of claim 12, wherein the thrice hydrotreated effluent has an API gravity greater than an API gravity of the hydrocarbon feedstock.

19. The process of claim 1, wherein the hydrotreated effluent has a sulfur content of at least about 500 wppm.

20. The process of claim 1, wherein the hydrotreated effluent has a nitrogen content of at least about 500 wppm.

21. The process of claim 1, wherein the hydrotreated hydrocarbon feedstock comprises at least about 1 wt % of feed based on a biocomponent source.

22. The process of claim 21, wherein the hydrotreated hydrocarbon feedstock comprises from about 5 wt % to about 20 wt % of feed based on a biocomponent source.

23. The process of claim 1, wherein contacting the hydrotreated hydrocarbon feedstock with a sulfided bulk metal catalyst under second hydrotreating conditions to produce a hydrotreated effluent continues until the bulk catalyst exhibits a relative volumetric hydrodesulfurization activity of not more than 60% of the relative volumetric hydrodesulfurization activity in its unused state, the process further comprising:

contacting a second feedstock with the sulfided bulk metal catalyst exhibiting a relative volumetric hydrodesulfurization activity of not more than 60%, the contacting of the second hydrocarbon feedstock being performed under conditions effective to at least partially hydrodesulfurize or hydrodenitrogenate the second feedstock,

wherein an amount of feed from a biocomponent source in the second feedstock is at least 10 wt % greater than an amount of feed based on a biocomponent source in the hydrotreated hydrocarbon feedstock.