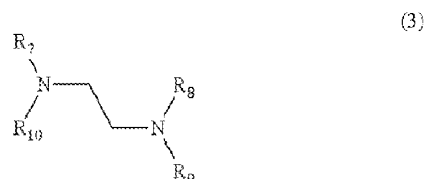
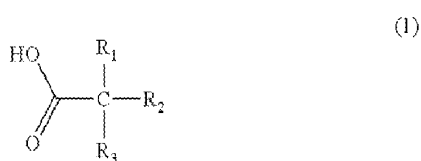


What is claimed is:

1. A hydrocracking process comprising:
passing a hydrocarbon feed to a single stage hydrocracking unit where the feed is hydrocracked under hydrocracking conditions, and with the catalyst in the hydrocracking unit comprising a base comprised of alumina, an amorphous silica-alumina material, a USY zeolite, ZSM-12, and a beta zeolite.
2. The process of claim 1, wherein the base comprises 5 to 40 wt. % alumina, 30 to 80 wt. % ASA, 0.5 to 40 wt. % USY zeolite, 0.1 to 40 wt. % ZSM-12, and 0 to 40 wt. % beta zeolite.
3. The process of claim 2, wherein the amount of alumina ranges from about 20 to about 30 wt. %.
4. The process of claim 2, wherein the amount of ASA ranges from about 45 to about 75 wt. %.
5. The process of claim 2, wherein the amount of USY zeolite ranges from about 4 to about 20 wt. %.
6. The process of claim 2, wherein the amount of beta zeolite ranges from about 4 to 20 wt. %.
7. The process of claim 2, wherein the amount of ZSM-12 ranges from about 2 to about 20 wt. %.
8. The process of claim 1, wherein the feed comprises a VGO.
9. The process of claim 1, wherein the selectivity of middle distillate (380-530° F) is at least 28 wt. % at about 60 wt. % apparent conversion (<700° F).
10. The process of claim 1, wherein the catalyst comprises the metals nickel (Ni) and tungsten (W) impregnated into the base.

11. The process of claim 10, wherein the catalyst comprises from about 2 to about 10 wt. % of nickel material and from about 8 to about 40 wt. % of tungsten material based on the bulk dry weight of the hydrocracking catalyst.
12. The process of claim 1, wherein the catalyst comprises a modifying agent.
13. The process of claim 12, wherein the modifying agent is selected from the group consisting of compounds represented by structures (1) through (4), and condensated forms thereof:



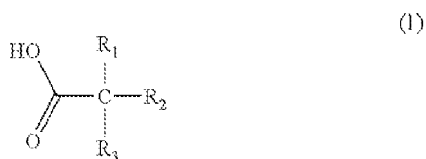
wherein:

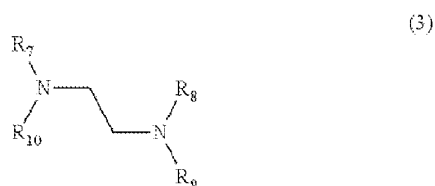
(1) R₁, R₂ and R₃ are independently selected from the group consisting of hydrogen; hydroxyl; methyl; amine; and linear or branched, substituted or unsubstituted C₁-C₃ alkyl groups, C₁-C₃ alkenyl groups, C₁-C₃ hydroxyalkyl groups, C₁-C₃ alkoxyalkyl groups, C₁-C₃ aminoalkyl groups, C₁-C₃ oxoalkyl groups, C₁-C₃ carboxyalkyl groups, C₁-C₃ aminocarboxyalkyl groups and C₁-C₃ hydroxycarboxyalkyl groups;

(2) R₄ through R₁₀ are independently selected from the group consisting of hydrogen; hydroxyl; and linear or branched, substituted or unsubstituted C₂-C₃ carboxyalkyl groups; and

(3) R_{11} is selected from the group consisting of linear or branched, saturated and unsaturated, substituted or unsubstituted C_1 - C_3 alkyl groups, C_1 - C_3 hydroxyalkyl groups, and C_1 - C_3 oxoalkyl groups.

14. The process of claim 13, wherein the modifying agent comprises citric acid.
15. The process of claim 1, wherein the catalyst in the hydrocracking unit is prepared by:
 - (a) forming an extrudable mass containing the catalyst base;
 - (b) extruding the mass to form a shaped extrudate;
 - (c) calcining the mass to form a calcined extrudate;
 - (d) preparing an impregnation solution containing at least one metal nitrate or metal carbonate, a solvent, a modifying agent and an ammonium containing component, and adjusting the pH of the impregnation solution to between 1 and 5.5 with a hydroxide base, inclusive;
 - (e) contacting the shaped extrudate with the impregnation solution; and
 - (f) drying the impregnated extrudate at a temperature sufficient to remove the impregnation solution solvent, to form a dried impregnated extrudate.
16. The process of claim 15, wherein the impregnation solution comprises nickel carbonate.
17. The process of claim 15, wherein the modifying agent is selected from the group consisting of compounds represented by structures (1) through (4), and condensated forms thereof.





wherein:

(1) R₁, R₂ and R₃ are independently selected from the group consisting of hydrogen; hydroxyl; methyl; amine; and linear or branched, substituted or unsubstituted C₁-C₃ alkyl groups, C₁-C₃ alkenyl groups, C₁-C₃ hydroxyalkyl groups, C₁-C₃ alkoxyalkyl groups, C₁-C₃ aminoalkyl groups, C₁-C₃ oxoalkyl groups, C₁-C₃ carboxyalkyl groups, C₁-C₃ aminocarboxyalkyl groups and C₁-C₃ hydroxycarboxyalkyl groups;

(2) R₄ through R₁₀ are independently selected from the group consisting of hydrogen; hydroxyl; and linear or branched, substituted or unsubstituted C₂-C₃ carboxyalkyl groups; and

(3) R₁₁ is selected from the group consisting of linear or branched, saturated and unsaturated, substituted or unsubstituted C₁-C₃ alkyl groups, C₁-C₃ hydroxyalkyl groups, and C₁-C₃ oxoalkyl groups.

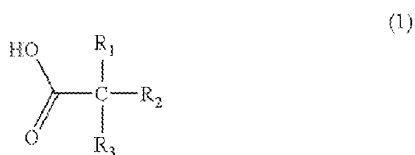
18. The process of claim 17, wherein the modifying agent comprises citric acid.

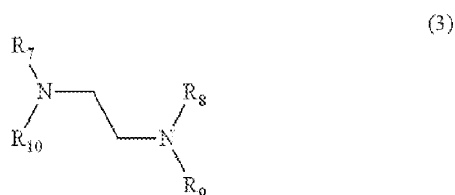
19. A hydrocracking catalyst comprising a base of alumina, an amorphous silica-alumina, a USY zeolite, a beta zeolite, and ZSM-12.

20. The hydrocracking catalyst of claim 19, wherein the base comprises 5 to 40 wt. % alumina, 30 to 70 wt. % ASA, 0.5 to 40 wt. % USY zeolite, 0.5 to 40 wt. % beta zeolite, and 0.1 to 40 wt. % ZSM-12.

21. The hydrocracking catalyst of claim 20, wherein the amount of alumina ranges from about 20 to about 30 wt. %.

22. The hydrocracking catalyst of claim 20, wherein the amount of ASA ranges from about 45 to about 75 wt. %.
23. The hydrocracking catalyst of claim 20, wherein the amount of USY zeolite ranges from about 4 to about 20 wt. %.
24. The hydrocracking catalyst of claim 20, wherein the amount of beta zeolite ranges from about 4 to 20 wt. %.
25. The hydrocracking catalyst of claim 20, wherein the amount of ZSM-12 ranges from about 2 to about 20 wt. %.
26. The hydrocracking catalyst of claim 19, wherein the catalyst comprises the metals nickel (Ni) and tungsten (W) impregnated into the base.
27. The hydrocracking catalyst of claim 26, wherein the catalyst comprises from 2 to 10 wt. % of nickel material and from 8 to 40 wt. % of tungsten material based on the bulk dry weight of the hydrocracking catalyst.
28. The hydrocracking catalyst of claim 19, wherein the catalyst comprises a modifying agent.
29. The hydrocracking catalyst process of claim 28, wherein the modifying agent is selected from the group consisting of compounds represented by structures (1) through (4), and condensated forms thereof:





wherein:

(1) R_1 , R_2 and R_3 are independently selected from the group consisting of hydrogen; hydroxyl; methyl; amine; and linear or branched, substituted or unsubstituted C_1 - C_3 alkyl groups, C_1 - C_3 alkenyl groups, C_1 - C_3 hydroxyalkyl groups, C_1 - C_3 alkoxyalkyl groups, C_1 - C_3 aminoalkyl groups, C_1 - C_3 oxoalkyl groups, C_1 - C_3 carboxyalkyl groups, C_1 - C_3 aminocarboxyalkyl groups and C_1 - C_3 hydroxycarboxyalkyl groups;

(2) R_4 through R_{10} are independently selected from the group consisting of hydrogen; hydroxyl; and linear or branched, substituted or unsubstituted C_2 - C_3 carboxyalkyl groups; and

(3) R_{11} is selected from the group consisting of linear or branched, saturated and unsaturated, substituted or unsubstituted C_1 - C_3 alkyl groups, C_1 - C_3 hydroxyalkyl groups, and C_1 - C_3 oxoalkyl groups.

30. The hydrocracking catalyst of claim 28, wherein the modifying agent comprises citric acid.

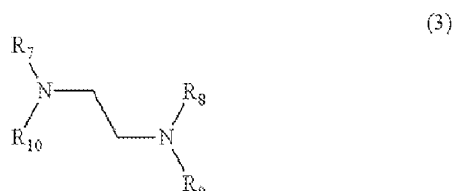
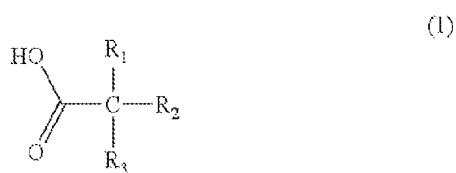
31. The hydrocracking catalyst of claim 19, wherein the catalyst in the hydrocracking unit is prepared by:

- (a) forming an extrudable mass containing the catalyst base;
- (b) extruding the mass to form a shaped extrudate;
- (c) calcining the mass to form a calcined extrudate;
- (d) preparing an impregnation solution containing at least one metal nitrate or metal carbonate, a modifying agent, a solvent, and an ammonium containing component, and adjusting the pH of the impregnation solution to between 1 and 5.5 with a hydroxide base, inclusive;
- (e) contacting the shaped extrudate with the impregnation solution; and

(f) drying the impregnated extrudate at a temperature sufficient to remove the impregnation solution solvent, to form a dried impregnated extrudate.

32. The hydrocracking catalyst of claim 31, wherein the impregnation solution comprises nickel carbonate.

33. The hydrocracking catalyst of claim 31, wherein the modifying agent is selected from the group consisting of compounds represented by structures (1) through (4), and condensed forms thereof:



wherein:

(1) R₁, R₂ and R₃ are independently selected from the group consisting of hydrogen; hydroxyl; methyl; amine; and linear or branched, substituted or unsubstituted C₁-C₃ alkyl groups, C₁-C₃ alkenyl groups, C₁-C₃ hydroxyalkyl groups, C₁-C₃ alkoxyalkyl groups, C₁-C₃ aminoalkyl groups, C₁-C₃ oxoalkyl groups, C₁-C₃ carboxyalkyl groups, C₁-C₃ aminocarboxyalkyl groups and C₁-C₃ hydroxycarboxyalkyl groups;

(2) R_4 through R_{10} are independently selected from the group consisting of hydrogen, hydroxyl, and linear or branched, substituted or unsubstituted C_2 - C_3 carboxyalkyl groups; and

(3) R_{11} is selected from the group consisting of linear or branched, saturated and unsaturated, substituted or unsubstituted C_1 - C_3 alkyl groups, C_1 - C_3 hydroxyalkyl groups, and C_1 - C_3 oxoalkyl groups.

34. The hydrocracking catalyst of claim 33, wherein the modifying agent comprises citric acid.