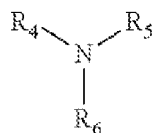
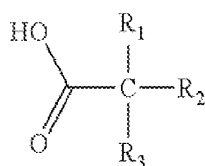
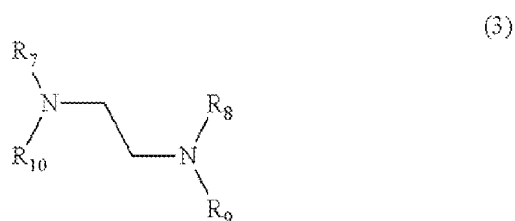


What is claimed is:

1. A two stage hydrocracking process comprising:
 - a) hydrocracking a hydrocarbon feed in a first hydrocracking stage under hydrocracking conditions; and
 - b) passing an effluent from the first hydrocracking stage to a second hydrocracking stage wherein the effluent is hydrocracked under hydrocracking conditions, with the catalyst in the second hydrocracking stage comprises a base comprised of alumina, an amorphous silica-alumina (ASA) material, a USY zeolite and ZSM-12.
2. The process of claim 1, wherein the base comprises 0.1 to 40 wt. % alumina, 30 to 80 wt. % ASA, 0 to 40 wt. % USY zeolite and 0.1 to 40 wt. %, ZSM-12.
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 55 to about 75 wt. %.
5. The process of claim 2, wherein the amount of USY zeolite ranges from about 0.1 to about 10 wt. %.
6. The process of claim 2, wherein the amount of ZSM-12 ranges from about 0.2 to about 10 wt. %.
7. The process of claim 1, wherein the selectivity of distillate products having a boiling point in the range of 380-700 °F (193-371 °C) is at least 50 wt. %.
8. The process of claim 7, wherein the selectivity is at least 65 wt. %.
9. The process of claim 1, wherein the effluent from the first hydrocracking stage comprises unconverted oil (UCO).
10. The process of claim 1, wherein the first hydrocracking stage employs a conventional hydrocracking catalyst.

11. The process of claim 7, wherein the selectivity of heavy distillate having a boiling point in the range of 530-700 °F (277-371 °C) is at least 15 wt. %.
12. The process of claim 7, wherein the selectivity of middle distillate having a boiling point in the range of 380-530 °F (193-277 °C) is at least 35 wt. %.
13. The process of claim 1, wherein the catalyst in the second hydrocracking stage comprises the metals nickel (Ni) and tungsten (W) impregnated into the base as oxides.
14. The process of claim 13, wherein the catalyst in the second hydrocracking stage comprises from about 2 to about 10 wt. % of nickel oxide and from about 8 to about 40 wt. % of tungsten oxide based on the bulk dry weight of the hydrocracking catalyst.
15. The process of claim 1, wherein the catalyst in the second hydrocracking stage comprises a modifying agent.
16. 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.

17. The process of claim 16, wherein the modifying agent comprises citric acid.

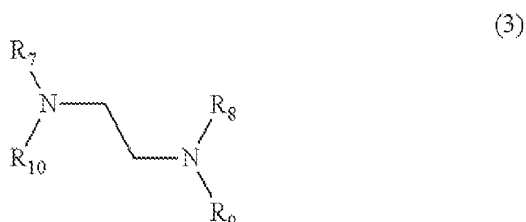
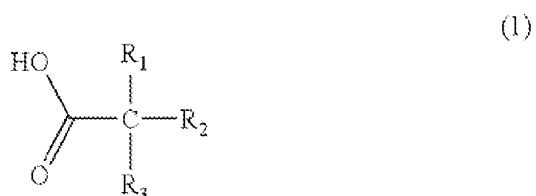
18. The process of claim 1, wherein the catalyst in the second hydrocracking stage is prepared by a method comprising the steps of:

- (a) forming an extrudable mass containing the catalyst support 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 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.

19. The process of claim 18, wherein the impregnation solution comprises nickel carbonate.

20. The process of claim 18, 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 C₁-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.

21. The process of claim 20, wherein the modifying agent comprises citric acid.

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

23. The hydrocracking catalyst of claim 22, wherein the base comprises 0.1 to 40 wt. % alumina, 30 to 80 wt. % ASA, 0 to 40 wt. % USY zeolite, and 0.1 to 40 wt. % ZSM-12.

24. The hydrocracking catalyst of claim 23, wherein the amount of alumina ranges from about 20 to about 30 wt. %.

25. The hydrocracking catalyst of claim 23, wherein the amount of ASA ranges from about 55 to about 75 wt. %.

26. The hydrocracking catalyst of claim 23, wherein the amount of USY zeolite ranges from about 0.1 to about 10 wt. %.

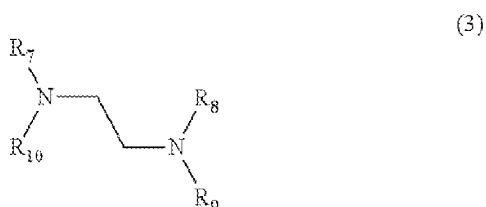
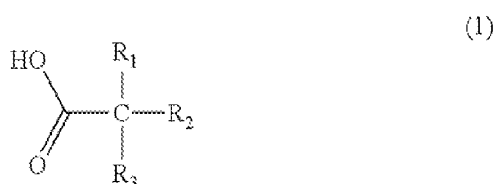
27. The hydrocracking catalyst of claim 23, wherein the amount of ZSM-12 ranges from about 0.2 to about 10 wt. %.

28. A hydrocracking catalyst of claim 22, wherein the catalyst comprises the metals nickel (Ni) and tungsten (W) impregnated into the base as oxides.

29. A hydrocracking catalyst of claim 28, wherein the catalyst comprises from about 2 to 10 wt. % of nickel oxide and from about 8 to 40 wt. % of tungsten oxide based on the bulk dry weight of the hydrocracking catalyst.

30. The catalyst process of claim 22, wherein the catalyst comprises a modifying agent.

31. The catalyst of claim 30, 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 C₁-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.

32. The catalyst of claim 31, wherein the modifying agent comprises citric acid.