Claims

1. A method for optimizing a layered hydrocracking catalytic process, comprising (i) contacting a molecule capable of (a) being hydrocracked as well as at least one of (ii) hydrogenation , hydrosulfurization and hydrodenitrogenation to a plurality of catalysts to determine an optimal catalyst for each of (i) and (ii), (b) layering the optimal catalyst for each of(i) and (ii) in a reaction chamber, and (c) contacting a feedstock to the layered catalysts under condition favoring formation of lower weight hydrocarbon from said hydrocarbon containing feedstock.

2. The method of Claim 1, comprising layering the catalysts in a reaction zone based on their activity reacting with a model compound.

3. The method of Claim 1, wherein said molecule is methylnaphthalene, dibenzothiophene, an alkylated or naphtalated derivative thereof, a basic nitrogen compound or a carbazole molecule, wherein said model compound boils in the range 180°C - 520°C.

4. The method of Claim 2, further comprising determining double bond equivalence (DBE) of said feedstock, and contacting said test molecule to a plurality of catalysts suitable for hydrocracking a substance with a DBE of said feedstock, to determine an optimum hydrocracking catalyst for said feedstock.

5. The method of Claim 4, further comprising contacting said test molecule to a second plurality of catalysts suitable for hydrogenerating, hydrodesulfurizing, or hydrodenitrogenating a substance with a DBE value less than said feedstock to determine an optimal, second catalyst.

6. The method of Claim 4, wherein said hydrocarbons contained in said feedstock have a double bond equivalency of 24 or less.

7. The method of Claim 4, wherein said feedstock has a double bond equivalency of 24 or less, and at least one of said catalysts for VGO hydrocracking catalyst.

8. The method of Claim 4, wherein said feedstock has a double bond equivalency of 25 or more, and at least one of said catalysts is a catalyst designed for heavy feedstock.

9. The method of Claim 1, comprising contacting said hydrocarbon containing feedstock to said reaction chamber at a temperature of from 350°C to 450°C.

10. The method of Claim 1, comprising contacting said hydrocarbon containing feedstock to said reaction chamber at a hydrogen feed rate less than 2500 liters per liter of feedstock.

11. The method of Claim 1, comprising contacting said hydrocarbon containing feedstock to said reaction vessel at a pressure of from 100 bars to 200 bars.

12. The method of Claim 1, wherein at least one of said catalysts contains a metal from Group VI, VII or VIIIB of the periodic table, or is a noble metal.

13. The method of Claim 12, wherein said metal is Co, Ni, W, Mo, Pt, or Pd.

14. The method of Claim 1, wherein at least one of said catalysts contains amorphous alumina, silica-alumina, titanium, Y zeolite, or at least one a transition metal inserted Y zeolite.

15. The method of Claim 14, wherein said transition metal is Zr, Ti, Hf and combination thereof.

16. The method of Claim 1, wherein said molecule is capable of being at least two of hydrogenated, hydrodesulfurized, and hydrodenitrogenated.

17. The method of Claim 1, wherein said molecule is capable of being hydrogenated, hydrodesulfurized, and hydrodenitrogenated.

Claims

1. A method for optimizing a layered hydrocracking catalytic process, comprising (i) contacting a model compound capable of (a) being hydrocracked as well as at least one of (ii) hydrogenation , hydrosulfurization and hydrodenitrogenation to a plurality of catalysts to determine an optimal catalyst for each of (i) and (ii), (b) followed by layering the optimal catalysts for each of (i) and (ii) in a reaction chamber based on their activity reacting with said model compound, and (c) contacting a feedstock to the layered catalysts under condition favoring formation of lower weight hydrocarbon from said hydrocarbon containing feedstock, wherein said model compound boils in the range of 180°C – 520°C and is selected from the group consisting of methylnaphthalene, dibenzothiophene, an alkylated or naphtalated derivative thereof, a basic nitrogen compound and a carbazole molecule.

2. The method of Claim 1, further comprising determining double bond equivalence (DBE) of said feedstock, and contacting said model compound to a plurality of catalysts suitable for hydrocracking a substance with a DBE of said feedstock, to determine an optimum hydrocracking catalyst for said feedstock.

3. The method of Claim 2, further comprising contacting said model compound to a second plurality of catalysts suitable for hydrogenerating, hydrodesulfurizing, or hydrodenitrogenating a substance with a DBE value less than said feestock to determine an optimal, second catalyst.

4. The method of Claim 2, wherein said hydrocarbons contained in said feedstock have a double bond equivalency of 24 or less.

5. The method of Claim 2, wherein said feedstock has a double bond equivalency of 24 or less, and at least one of said catalysts for VGO hydrocracking catalyst.

6. The method of Claim 2, wherein said feedstock has a double bond equivalency of 25 or more, and at least one of said catalysts is a catalyst designed for heavy feedstock.

7. The method of Claim 1, comprising contacting said hydrocarbon containing feedstock to said reaction chamber at a temperature of from 350°C to 450°C.

8. The method of Claim 1, comprising contacting said hydrocarbon containing feedstock to said reaction chamber at a hydrogen feed rate less than 2500 liters per liter of feedstock.

9. The method of Claim 1, comprising contacting said hydrocarbon containing feedstock to said reaction vessel at a pressure of from 100 bars to 200 bars.

10. The method of Claim 1, wherein at least one of said catalysts contains a metal from Group VI, VII or VIIIB of the periodic table, or is a noble metal.

11. The method of Claim 10, wherein said metal is Co, Ni, W, Mo, Pt, or Pd.

12. The method of Claim 1, wherein at least one of said catalysts contains amorphous alumina, silica-alumina, titanium, Y zeolite, or at least one a transition metal inserted Y zeolite.

13. The method of Claim 12, wherein said transition metal is Zr, Ti, Hf and combination thereof.

14. The method of Claim 1, wherein said molecule is capable of being at least two of hydrogenated, hydrodesulfurized, and hydrodenitrogenated.

15. The method of Claim 1, wherein said molecule is capable of being hydrogenated, hydrodesulfurized, and hydrodenitrogenated.