

Claim:

1. A method for treating a hydrocarbon containing feedstock which has a boiling point greater than 300 °C, comprising:
 - (i) emulsifying said feedstock with an upgrading catalyst precursor, an aromatic rich hydrocarbon stream, and water to form an emulsion in the form of a slurry;
 - (ii) forming the catalyst by decomposing the said emulsion into a catalytic suspension, which is then transported to a hydrotreating reactor that contains a hydrotreating catalyst, said emulsion decomposition being carried out at a temperature of from about 300 °C to about 500 °C, and a pressure of from about 1 Bar to about 200 Bar;
 - (iii) fractionating said effluent into (a) contaminant gases, (b) a portion of light hydrocarbon gases having a boiling point of from 36 °C to 180 °C, (c) a portion of gas oil having a boiling point of from 180 °C to 375 °C, and (d) a portion of unconverted bottoms;
 - (iv) separating from (a) from (b), and (c) and transporting (b) and (c) to a recovery unit;
 - (v) combining said uncovered bottom with water, to form a slurry mixture;
 - (vi) transferring said slurry mixture to an upgrading reactor under conditions for cracking said mixture to form a light fraction containing (a), (b), (c), and (d) of step (ii);
 - (vii) transporting the unconverted bottoms from (vi) to a fractionation zone to remove light fractions therefrom, and
 - (viii) mixing any remaining unconverted bottoms with water in a feedstock preparation unit and subjecting said mixture to catalytic hydrothermal aquathermolysis.
2. The method of claim 1, further comprising adding hydrogen in step (vi).
3. The method of claim 1, wherein said temperature in step (ii) ranges from 380 °C to 450 °C.

4. The method of claim 1, wherein said pressure in step (i) ranges from 50 Bar to 180 Bar.
5. A method for treating a hydrocarbon containing feedstock which has a boiling point greater than 300 °C, comprising:
 - (i) combining said feedstock with hydrogen in a hydrotreating reactor which contains a hydrotreating catalyst, at a temperature of from about 300 °C to about 500 °C and a pressure from about 1 Bar to about 200 Bar, to form a first effluent containing (a) contaminant gases, (b) a portion of light hydrocarbon gases having a boiling point of from 36 °C to 180 °C, (c) a portion of gas oil having a boiling point of from 180 °C to 375 °C, and (d) a portion of unconverted bottoms;
 - (ii) transporting (a), (b), and (c) to a fractionation zone to separate (a), (b), and (c) from each other;
 - (iii) transporting said unconverted bottoms to a feedstock / catalyst preparation zone which contains an upgrading catalyst precursor, to form a mixture therebetween;
 - (iv) transporting said mixture to a decomposition zone;
 - (v) treating said mixture in (iv) to form said catalyst;
 - (vi) adding water to said mixture;
 - (vii) transporting said mixture to an upgrading reactor for reaction via catalytic hydrothermal aquathermolysis, to form a light fraction containing (a), (b), and (c) of step (i) and unconverted bottoms;
 - (viii) separating said light fraction and said unconverted bottoms;
 - (ix) transporting said light fraction to a fractionation zone to separate (a), (b), and (c) from each other, and
 - (x) recycling said unconverted bottoms to said upgrading reactor for further processing.
6. The method of claim 5, further comprising adding hydrogen in step (vi).

7. The method of claim 5, wherein the temperature in step (i) range from 380 °C to 450 °C.
8. The method of claim 5, wherein said pressure in step (i) ranges from 50 Bar to 180 Bar.
9. A method for treating a hydrocarbon containing feedstock which has a boiling point greater than 300 °C, comprising:
 - (i) combining said feedstock with an upgrading catalyst precursor to form a mixture;
 - (ii) transporting said mixture to a decomposition reactor;
 - (iii) treating said mixture to form said upgrading catalyst;
 - (iv) adding water to said mixture;
 - (v) transporting said mixture to an upgrading reactor;
 - (vi) upgrading said mixture, to form an effluent of (a) contaminant gases, (b) hydrocarbon gases having a boiling point of from 36 °C to 180 °C, (c) gas oil having a boiling point of from 180 °C to 375 °C, and (d) unconverted bottoms;
 - (vii) fractionating (a), (b), and (c) from said unconverted bottoms in a fractionation zone;
 - (viii) transporting said unconverted bottoms to an upgrading reactor which contains a hydrotreating catalyst, at a temperature of from about 300 °C to about 500 °C, and a pressure of from about 50 Bar to about 200 Bar, to form a fractionate of (a), (b), and (c) and unconverted bottoms;
 - (ix) transporting (a), (b), and (c) produced in step (vi) and (viii) to a fractionation zone to separate (a), (b), and (c) from each other, and
 - (x) recycling any unconverted bottoms from (viii) to said feedstock preparation zone for further processing.
10. The method of claim 9, further comprising adding hydrogen in step (iv).
11. The method of claim 9, wherein said temperature in step (viii) ranges from 380 °C to 450 °C.

12. The method of claim 9, wherein said pressure in step (viii) ranges from 50 Bar to 180 Bar.
13. The method of claim 1, 5, or 9, wherein said hydrotreating reactor is a fixed bed, moving bed, slurry, plug flow, or CSTR.
14. The method of claim 1, 5, or 9, wherein each reactor is a single or multiple reactors.
15. The method of claim 1, 5, or 9, wherein each said catalyst contains an active metal selected from the group consisting of a Group VI, Group VII, or Group VIII B metal plus alkali and alkaline metals.
16. The method of claim 1, 5, or 9, wherein each said catalyst is a part of a support.
17. The method of claim 16, wherein said support is an alumina, alumina silica, silica, or zeolite support.