CLAIMS

1. A process for removing asphaltenes from an oil feed, the process comprising the steps of:

introducing the oil feed to a reactor, where the oil feed comprises a carbonaceous material and asphaltenes;

introducing a heteropolyacid feed to the reactor, where the heteropolyacid feed comprises a heteropolyacid;

operating the reactor at a reaction temperature and a reaction pressure for a reaction time such that the heteropolyacid is operable to catalyze an acid catalyzed polymerization reaction of the asphaltenes to produce polymerized asphaltenes, where a mixed product comprises the polymerized asphaltenes and a de-asphalted oil, wherein the reactor is in the absence of water;

introducing the mixed product to a cooling unit at the end of the reaction time;

reducing the temperature of the mixed product in the cooling unit to produce a cooled product;

introducing the cooled product to a separator; and

separating the cooled product in the separator to produce a de-asphalted oil and a waste stream, where the de-asphalted oil has a lower concentration of sulfur, a lower concentration of nitrogen, and a lower concentration of metals as compared to the oil feed, wherein the process for removing asphaltenes is in the absence of added hydrogen gas.

2. The process of claim 1, further comprising the step of separating the waste stream into a recovered heteropolyacid and an recovered asphaltenes.

3. The process of claim 1, where the carbonaceous material can be selected from the group consisting of crude oil, heavy crude oil, light crude oil, vacuum residue streams, and atmospheric distillation streams.

4. The process of claim 1, where the concentration of asphaltenes in the oil feed is between 1 % by weight and 20 % by weight.

5. The process of claim 1, where the heteropolyacid is selected from the group consisting of Keggin-type heteropolyacids, cesium substituted heteropolyacids, and combinations of the same.

6. The process of claim 5, where the Keggin-type heteropolyacid is selected from the group consisting of phosphortungstic heteropolyacid ($H_3PW_{12}O_{40}$), phosphomolybdic heteropolyacid ($H_3PMo_{12}O_{40}$), silicotungstic heteropolyacid ($H_4SiW_{12}O_{40}$) silicomolybdic heteropolyacid ($H_4SiMo_{12}O_{40}$),and combinations of the same.

7. The process of claim 5, where the cesium substituted heteropolyacid is selected from the group consisting of $Cs_xH_yPMo_{12}O_{40}$, in which $0 < x < 4$ and y equals 3-x, $Cs_xH_yPW_{12}O_{40}$, in which $0 < x < 4$ and y equals 4-x, $Cs_xH_ySiMo_{12}O_{40}$, in which $0 < x < 4$ and y equals 3-x and $Cs_xH_ySiW_{12}O_{40}$, in which $0 < x < 4$ and y equals 4-x.

8. The process of claim 1, where the reaction temperature is between 20 deg C and 100 deg C.

9. The process of claim 1, where the reaction pressure is atmospheric pressure.

10. The process of claim 1, where the reaction time is between 3 hours and 5 hours.

11. The process of claim 1, where the separator is a centrifuge.

12. The process of claim 1, where the de-asphalted oil contains less than 1 % by weight asphaltenes.

13. The process of claim 1, further comprising the step of introducing the de-asphalted oil to an upgrading reactor to produce an upgraded product.

14. The process of claim 1, further comprising the steps of introducing the oil feed and the heteropolyacid feed to a mixer to produce a mixed feed prior to the steps of introducing the oil feed to the reactor and introducing a heteropolyacid feed to the reactor; and

introducing the mixed feed to the reactor.

15. A system for removing asphaltenes from an oil feed, the system comprising:

a reactor, the reactor configured to operate at a reaction pressure, a reaction temperature, and for a reaction time such that an acid catalyzed polymerization reaction of asphaltenes in the oil feed occurs to produce a polymerized asphaltenes in a mixed product, wherein the reactor is in the absence of water;

a cooling unit fluidly connected to the reactor, the cooling unit configured to reduce the temperature of the mixed product to produce a cooled product; and

a separator fluidly connected to the cooling unit, the separator configured to separate the cooled product into a de-asphalted oil and a waste stream, where the waste stream comprises the polymerized asphaltenes, wherein the system for removing asphaltenes from an oil feed is in the absence of added hydrogen gas.

16. The system of claim 15, further comprising a mixer upstream of the reactor and fluidly connected to the reactor, where the mixer is configured to mix the oil feed and the heteropolyacid feed to produce a mixed feed.

17. The system of claims 15, further comprising an upgrading reactor fluidly connected to the separator, the upgrading reactor configured to upgrade the de-asphalted oil.

18. The system of claim 15, further comprising an asphaltene recovery unit fluidly connected to the separator, the asphaltene recovery unit configured to separate the waste stream into a recovered heteropolyacids and a recovered asphaltene.