CLAIMS

1. A method for producing anode grade coke, comprising:
   (i) solvent deasphalting a hydrocarbon feedstock to produce an asphalt fraction and a deasphalted oil (DAO) fraction, in a first reaction chamber;
   (ii) processing said DAO fraction and asphalt fraction in separate, second, third, and fourth reaction chambers;
   (iii) hydrocracking said DAO fraction in said second reaction chamber at a pressure of from 100 – 200 bars, a temperature of from 350°C to 450°C, an LHSV of from 0.1 to 4.0 h^{-1}, and a hydrogen:DAO ratio of from 500 – 2,500 SLt/Lt to remove sulfur and nitrogen therefrom and to distill any hydrocarbons contained in said DAO which have a boiling point over 370°C;
   (iv) subjecting any hydrocracked or unconverted DAO fraction to delayed coking in a third chamber, and
   (v) gasifying said asphalt fraction via combining it with oxygen and steam, in said fourth reaction chamber, to produce hydrogen therefrom.

2. The method of claim 1, further comprising gasifying any coke produced in step (iv).

3. The method of claim 1, comprising introducing any hydrogen produced in said third reaction chamber into said second reaction chamber.

4. The method of claim 1, wherein said hydrocarbon feedstock is crude oil and said solvent deasphalting comprises mixing said crude oil with a paraffinic solvent containing C_3-C_7 carbon atoms, at a temperature and a pressure below critical temperature and critical pressure of said solvent.

5. The method of claim 4, wherein said solvent comprises n-butane and isobutane.

6. The method of claim 1, further comprising contacting said hydrocarbon feedstock with a solid adsorbent.

7. The method of claim 1, wherein said hydrocarbon feedstock is crude oil and said solvent deasphalting comprises mixing said crude oil and solvent at a temperature and pressure below the critical temperature and critical pressure of said solvent.

8. The method of claim 4, wherein said crude oil and solvent are combined at a weight ratio of from 10:1 to 200:1 w/w.

9. The method of claim 1, comprising hydrocracking said DAO in a series of multiple chambers.

10. The method of claim 1, wherein said second reaction chamber is a fixed bed, ebullated bed, or slurry bed chamber.

11. The method of claim 1, comprising hydrocracking said DAO in the presence of a catalyst, which contains from 2-40 wt% active metal, a pore volume of from 0.33-1.50 cc/gm, a surface area of 250 - 450 m^2/g, and an average pore diameter of at least 50 Angstroms.

12. The method of claim 11, wherein said active metal is a Group VI, VII, or VIIIB metal.

13. The method of claim 11, wherein said active metal comprises Co, Ni, W, or Mo.

14. The method of claim 11, wherein said catalyst is presented on a support.

15. The method of claim 14, wherein said support comprises alumina, silica, or a zeolite.

16. The method of claim 15, wherein said support is a zeolite with FAU, MOR, BEA or MFI topology.

17. The method of claim 16, wherein said zeolite has been modified by treatment with at least one of steam, ammonia, or acid, and contains at least one transition metal.

18. The method of claim 17, wherein said at least one transition metal is Zn or Ti.

19. The method of claim 1, comprising gasifying said asphalt fraction at a temperature of from 900°C to 1700°C, and a pressure of from 20 bars to 100 bars.

20. The method of claim 1, further comprising adjusting the amount of asphalt and at least one of oxygen and steam in said fourth reaction chamber to provide a stoichiometric balance therebetween which results in partial combustion of said asphalt.

21. The method of claim 19, wherein said stoichiometric ratio based on the oxygen:carbon ratio is from 0.2:1:0 to 10:0.2 by weight.

22. The method of claim 19, comprising introducing asphalt and steam to said fourth reaction chamber in a ratio of from 0.1 to 1.0 to 10:0.1 based upon weight of carbon in said crude oil.

23. A process for producing anode grade coke, comprising:

(i) solvent deasphalting a hydrocarbon feedstock to produce an asphalt fraction and a deasphalted oil (DAO) fraction, in a first reaction chamber;

(ii) processing said DAO fraction and asphalt fraction in separate, second, third, and fourth reaction chambers;

(iii) hydrocracking said DAO fraction in said second reaction chamber at a pressure of from 100 – 200 bars, a temperature of from 350°C to 450°C, an LHSV of from 0.1 to 4.0 h^{-1}, and a hydrogen:DAO ratio of from 500 – 2,500 SLt/Lt to remove sulfur and nitrogen therefrom and to distillate any hydrocarbons contained in said DAO which have a boiling point over 370°C;

(iv) subjecting any hydrotreated or unconverted DAO fraction to delayed coking in a third chamber, and either

(v) oxidizing said asphalt fraction in said fourth reaction chamber, to produce higher grade asphalt or

(vi) subjecting said asphalt fraction to delayed coking in said third reaction chamber to produce fuel grade coke.

24. A method for producing anode grade coke, comprising:

(i) solvent deasphalting a hydrocarbon feedstock to produce an asphalt fraction and a deasphalted oil (DAO) fraction, in a first reaction chamber;

(ii) processing said DAO fraction and asphalt fraction in separate, second, third, and fourth reaction chambers;

(iii) hydrocracking said DAO fraction to remove sulfur and nitrogen therefrom and distill any hydrocarbons contained in said DAO fraction which have a boiling point over 370°C, in a series of multiple chambers;

(iv) subjecting any hydrotreated or unconverted DAO fraction to delayed coking in a third chamber, and

(v) gasifying said asphalt fraction via combining it with oxygen and steam, in said fourth reaction chamber, to produce hydrogen therefrom.

25. The method of claim 24, further comprising gasifying any coke produced in step (iv).

26. The method of claim 24, comprising introducing any hydrogen produced in said third reaction chamber into said second reaction chamber.

27. The method of claim 24, wherein said hydrocarbon feedstock is crude oil and said solvent deasphalting comprises mixing said crude oil with a paraffinic solvent containing C_3-C_7 carbon atoms, at a temperature and a pressure below critical temperature and critical pressure of said solvent.

28. The method of claim 27, wherein said solvent comprises n-butane and isobutane.

29. The method of claim 24, further comprising contacting said hydrocarbon feedstock with a solid adsorbent.

30. The method of claim 27, comprising mixing said crude oil and solvent at a temperature and pressure below the critical temperature and critical pressure of said solvent.

31. The method of claim 27, wherein said crude oil and solvent are combined at a weight ratio of from 10:1 to 200:1 w/w.

32. The method of claim 24, wherein said hydrocracking chambers are fixed bed, ebullated bed, or slurry bed chambers.

33. The method of claim 24, comprising hydrocracking said DAO in the presence of a catalyst, which contains from 2-40 wt% active metal, a pore volume of from 0.33-1.50

cc/gm, a surface area of 250 - 450 m^2/g, and an average pore diameter of at least 50 Angstroms.

34. The method of claim 33, wherein said active metal is a Group VI, VII, or VIIIB metal.

35. The method of claim 33, wherein said active metal comprises Co, Ni, W, or Mo.

36. The method of claim 33, wherein said catalyst is presented on a support.

37. The method of claim 36, wherein said support comprises alumina, silica, or a zeolite.

38. The method of claim 37, wherein said support is a zeolite with FAU, MOR, BEA or MFI topology.

39. The method of claim 38, wherein said zeolite has been modified by treatment with at least one of steam, ammonia, or acid, and contains at least one transition metal.

40. The method of claim 39, wherein said at least one transition metal is Zn or Ti.

41. The method of claim 24, comprising gasifying said asphalt fraction at a temperature of from 900°C to 1700°C, and a pressure of from 20 bars to 100 bars.

42. The method of claim 24, further comp`rising adjusting the amount of asphalt and at least one of oxygen and steam in said fourth reaction chamber to provide a stoichiometric balance therebetween which results in partial combustion of said asphalt.

43. The method of claim 41, wherein said stoichiometric ratio based on the oxygen:carbon ratio is from 0.2:1:0 to 10:0.2 by weight.

44. The method of claim 41, comprising introducing asphalt and steam to said fourth reaction chamber in a ratio of from 0.1 to 1.0 to 10:0.1 based upon weight of carbon in said crude oil.

45. A process for producing anode grade coke, comprising:

(i) solvent deasphalting a hydrocarbon feedstock to produce an asphalt fraction and a deasphalted oil (DAO) fraction, in a first reaction chamber;

(ii) processing said DAO fraction and asphalt fraction in separate, second, third, and fourth reaction chambers;

(iii) hydrocracking said DAO fraction to remove sulfur and nitrogen therefrom and to distillate any hydrocarbons contained in said DAO which have a boiling point over 370°C, in a series of multiple chambers;

(iv) subjecting any hydrotreated or unconverted DAO fraction to delayed coking in a third chamber, and either;

(v) oxidizing said asphalt fraction in said fourth reaction chamber, to produce higher grade asphalt, or

(vi) subjecting said asphalt fraction to delayed coking in said third reaction chamber to produce fuel grade coke.