



(51) International Patent Classification:
C09C 1/48 (2006.01) *C01B 31/04* (2006.01)

(21) International Application Number:
PCT/US2011/024295

(22) International Filing Date:
10 February 2011 (10.02.2011)

(25) Filing Language: English

(26) Publication Language: English

(30) Priority Data:
61/306,092 19 February 2010 (19.02.2010) US

(71) Applicant (for all designated States except US): **CABOT CORPORATION** [US/US]; Two Seaport Lane, Suite 1300, Boston, MA 02210 (US).

(72) Inventors; and

(75) Inventors/Applicants (for US only): **NESTER, Serguei** [US/US]; 11 Mustang Road, Tyngsboro, MA 01879 (US). **RUMPF, Frederick, H.** [US/US]; 5 Copley Place, Billerica, MA 01821 (US). **KUTSOVSKY, Yakov, E.** [RU/US]; 9 Sorenson Court, Arlington, MA 02474 (US). **NATALIE, Charles, A.** [US/US]; 2708 Seminole Drive, Pampa, TX 79065 (US).

(74) Agents: **PORTER, Mary, E.** et al.; Cabot Corporation, Billerica Technical Center, 157 Concord Road, Billerica, MA 01821-7001 (US).

(81) Designated States (unless otherwise indicated, for every kind of national protection available): AE, AG, AL, AM, AO, AT, AU, AZ, BA, BB, BG, BH, BR, BW, BY, BZ, CA, CH, CL, CN, CO, CR, CU, CZ, DE, DK, DM, DO, DZ, EC, EE, EG, ES, FI, GB, GD, GE, GH, GM, GT, HN, HR, HU, ID, IL, IN, IS, JP, KE, KG, KM, KN, KP, KR, KZ, LA, LC, LK, LR, LS, LT, LU, LY, MA, MD, ME, MG, MK, MN, MW, MX, MY, MZ, NA, NG, NI, NO, NZ, OM, PE, PG, PH, PL, PT, RO, RS, RU, SC, SD, SE, SG, SK, SL, SM, ST, SV, SY, TH, TJ, TM, TN, TR, TT, TZ, UA, UG, US, UZ, VC, VN, ZA, ZM, ZW.

(84) Designated States (unless otherwise indicated, for every kind of regional protection available): ARIPO (BW, GH, GM, KE, LR, LS, MW, MZ, NA, SD, SL, SZ, TZ, UG, ZM, ZW), Eurasian (AM, AZ, BY, KG, KZ, MD, RU, TJ, TM), European (AL, AT, BE, BG, CH, CY, CZ, DE, DK, EE, ES, FI, FR, GB, GR, HR, HU, IE, IS, IT, LT, LU, LV, MC, MK, MT, NL, NO, PL, PT, RO, RS, SE, SI, SK, SM, TR), OAPI (BF, BJ, CF, CG, CI, CM, GA, GN, GQ, GW, ML, MR, NE, SN, TD, TG).

Published:

- with international search report (Art. 21(3))
- with amended claims (Art. 19(1))

(88) Date of publication of the international search report:
19 January 2012

Date of publication of the amended claims: 15 March 2012

(54) Title: METHODS FOR CARBON BLACK PRODUCTION USING PREHEATED FEEDSTOCK AND APPARATUS FOR SAME

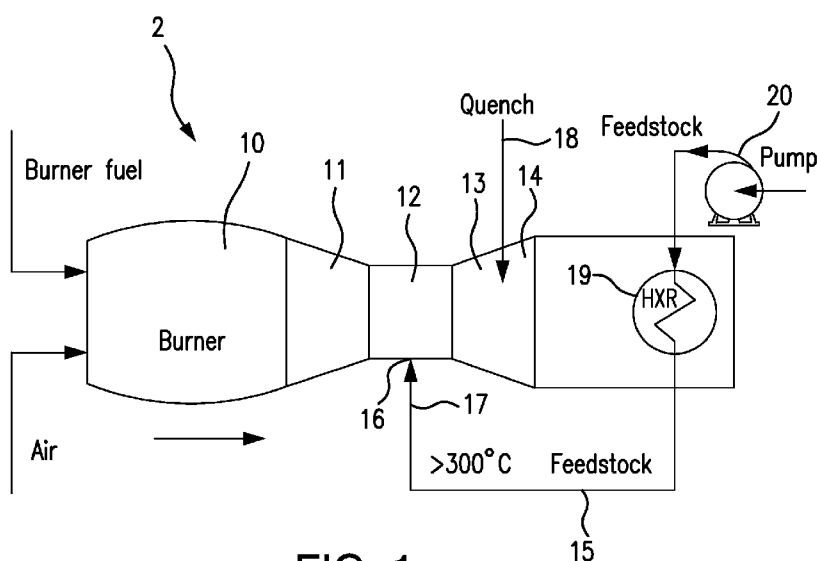


FIG. 1

(57) Abstract: Methods for production of carbon black using high temperature feedstock at temperatures exceeding about 300° C with fouling control are provided. An apparatus for production of carbon black according to these methods also is provided.

AMENDED CLAIMS**received by the International Bureau on 30 November 2011 (30.11.2011)****WHAT IS CLAIMED IS:**

1. A method for producing carbon black comprising:
introducing a heated gas stream into a carbon black reactor;
supplying at least one carbon black-yielding feedstock to at least one heater;
preheating said at least one carbon black-yielding feedstock in said at least one heater to a second temperature of greater than 300° C to provide a preheated carbon black-yielding feedstock, wherein (a) the at least one carbon black-yielding feedstock has a velocity in said at least one heater that is at least 0.2 m/sec, wherein velocity is calculated based on a feedstock density measured at 60° C at 1 atm and the smallest cross-sectional area of a feedstock line present in said at least one heater and (b) the at least one carbon black-yielding feedstock has a first feedstock residence time in said heater of less than 120 minutes;
supplying said preheated carbon black-yielding feedstock to at least one feedstock introduction point to the carbon black reactor, wherein said preheated carbon black-yielding feedstock has a second feedstock residence time of from exiting said at least one heater to right before the introduction point to said carbon black reactor of less than 120 minutes; and wherein said first feedstock residence time and said second feedstock residence time combined are 120 minutes or less; wherein said preheating avoids formation of vapor film in said at least one heater or prior to said supplying to said carbon black reactor;
combining at least said preheated carbon black-yielding feedstock through the at least one introduction point to said carbon black reactor with the heated gas stream to form a reaction stream in which carbon black is formed in said carbon black reactor; and
recovering the carbon black in the reaction stream.
2. The method of claim 1, further comprising pressurizing said carbon black-yielding feedstock to have a pressure greater than 10 bar prior to entering said at least one heater.

3. The method of claim 1, further comprising pressurizing said carbon black-yielding feedstock to have a pressure of greater than 20 bar prior to entering said at least one heater.
4. The method of claim 1, further comprising pressurizing said carbon black-yielding feedstock to a pressure of from 20 bar to 180 bar prior to entering said at least one heater.
5. The method of claim 1, wherein said velocity is at least 1 m/sec.
6. The method of claim 1, wherein said velocity of at least 1.6 m/sec.
7. The method of claim 1, wherein said carbon black-yielding feedstock comprises decant oil, coal tar product, ethylene cracker residues, asphaltene containing oil, or any combination thereof.
8. The method of claim 1, wherein said carbon black-yielding feedstock has an initial boiling point of from 160° C to 500° C.
9. The method of claim 1, wherein said preheating of the at least one carbon black-yielding feedstock comprises heating said carbon-black-yielding feedstock in said heater that has a heat exchanger operating at an average heat flux of greater than 10 kW/m².
10. The method of claim 1, wherein at least a portion of said preheating occurs in said at least one heater that has heat at least partially provided by heat generated by said carbon black reactor or other carbon black reactor or both.

11. The method of claim 1, wherein said first residence time and said second residence time combined are less than 60 minutes.
12. The method of claim 1, wherein said at least one heater is in heat exchange with at least a portion of said carbon black reactor.
13. The method of claim 1, wherein said at least one heater contacts said reaction stream in said carbon black reactor downstream of a quencher, wherein said at least one heater comprises a heat exchanger having walls heated by said reaction stream on a first side thereof and contacting said carbon black-yielding feedstock on an opposite side thereof.
14. The method of claim 1, wherein said at least one heater includes a heat exchanger that heat exchanges with said reaction stream in said carbon black reactor, wherein a flowable heat carrier that flows through the heat exchanger is heated, and the heated flowable heat carrier passes through said at least one heater positioned external to the reactor and operable to exchange heat of the flowable heat carrier with the feedstock to heat said carbon black-yielding feedstock.
15. The method of claim 1, wherein said at least one heater is at least partially heat sourced with carbon black tail gas from said carbon black reactor or a different carbon black reactor or both, to heat the carbon black-yielding feedstock.
16. The method of claim 1, wherein the introducing of the heated gas stream comprises plasma heating a plasma-heatable gas stream in a plasma heater to provide at least a portion

of the heated gas stream.

17. The method of claim 1, further comprising providing a non-catalytic surface on carbon black-yielding feedstock contacting walls of said at least one heater and inner walls of at least one feedstock supply line that supplies said preheated carbon black-yielding feedstock to said carbon black reactor, wherein the surface is non-catalytic to cracking or polymerization of hydrocarbons.

18. The method of claim 1, wherein said supplying comprises feeding said preheated carbon black-yielding feedstock through at least one feedstock supply line that supplies to said carbon black reactor, and said method further comprises periodically feeding a purge gas comprising an oxidant for carbon through the at least one carbon black-yielding feedstock supply line.

19. The method of claim 1, wherein said supplying comprises feeding said preheated carbon black-yielding feedstock through at least one feedstock supply line that supplies to said carbon black reactor, and said method further comprises injecting the preheated carbon black yielding feedstock into the carbon black reactor with at least partially flashing of the carbon black-yielding feedstock.

20. The method of claim 1, further comprising combining the preheated carbon black-yielding feedstock and the heated gas stream in the carbon black reactor to continuously form carbon black in the reactor for at least 12 hours.

21. A method for producing carbon black comprising:

introducing a heated gas stream into a carbon black reactor;

supplying at least one carbon black-yielding feedstock having a first temperature of below 360 ° C to at least one heater;

preheating said at least one carbon black-yielding feedstock in said at least one heater to a second temperature of from 360°C to 850°C to provide a preheated carbon black-yielding feedstock, wherein (a) the at least one carbon black-yielding feedstock has a velocity in said at least one heater that is at least 0.2 m/sec, wherein velocity is calculated based on a feedstock density measured at 60° C at 1 atm and the smallest cross-sectional area of a feedstock line present in said at least one heater and (b) the at least one carbon black-yielding feedstock has a first feedstock residence time in said heater of less than 120 minutes;

supplying said preheated carbon black-yielding feedstock to at least one feedstock introduction point to the carbon black reactor, wherein said preheated carbon black-yielding feedstock has a second feedstock residence time of from exiting said at least one heater to right before the introduction point to said carbon black reactor of less than 120 minutes; and wherein said first feedstock residence time and said second feedstock residence time combined are from 10 seconds to 120 minutes; wherein said preheating avoids formation of vapor film in said at least one heater or prior to said supplying to said carbon black reactor;

combining at least said preheated carbon black-yielding feedstock through the at least one introduction point to said carbon black reactor with the heated gas stream to form a reaction stream in which carbon black is formed in said carbon black reactor; and

recovering the carbon black in the reaction stream.

22. The method of claim 21, further comprising pressurizing said carbon black-yielding feedstock to have a pressure greater than 20 bar prior to entering said at least one heater.

23. The method of claim 21, further comprising pressurizing said carbon black-yielding feedstock to have a pressure of greater than 30 bar prior to entering said at least one heater.
24. The method of claim 21, further comprising pressurizing said carbon black-yielding feedstock to a pressure of from 30 bar to 180 bar prior to entering said at least one heater.
25. The method of claim 21, wherein said velocity is at least about 1 m/sec.
26. The method of claim 21, wherein said velocity of at least 1.6 m/sec.
27. The method of claim 21, wherein said carbon black-yielding feedstock comprises decant oil, coal tar product, ethylene cracker residues, asphaltene containing oil, or any combination thereof.
28. The method of claim 21, wherein said carbon black-yielding feedstock has an initial boiling point of from 160° C to 500° C.
29. The method of claim 21, wherein said preheating of the at least one carbon black-yielding feedstock comprises heating said carbon-black-yielding feedstock in said heater that has a heat exchanger operating at an average heat flux of greater than 20 kW/m².
30. The method of claim 21, wherein at least a portion of said preheating occurs in said at least one heater that has heat at least partially provided by heat generated by said carbon black reactor or other carbon black reactor or both.

31. The method of claim 21, wherein said first residence time and said second residence time combined are less than 60 minutes.
32. The method of claim 21, wherein said at least one heater is in heat exchange with at least a portion of said carbon black reactor.
33. The method of claim 21, wherein said at least one heater contacts said reaction stream in said carbon black reactor downstream of a quencher, wherein said at least one heater comprises a heat exchanger having walls heated by said reaction stream on a first side thereof and contacting said carbon black-yielding feedstock on an opposite side thereof before said carbon black-yielding feedstock.
34. The method of claim 21, wherein said at least one heater includes a heat exchanger that heat exchanges with said reaction stream in said carbon black reactor, wherein a flowable heat carrier that flows through the heat exchanger is heated, and the heated flowable heat carrier passes through said at least one heater positioned external to the reactor and operable to exchange heat of the flowable heat carrier with the feedstock to heat said carbon black-yielding feedstock.
35. The method of claim 21, wherein said at least one heater is at least partially heat sourced with carbon black tail gas from said carbon black reactor or a different carbon black reactor or both, to heat the carbon black-yielding feedstock.
36. The method of claim 21, wherein the introducing of the heated gas stream comprises plasma heating a plasma-heatable gas stream in a plasma heater to provide at least a portion

of the heated gas stream.

37. The method of claim 21, further comprising providing a non-catalytic surface on carbon black-yielding feedstock contacting walls of said at least one heater and inner walls of at least one feedstock supply line that supplies said preheated carbon black-yielding feedstock to said carbon black reactor, wherein the surface is non-catalytic to cracking or polymerization of hydrocarbons.

38. The method of claim 21, wherein said supplying comprises feeding said preheated carbon black-yielding feedstock through at least one feedstock supply line that supplies to said carbon black reactor, and said method further comprises periodically feeding a purge gas comprising an oxidant for carbon through the at least one carbon black-yielding feedstock supply line.

39. The method of claim 21, wherein said supplying comprises feeding said preheated carbon black-yielding feedstock through at least one feedstock supply line that supplies to said carbon black reactor, and said method further comprises injecting the preheated carbon black yielding feedstock into the carbon black reactor with at least partially flashing of the carbon black-yielding feedstock.

40. The method of claim 21, further comprising combining the preheated carbon black-yielding feedstock and the heated gas stream in the carbon black reactor to continuously form carbon black in the reactor for at least 12 hours.

41. A method for producing carbon black comprising:

introducing a heated gas stream into a carbon black reactor;

supplying at least one carbon black-yielding feedstock having a first temperature of below 450 ° C to at least one heater;

preheating said at least one carbon black-yielding feedstock in said at least one heater to a second temperature of greater than 450° C to provide a preheated carbon black-yielding feedstock, wherein (a) the at least one carbon black-yielding feedstock has a velocity in said at least one heater that is at least 0.2 m/sec, wherein velocity is calculated based on a feedstock density measured at 60° C at 1 atm and the smallest cross-sectional area of a feedstock line present in said at least one heater and (b) the at least one carbon black-yielding feedstock has a first feedstock residence time in said heater of from 10 seconds to 120 minutes;

supplying said preheated carbon black-yielding feedstock to at least one feedstock introduction point to the carbon black reactor, wherein said preheated carbon black-yielding feedstock has a second feedstock residence time of from exiting said at least one heater to right before the introduction point to said carbon black reactor of less than 120 minutes; and wherein said first feedstock residence time and said second feedstock residence time combined are 120 minutes or less; wherein said preheating avoids formation of vapor film in said at least one heater or prior to said supplying to said carbon black reactor;

combining at least said preheated carbon black-yielding feedstock through the at least one introduction point to said carbon black reactor with the heated gas stream to form a reaction stream in which carbon black is formed in said carbon black reactor; and

recovering the carbon black in the reaction stream.

42. The method of claim 41, further comprising pressurizing said carbon black-yielding feedstock to have a pressure of from 20 bar to 180 bar prior to entering said at least one

heater.

43. The method of claim 41, further comprising pressurizing said carbon black-yielding feedstock to have a pressure of from 30 bar to 180 bar prior to entering said at least one heater.

44. The method of claim 41, further comprising pressurizing said carbon black-yielding feedstock to a pressure of from 40 bar to 180 bar prior to entering said at least one heater.

45. The method of claim 41, wherein said velocity is at least 1 m/sec.

46. The method of claim 41, wherein said velocity of at least 1.6 m/sec.

47. The method of claim 41, wherein said carbon black-yielding feedstock comprises decant oil, coal tar product, ethylene cracker residues, asphaltene containing oil, or any combination thereof.

48. The method of claim 41, wherein said carbon black-yielding feedstock has an initial boiling point of from 160° C to 500° C.

49. The method of claim 41, wherein said preheating of the at least one carbon black-yielding feedstock comprises heating said carbon-black-yielding feedstock in said heater that has a heat exchanger operating at an average heat flux of from 20 kW/m² to 150 kW/m².

50. The method of claim 41, wherein at least a portion of said preheating occurs in said at

least one heater that has heat at least partially provided by heat generated by said carbon black reactor or other carbon black reactor or both.

51. The method of claim 41, wherein said first residence time and said second residence time combined are less than 60 minutes.

52. The method of claim 41, wherein said at least one heater is in heat exchange with at least a portion of said carbon black reactor.

53. The method of claim 41, wherein said at least one heater contacts said reaction stream in said carbon black reactor downstream of a quencher, wherein said at least one heater comprises a heat exchanger having walls heated by said reaction stream on a first side thereof and contacting said carbon black-yielding feedstock on an opposite side thereof before said carbon black-yielding feedstock.

54. The method of claim 41, wherein said at least one heater includes a heat exchanger that heat exchanges with said reaction stream in said carbon black reactor, wherein a flowable heat carrier that flows through the heat exchanger is heated, and the heated flowable heat carrier passes through said at least one heater positioned external to the reactor and operable to exchange heat of the flowable heat carrier with the feedstock to heat said carbon black-yielding feedstock.

55. The method of claim 41, wherein said at least one heater is at least partially heat sourced with carbon black tail gas from said carbon black reactor or a different carbon black reactor or both, to heat the carbon black-yielding feedstock.

56. The method of claim 41, wherein the introducing of the heated gas stream comprises plasma heating a plasma-heatable gas stream in a plasma heater to provide at least a portion of the heated gas stream.

57. The method of claim 41, further comprising providing a non-catalytic surface on carbon black-yielding feedstock contacting walls of said at least one heater and inner walls of at least one feedstock supply line that supplies said preheated carbon black-yielding feedstock to said carbon black reactor, wherein the surface is non-catalytic to cracking or polymerization of hydrocarbons.

58. The method of claim 41, wherein said supplying comprises feeding said preheated carbon black-yielding feedstock through at least one feedstock supply line that supplies to said carbon black reactor, and said method further comprises periodically feeding a purge gas comprising an oxidant for carbon through the at least one carbon black-yielding feedstock supply line.

59. The method of claim 41, wherein said supplying comprises feeding said preheated carbon black-yielding feedstock through at least one feedstock supply line that supplies to said carbon black reactor, and said method further comprises injecting the preheated carbon black yielding feedstock into the carbon black reactor with at least partially flashing of the carbon black-yielding feedstock.

60. The method of claim 41, further comprising combining the preheated carbon black-yielding feedstock and the heated gas stream in the carbon black reactor to continuously form

carbon black in the reactor for at least 12 hours.

61. A method for producing carbon black comprising:

introducing a heated gas stream into a carbon black reactor;

supplying at least one carbon black-yielding feedstock having a first temperature of below 300 ° C to at least one heater at a first pressure of greater than 10 bar;

preheating said at least one carbon black-yielding feedstock in said at least one heater to a second temperature of greater than 300° C to provide a preheated carbon black-yielding feedstock, wherein (a) the at least one carbon black-yielding feedstock has a second pressure in said at least one heater that is the same or lower than said first pressure, as calculated based on assuming same cross-sectional area that feedstock travels in during first pressure and second pressure and (b) the at least one carbon black-yielding feedstock has a first feedstock residence time in said heater of less than 120 minutes;

supplying said preheated carbon black-yielding feedstock to at least one feedstock introduction point to the carbon black reactor, wherein said preheated carbon black-yielding feedstock has a second feedstock residence time of from exiting said at least one heater to right before the introduction point to said carbon black reactor of less than 120 minutes; and wherein said first feedstock residence time and said second feedstock residence time combined are 120 minutes or less; wherein said preheating avoids formation of vapor film in said at least one heater or prior to said supplying to said carbon black reactor;

combining at least said preheated carbon black-yielding feedstock through the at least one introduction point to said carbon black reactor with the heated gas stream to form a reaction stream in which carbon black is formed in said carbon black reactor; and

recovering the carbon black in the reaction stream.

62. A method for producing carbon black comprising:

introducing a heated gas stream into a carbon black reactor;

supplying at least one carbon black-yielding feedstock having a first temperature of below 300 ° C to at least one heater at a first pressure of greater than 10 bar;

preheating said at least one carbon black-yielding feedstock in said at least one heater to a second temperature of greater than 300° C to provide a preheated carbon black-yielding feedstock, wherein the at least one carbon black-yielding feedstock has i) a second pressure in said at least one heater that is about the same or lower than said first pressure and ii) the at least one carbon black-yielding feedstock has a velocity in said at least one heater that is at least 0.2 m/sec, wherein velocity is calculated based on a feedstock density measured at 60° C at 1 atm and the smallest cross-sectional area of a feedstock line present in said at least one heater and wherein i) is calculated based on same cross-sectional area that feedstock travels in during first pressure and second pressure; and

supplying said preheated carbon black-yielding feedstock to at least one feedstock introduction point to the carbon black reactor; wherein said preheating avoids formation of vapor film in said at least one heater or prior to said supplying to said carbon black reactor;

combining at least said preheated carbon black-yielding feedstock through the at least one introduction point to said carbon black reactor with the heated gas stream to form a reaction stream in which carbon black is formed in said carbon black reactor; and

recovering the carbon black in the reaction stream.

63. An apparatus for producing carbon black comprising:

a reactor for combining a heated gas stream and at least one carbon black-yielding feedstock to form a reaction stream in which carbon black is formed in the reactor;

at least one feedstock supply line for supplying the carbon black-yielding feedstock to

at least one feedstock introduction point to the reactor to combine the feedstock with the heated gas stream;

at least one feedstock heater operable to preheat the carbon black-yielding feedstock supplied in the at least one feedstock supply line to a temperature of at least 300° C;

at least one pump operable to pressurize the carbon black-yielding feedstock to a pressure greater than about 10 bar before the feedstock is preheated to at least 300° C and for providing a feedstock velocity of the feedstock supplied in the at least one feedstock heater of at least 0.2 m/sec, wherein velocity is calculated based on a feedstock density measured at 60° C at 1 atm and the smallest cross-sectional area of a feedstock line present in said at least one heater; and

a quencher for cooling the carbon black in the reaction stream;

wherein said apparatus is further operable to provide a feedstock residence time in the at least one feedstock heater and the at least one feedstock supply line before introduction to the reactor for the feedstock preheated to at least 300° C that is less than 120 minutes.

64. The apparatus of claim 63, wherein the at least one feedstock heater comprises a heat exchanger operable to heat the carbon black-yielding feedstock at an average heat flux of greater than 10 kW/m².

65. The apparatus of claim 63, wherein the at least one feedstock heater is positioned within the reactor to be contactable by the reaction stream operable to heat the feedstock to a temperature of at least 300° C.

66. The apparatus of claim 63, wherein the at least one feedstock heater is positioned in contact with at least a portion of the reactor operable to heat the feedstock to a temperature of

at least 300° C.

67. The apparatus of claim 63, wherein the at least one feedstock heater comprises a heat exchanger positioned within the reactor downstream of the quencher, wherein said heat exchanger comprises walls adapted to be heated by the reaction stream on a first side thereof and adapted to be contacted by feedstock on an opposite side thereof before the feedstock is supplied to the at least one feedstock supply line, wherein the feedstock is heatable to a temperature of at least 300° C in the heat exchanger.

68. The apparatus of claim 63, further comprising a heat exchanger for a flowable heat carrier positioned within the reactor to be contactable by the reaction stream, and the at least one feedstock heater is external to the reactor and operable to exchange heat of the flowable heat carrier that has exited the heat exchanger with the feedstock in the feedstock heater to heat the feedstock to a temperature of at least 300° C.

69. The apparatus of claim 63, wherein the at least one feedstock heater is operable to exchange heat from a tail gas stream of the reactor to heat the feedstock to a temperature of at least 300° C.

70. The apparatus of claim 63, further comprising a plasma heater operable for heating a plasma-heatable gas stream for providing at least a portion of the heated gas stream.

71. The apparatus of claim 63, further comprising non-catalytic surface on feedstock contacting walls of the feedstock heater and feedstock contacting inner walls of the at least one feedstock supply line, wherein the surface is non-catalytic to cracking or polymerization of hydrocarbons.

72. The apparatus of claim 63, further comprising non-catalytic ceramic lining on feedstock contacting walls of the feedstock heater and feedstock contacting inner walls of the at least one feedstock supply line.

73. The apparatus of claim 63, further comprising at least one source of purge gas comprising an oxidant for carbon and at least one purge gas introduction point on the at least one feedstock supply line operable to periodically purge the at least one feedstock supply line with the purge gas.

74. The apparatus of claim 63, wherein said reactor is operable to combine feedstock and heated gas stream to continuously form carbon black in the reactor for at least 12 hours.

75. The method of any one of claims 1-62, wherein said preheating and said supplying is in the absence of a runaway pressure drop based on steady state operating conditions.

76. Carbon black formed by the method of any one of claims 1-62.

77. The carbon black of claim 76, wherein said carbon black has a PAH amount of at least 10% less PAH compared to a carbon black having the same morphology made in a method without said preheating.

78. The carbon black of claim 76, wherein said carbon black has a percentage of high MW PAH amount based on total PAH amount of at least 10% less compared to a carbon black having the same morphology made in a method without said preheating.

79. A method for producing carbon black comprising:

introducing a heated gas stream into a carbon black reactor;

supplying at least one carbon black-yielding feedstock to at least one heater;

preheating said at least one carbon black-yielding feedstock in said at least one heater to a second temperature of greater than 300° C to provide a preheated carbon black-yielding feedstock, wherein (a) the at least one carbon black-yielding feedstock has a velocity in said at least one heater that is at least 0.2 m/sec, wherein velocity is calculated based on a feedstock density measured at 60° C at 1 atm and the smallest cross-sectional area of a feedstock line present in said at least one heater and (b) the at least one carbon black-yielding feedstock has a first feedstock residence time in said heater of less than 120 minutes;

supplying said preheated carbon black-yielding feedstock to at least one feedstock introduction point to the carbon black reactor, wherein said preheated carbon black-yielding feedstock has a second feedstock residence time of from exiting said at least one heater to right before the introduction point to said carbon black reactor of less than 120 minutes; and wherein said first feedstock residence time and said second feedstock residence time combined are 120 minutes or less; wherein said preheating is at a sufficient pressure that avoids formation of vapor film in said at least one heater or prior to said supplying to said carbon black reactor;

combining at least said preheated carbon black-yielding feedstock through the at least one introduction point to said carbon black reactor with the heated gas stream to form a reaction stream in which carbon black is formed in said carbon black reactor; and

recovering the carbon black in the reaction stream.