

CLAIMS:

1. A hydrocracking catalyst comprised of:
 - a Y zeolite with a Large Mesopore Volume of at least about 0.03 cm³/g and a Small Mesopore Peak of less than about 0.15 cm³/g;
 - an inorganic matrix; and
 - at least one active metal selected from Group 6 and Group 8/9/10 metals.
2. The catalyst of claim 1, wherein the zeolite has a Large-to-Small Pore Volume Ratio of at least about 4.0.
3. The catalyst of any prior claim, wherein the unit cell size of the zeolite is less than about 24.45 Angstroms.
4. The catalyst of any prior claim, wherein the inorganic matrix is comprised of silica, alumina, or combinations thereof.
5. The catalyst of any prior claim, wherein the inorganic matrix is comprised of pseudoboehmite alumina.
6. The catalyst of any prior claim, wherein the catalyst is comprised of at least one Group 6 metal selected from Pt and Pd.
7. The catalyst of any prior claim, wherein the catalyst is comprised of at least one Group 6 metal and one Group 8/9/10 metal.
8. The catalyst of claim 7, wherein the Group 6 metal is selected from Cr, Mo, and W, and the Group 8/9/10 metal is selected from Fe, Co, Ni, Ru, Rh, Pd, Os, Ir, and Pt.

9. The catalyst of claim 8, wherein the Group 6 metal is Mo and the Group 8/9/10 metal is selected from Co.

10. The catalyst of claim 8, wherein the Group 6 metal is W and the Group 8/9/10 metal is selected from Ni.

11. The catalyst of any of claims 7-10, wherein the combined amount of Group 6 metal and one Group 8/9/10 metal is from 1 wt% to 25 wt%.

12. The catalyst of any prior claim, wherein the zeolite is present in the hydrocracking catalyst in an amount of at least 10 wt% based on the hydrocracking catalyst weight.

13. The catalyst of any prior claim, wherein the hydrocracking catalyst has a 40 Å Peak of less than about 0.15/cm³/g.

14. The catalyst of any prior claim, wherein the zeolite has been made from a zeolite precursor wherein the zeolite precursor is subjected to a high temperature steam calcination step at a temperature from about 1200 °F to about 1500 °F wherein the temperature of the zeolite precursor is within 50 °F of the high temperature steam calcination temperature in less than 5 minutes.

15. The catalyst of any prior claim, wherein the zeolite precursor is a sodium-Y zeolite.

16. The catalyst of any of claims 14-15, wherein the zeolite precursor is subjected to at least one first ion-exchange step by contacting the zeolite precursor with a first ion-exchange solution prior to the high temperature steam calcination step.

~~17. The catalyst of claim 16, wherein the ion-exchange solution comprises NH_4NO_3 .~~

18. The catalyst of any of claims 16-17, wherein the zeolite precursor is subjected to at least one second ion-exchange step by contacting the zeolite precursor with a second ion-exchange solution after the high temperature steam calcination step.

19. The catalyst of claim 18, wherein the zeolite precursor is calcined in air at a temperature of from about 800°F to about 1200°F after the second ion-exchange.

20. The catalyst of any of claims 16-17, wherein the zeolite precursor is subjected to at least one acid washing step by contacting the zeolite precursor with an acidic solution after the high temperature steam calcination step.

21. The catalyst of claim 20, wherein the acidic solution comprises oxalic acid.

22. The catalyst of any of claims 20-21, wherein the zeolite precursor is calcined in air at a temperature of from about 800°F to about 1200°F after the at least one acid washing step.

23. The catalyst of claim 14, wherein the zeolite precursor is subjected to at least one first ion-exchange step by contacting the zeolite precursor with a first ion-exchange solution after the high temperature steam calcination step.

24. The catalyst of claim 23, wherein the zeolite precursor is further subjected to:

- contacting the zeolite precursor with steam;
- subjected the zeolite precursor to at least one second ion-exchange step by contacting the zeolite precursor with a second ion-exchange solution after the high temperature steam calcination step; and
- contacting the zeolite precursor with steam at a temperature from about 1200°F to about 1500°F.

25. The catalyst of claim 14, wherein the Na₂O content of the zeolite precursor prior to the high temperature steam calcination step is from about 2 to about 5 wt% of the total precursor weight on a dry basis.

26. The catalyst of any prior claim, wherein the Small Mesopore Volume Peak of the zeolite is less than about 0.13 cm³/g.

27. The catalyst of any prior claim, wherein the Large Mesopore Volume of the zeolite is at least about 0.05 cm³/g.

28. A method of making a hydrocracking catalyst, comprising the steps of:

- a) making a zeolite from a zeolite precursor;
 - b) combining a binder precursor selected from a silica, an alumina, or a combination thereof, with a zeolite to form a catalyst mixture;
 - c) drying the catalyst mixture to form a catalyst precursor; and
 - d) adding at least one active metal to the catalyst precursor to form the hydrocracking catalyst;
- wherein the zeolite is a Y zeolite with a Large Mesopore Volume of at least about 0.03 cm³/g and a Small Mesopore Peak of less than about 0.15 cm³/g.

~~29. The method of claim 28, wherein the zeolite precursor is subjected to a high temperature steam calcination step at a temperature from about 1200 °F to about 1500 °F, wherein the temperature of the zeolite precursor is within 50 °F of the high temperature steam calcination temperature in less than 5 minutes.~~

30. The method of any of claims 28-29, wherein the zeolite precursor is a sodium-Y zeolite.

31. The method of any of claims 28-30, wherein the zeolite precursor is subjected to at least one first ion-exchange step by contacting the zeolite precursor with a first ion-exchange solution prior to the high temperature steam calcination step.

32. The method of claim 31, wherein the ion-exchange solution comprises NH_4NO_3 .

33. The method of any of claims 31-32, wherein the zeolite precursor is subjected to at least one second ion-exchange step by contacting the zeolite precursor with at least one second ion-exchange solution after the high temperature steam calcination step.

34. The method of claim 33, wherein the zeolite precursor is calcined in air at a temperature of from about 800°F to about 1200°F after the at least one second ion-exchange.

35. The method of any of claims 31-32, wherein the zeolite precursor is subjected to at least one acid washing step by contacting the zeolite precursor with an acidic solution after the high temperature steam calcination step.

~~36. The method of claim 35, wherein the acidic solution comprises oxalic acid.~~

37. The method of any of claims 35-36, wherein the zeolite precursor is calcined in air at a temperature of from about 800°F to about 1200°F after the at least one acid washing step.

38. The method of any of claims 29-30, wherein the zeolite precursor is subjected to at least one first ion-exchange step by contacting the zeolite precursor with a first ion-exchange solution after the high temperature steam calcination step.

39. The method of claim 38, wherein the zeolite precursor is further subjected to:

- contacting the zeolite precursor with steam;
- subjected the zeolite precursor to at least one second ion-exchange step by contacting the zeolite precursor with a second ion-exchange solution after the high temperature steam calcination step; and
- contacting the zeolite precursor with steam at a temperature from about 1200°F to about 1500°F.

40. The method of claim 39, wherein the binder precursor is comprised of pseudoboehmite alumina.

41. The method of any of claims 28-40, wherein tetraethylammonium hydroxide and water are added to the catalyst mixture in step b).

~~42. The method of any of claims 28-30, wherein the catalyst precursor is calcined in air at a temperature from about 800°F to about 1200°F after the drying in step c) and prior to the adding of the at least one active metal in step d).~~

43. The method of any of claims 28-42, wherein the at least one active metal is added to the catalyst precursor via incipient wetness technique.

44. The method of any of claims 28-43, wherein the at least one active metal is comprised of at least one Group 6 metal selected from Pt and Pd.

45. The method of any of claims 28-43, wherein the at least one active metal is comprised of at least one Group 6 metal and at least one Group 8/9/10 metal.

46. The method of claim 45, wherein the Group 6 metal is selected from Cr, Mo, and W, and the Group 8/9/10 metal is selected from Fe, Co, Ni, Ru, Rh, Pd, Os, Ir, and Pt.

47. The method of claim 46, wherein the Group 6 metal is Mo and the Group 8/9/10 metal is selected from Co.

48. The method claim 46, wherein the Group 6 metal is W and the Group 8/9/10 metal is selected from Ni.

49. The method of any of claims 45-48, wherein the combined amount of Group 6 metal and one Group 8/9/10 metal is from 1 wt% to 25 wt%.

~~50. The method of any of claims 28-49, wherein the zeolite is present in the hydrocracking catalyst in an amount of at least 10 wt% based on the hydrocracking catalyst weight.~~

51. The method of any of claims 28-50, wherein the hydrocracking catalyst has a 40 Å Peak of less than about 0.15 cm³/g.

52. A hydrocracking process for selectively catalytically cracking a hydrocarbon feedstock to form a distillate product, comprising:

- a) contacting the hydrocarbon feedstock, in the presence of hydrogen, with a hydrocracking catalyst comprised of a Y zeolite with a Large Mesopore Volume of at least about 0.03 cm³/g and a Small Mesopore Peak of less than about 0.15 cm³/g; an inorganic matrix; and at least one active metal selected from Group 6 and Group 8/9/10 metals under hydrocracking conditions; and
 - b) producing at least one distillate product stream boiling in the range of about 400 to 700°F, which has a lower average molecular weight than the hydrocarbon feedstock;
- wherein the zeolite has a Large Mesopore Volume of at least about 0.03 cm³/g, and a Small Mesopore Peak of less than about 0.15 cm³/g.

53. The process of claim 52, wherein the hydrocarbon feedstock is contacted with the hydrocracking conditions comprise a temperature of 50°F (about 288°C) to about 800°F (about 427°C); a total pressure from about 300 psig (about 2.1 MPag) to about 3000 psig (about 20.7 MPag); an LHSV from about 0.1 hr⁻¹ to about 20 hr⁻¹; and a hydrogen treat gas rate from about 500 scf/bbl (about 85 Nm³/m³) to about 10000 scf/bbl (about 1700 Nm³/m³).

54. The process of any of claims 52-53, wherein the hydrocarbon feedstock comprises gasoil having an initial boiling point above about 400°F (204°C), a T50 boiling point of at least about 600°F (316°C), and an end boiling point of at least about 750°F (399°C).

55. The process of any of claims 52-54, wherein the hydrocarbon feedstock contains at least 50 wt% hydrocarbons with boiling points above 750°F (399°C).

56. The process of any of claims 52-55, wherein the zeolite has a Large-to-Small Pore Volume Ratio of at least about 4.0.

57. The process of any of claims 52-56, wherein the unit cell size of the zeolite is less than about 24.45 Angstroms.

58. The process of any of claims 52-57, wherein the inorganic matrix is comprised of silica, alumina, or combinations thereof.

59. The process of any of claims 52-58, wherein the inorganic matrix is comprised of alumina.

60. The process of any of claims 52-59, wherein the catalyst is comprised of at least one Group 6 metal selected from Pt and Pd.

61. The process of any of claims 52-59, wherein the catalyst is comprised of at least one Group 6 metal and one Group 8/9/10 metal.

62. The process of claim 61, wherein the Group 6 metal is selected from Cr, Mo, and W, and the Group 8/9/10 metal is selected from Fe, Co, Ni, Ru, Rh, Pd, Os, Ir, and Pt.

~~63. The process of claim 62, wherein the Group 6 metal is Mo and the Group 8/9/10 metal is selected from Co.~~

~~64. The process of claim 62, wherein the Group 6 metal is W and the Group 8/9/10 metal is selected from Ni.~~

~~65. The process of any of claims 61-64, wherein the combined amount of Group 6 metal and one Group 8/9/10 metal is from 1 wt% to 25 wt%.~~

~~66. The process of any of claims 52-65, wherein the zeolite is present in the catalyst in an amount of at least 10 wt% based on the catalyst weight.~~

~~67. The process of any of claims 52-66, wherein the catalyst has a 40 Å Peak of less than about 0.15 cm³/g.~~

~~68. The process of any of claims 52-67, wherein the zeolite has been made from a zeolite precursor wherein the zeolite precursor is subjected to a high temperature steam calcination step at a temperature from about 1200 °F to about 1500 °F wherein the temperature of the zeolite precursor is within 50 °F of the high temperature steam calcination temperature in less than 5 minutes.~~

~~69. The process of claim 68, wherein the Na₂O content of the precursor of the zeolite prior to the high temperature steam calcination step is from about 2 to about 5 wt% of the total precursor weight on a dry basis.~~

~~70. The process of any of claims 52-69, wherein the Small Mesopore Volume Peak of the zeolite is less than about 0.13 cm³/g, and the Large Mesopore Volume of the zeolite is at least about 0.05 cm³/g.~~

CLAIMS:

1. A hydrocracking catalyst comprised of:
 - a Y zeolite with a Large Mesopore Volume of at least about 0.03 cm³/g and a Small Mesopore Peak of less than about 0.15 cm³/g;
 - an inorganic matrix; and
 - at least one active metal selected from Group 6 and Group 8/9/10 metals.
2. The catalyst of claim 1, wherein the zeolite has a Large-to-Small Pore Volume Ratio of at least about 4.0.
3. The catalyst of claim 1, wherein the unit cell size of the zeolite is less than about 24.45 Angstroms.
4. The catalyst of claim 1, wherein the inorganic matrix is comprised of silica, alumina, or combinations thereof.
5. The catalyst of claim 1, wherein the inorganic matrix is comprised of pseudoboehmite alumina.
6. The catalyst of claim 1, wherein the catalyst is comprised of at least one Group 6 metal selected from Pt and Pd.
7. The catalyst of claim 1, wherein the catalyst is comprised of at least one Group 6 metal and one Group 8/9/10 metal.
8. The catalyst of claim 4, wherein the catalyst is comprised of at least one Group 6 metal and one Group 8/9/10 metal.
9. The catalyst of claim 8, wherein the Group 6 metal is selected from Cr, Mo, and W, and the Group 8/9/10 metal is selected from Fe, Co, Ni, Ru, Rh, Pd, Os, Ir, and Pt.

10. The catalyst of claim 9, wherein the Group 6 metal is Mo and the Group 8/9/10 metal is selected from Co.

11. The catalyst of claim 9, wherein the Group 6 metal is W and the Group 8/9/10 metal is selected from Ni.

12. The catalyst of claim 9, wherein the combined amount of Group 6 metal and one Group 8/9/10 metal is from 1 wt% to 25 wt%.

13. The catalyst of claim 1, wherein the zeolite is present in the hydrocracking catalyst in an amount of at least 10 wt% based on the hydrocracking catalyst weight.

14. The catalyst of claim 1, wherein the hydrocracking catalyst has a 40 Å Peak of less than about 0.15 cm³/g.

15. The catalyst of claim 1, wherein the zeolite has been made from a zeolite precursor wherein the zeolite precursor is subjected to a high temperature steam calcination step at a temperature from about 1200 °F to about 1500 °F wherein the temperature of the zeolite precursor is within 50 °F of the high temperature steam calcination temperature in less than 5 minutes.

16. The catalyst of claim 1, wherein the zeolite precursor is a sodium-Y zeolite.

17. The catalyst of claim 15, wherein the zeolite precursor is subjected to at least one first ion-exchange step by contacting the zeolite precursor with a first ion-exchange solution prior to the high temperature steam calcination step.

18. The catalyst of claim 17, wherein the ion-exchange solution comprises NH₄NO₃.

19. The catalyst of claim 17, wherein the zeolite precursor is subjected to

at least one second ion-exchange step by contacting the zeolite precursor with a second ion-exchange solution after the high temperature steam calcination step.

20. The catalyst of claim 19, wherein the zeolite precursor is calcined in air at a temperature of from about 800°F to about 1200°F after the second ion-exchange.

21. The catalyst of claim 17, wherein the zeolite precursor is subjected to at least one acid washing step by contacting the zeolite precursor with an acidic solution after the high temperature steam calcination step.

22. The catalyst of claim 21, wherein the acidic solution comprises oxalic acid.

23. The catalyst of claim 22, wherein the zeolite precursor is calcined in air at a temperature of from about 800°F to about 1200°F after the at least one acid washing step.

24. The catalyst of claim 15, wherein the zeolite precursor is subjected to at least one first ion-exchange step by contacting the zeolite precursor with a first ion-exchange solution after the high temperature steam calcination step.

25. The catalyst of claim 24, wherein the zeolite precursor is further subjected to:

- contacting the zeolite precursor with steam;
- subjected the zeolite precursor to at least one second ion-exchange step by contacting the zeolite precursor with a second ion-exchange solution after the high temperature steam calcination step; and
- contacting the zeolite precursor with steam at a temperature from about 1200°F to about 1500°F.

26. The catalyst of claim 15, wherein the Na₂O content of the zeolite precursor prior to the high temperature steam calcination step is from about 2 to about

5 wt% of the total precursor weight on a dry basis.

27. The catalyst of claim 2, wherein the Small Mesopore Volume Peak of the zeolite is less than about $0.13 \text{ cm}^3/\text{g}$.

28. The catalyst of claim 27, wherein the Large Mesopore Volume of the zeolite is at least about $0.05 \text{ cm}^3/\text{g}$.

29. A method of making a hydrocracking catalyst, comprising the steps of:

- a) making a zeolite from a zeolite precursor;
- b) combining a binder precursor selected from a silica, an alumina, or a combination thereof, with a zeolite to form a catalyst mixture;
- c) drying the catalyst mixture to form a catalyst precursor; and
- d) adding at least one active metal to the catalyst precursor to form the hydrocracking catalyst;

wherein the zeolite is a Y zeolite with a Large Mesopore Volume of at least about $0.03 \text{ cm}^3/\text{g}$ and a Small Mesopore Peak of less than about $0.15 \text{ cm}^3/\text{g}$.

30. The method of claim 29, wherein the zeolite precursor is subjected to a high temperature steam calcination step at a temperature from about 1200°F to about 1500°F , wherein the temperature of the zeolite precursor is within 50°F of the high temperature steam calcination temperature in less than 5 minutes.

31. The method of claim 29, wherein the zeolite precursor is a sodium-Y zeolite.

32. The method of claim 30, wherein the zeolite precursor is subjected to at least one first ion-exchange step by contacting the zeolite precursor with a first ion-exchange solution prior to the high temperature steam calcination step.

33. The method of claim 32, wherein the ion-exchange solution comprises NH_4NO_3 .

34. The method of claim 32, wherein the zeolite precursor is subjected to at least one second ion-exchange step by contacting the zeolite precursor with at least one second ion-exchange solution after the high temperature steam calcination step.

35. The method of claim 34, wherein the zeolite precursor is calcined in air at a temperature of from about 800°F to about 1200°F after the at least one second ion-exchange.

36. The method of claim 32, wherein the zeolite precursor is subjected to at least one acid washing step by contacting the zeolite precursor with an acidic solution after the high temperature steam calcination step.

37. The method of claim 36, wherein the acidic solution comprises oxalic acid.

38. The method of claim 37, wherein the zeolite precursor is calcined in air at a temperature of from about 800°F to about 1200°F after the at least one acid washing step.

39. The method of claim 30, wherein the zeolite precursor is subjected to at least one first ion-exchange step by contacting the zeolite precursor with a first ion-exchange solution after the high temperature steam calcination step.

40. The method of claim 39, wherein the zeolite precursor is further subjected to:

- contacting the zeolite precursor with steam;
- subjected the zeolite precursor to at least one second ion-exchange step by contacting the zeolite precursor with a second ion-exchange solution after the high temperature steam calcination step; and
- contacting the zeolite precursor with steam at a temperature from about 1200°F to about 1500°F.

41. The method of claim 30, wherein the binder precursor is comprised of pseudoboehmite alumina.

42. The method of claim 30, wherein tetraethylammonium hydroxide and water are added to the catalyst mixture in step b).

43. The method of claim 30, wherein the catalyst precursor is calcined in air at a temperature from about 800°F to about 1200°F after the drying in step c) and prior to the adding of the at least one active metal in step d).

44. The method of claim 30, wherein the at least one active metal is added to the catalyst precursor via incipient wetness technique.

45. The method of claim 30, wherein the at least one active metal is comprised of at least one Group 6 metal selected from Pt and Pd.

46. The method of claim 30, wherein the at least one active metal is comprised of at least one Group 6 metal and at least one Group 8/9/10 metal.

47. The method of claim 46, wherein the Group 6 metal is selected from Cr, Mo, and W, and the Group 8/9/10 metal is selected from Fe, Co, Ni, Ru, Rh, Pd, Os, Ir, and Pt.

48. The method of claim 47, wherein the Group 6 metal is Mo and the Group 8/9/10 metal is selected from Co.

49. The method claim 47, wherein the Group 6 metal is W and the Group 8/9/10 metal is selected from Ni.

50. The method of claim 46, wherein the combined amount of Group 6 metal and one Group 8/9/10 metal is from 1 wt% to 25 wt%.

51. The method of claim 29, wherein the zeolite is present in the hydrocracking catalyst in an amount of at least 10 wt% based on the hydrocracking catalyst weight.

52. The method of claim 29, wherein the hydrocracking catalyst has a 40 Å Peak of less than about 0.15 cm³/g.

53. A hydrocracking process for selectively catalytically cracking a hydrocarbon feedstock to form a distillate product, comprising:

a) contacting the hydrocarbon feedstock, in the presence of hydrogen, with a hydrocracking catalyst comprised of a Y zeolite with a Large Mesopore Volume of at least about 0.03 cm³/g and a Small Mesopore Peak of less than about 0.15 cm³/g; an inorganic matrix; and at least one active metal selected from Group 6 and Group 8/9/10 metals under hydrocracking conditions; and

b) producing at least one distillate product stream boiling in the range of about 400 to 700°F, which has a lower average molecular weight than the hydrocarbon feedstock;

wherein the zeolite has a Large Mesopore Volume of at least about 0.03 cm³/g, and a Small Mesopore Peak of less than about 0.15 cm³/g.

54. The process of claim 53, wherein the hydrocarbon feedstock is contacted with the hydrocracking conditions comprise a temperature of 50°F (about 288°C) to about 800°F (about 427°C); a total pressure from about 300 psig (about 2.1 MPa) to about 3000 psig (about 20.7 MPa); an LHSV from about 0.1 hr⁻¹ to about 20 hr⁻¹; and a hydrogen treat gas rate from about 500 scf/bbl (about 85 Nm³/m³) to about 10000 scf/bbl (about 1700 Nm³/m³).

55. The process of claim 54, wherein the hydrocarbon feedstock comprises gasoil having an initial boiling point above about 400°F (204°C), a T50 boiling point of at least about 600°F (316°C), and an end boiling point of at least about 750°F (399°C).

56. The process of claim 54, wherein the hydrocarbon feedstock contains at least 50 wt% hydrocarbons with boiling points above 750°F (399°C).

57. The process of claim 53, wherein the zeolite has a Large-to-Small Pore Volume Ratio of at least about 4.0.

58. The process of claim 53, wherein the unit cell size of the zeolite is less than about 24.45 Angstroms.

59. The process of claim 53, wherein the inorganic matrix is comprised of silica, alumina, or combinations thereof.

60. The process of claim 53, wherein the inorganic matrix is comprised of alumina.

61. The process of claim 53, wherein the catalyst is comprised of at least one Group 6 metal selected from Pt and Pd.

62. The process of claim 53, wherein the catalyst is comprised of at least one Group 6 metal and one Group 8/9/10 metal.

63. The process of claim 59, wherein the catalyst is comprised of at least one Group 6 metal and one Group 8/9/10 metal.

64. The process of claim 63, wherein the Group 6 metal is selected from Cr, Mo, and W, and the Group 8/9/10 metal is selected from Fe, Co, Ni, Ru, Rh, Pd, Os, Ir, and Pt.

65. The process of claim 64, wherein the Group 6 metal is Mo and the Group 8/9/10 metal is selected from Co.

66. The process of claim 64, wherein the Group 6 metal is W and the Group 8/9/10 metal is selected from Ni.

67. The process of claim 64, wherein the combined amount of Group 6 metal and one Group 8/9/10 metal is from 1 wt% to 25 wt%.

68. The process of claim 67, wherein the zeolite is present in the catalyst in an amount of at least 10 wt% based on the catalyst weight.

69. The process of claim 68, wherein the catalyst has a 40 Å Peak of less than about 0.15 cm³/g.

70. The process of claim 53, wherein the zeolite has been made from a zeolite precursor wherein the zeolite precursor is subjected to a high temperature steam calcination step at a temperature from about 1200 °F to about 1500 °F wherein the temperature of the zeolite precursor is within 50 °F of the high temperature steam calcination temperature in less than 5 minutes.

71. The process of claim 70, wherein the Na₂O content of the precursor of the zeolite prior to the high temperature steam calcination step is from about 2 to about 5 wt% of the total precursor weight on a dry basis.

72. The process of claim 69, wherein the Small Mesopore Volume Peak of the zeolite is less than about 0.13 cm³/g.

73. The process of claim 72, wherein the Large Mesopore Volume of the zeolite is at least about 0.05 cm³/g.