CLAIMS

1. A method, comprising:

providing a microfluidic device comprising a plurality of droplet-making units, substantially each of the droplet-making units in fluidic communication with a different source of droplet fluid and a common source of carrier fluid;

applying substantially the same pressure and/or pressure drop to substantially all of the different sources of droplet fluid to cause droplet fluid to move from the different sources of droplet fluid into the microfluidic device; and

producing, within the microfluidic device, a set comprising a plurality of droplets, substantially each droplet of the set comprising droplet fluid from only one of the different sources of droplet fluid, the plurality of droplets of the set being contained within carrier fluid from the common source of carrier fluid.

2. The method of claim 1, wherein applying substantially the same pressure and/or pressure drop comprises providing the microfluidic device in a pressure chamber, and applying a common pressure via the pressure chamber.

3. The method of any one of claims 1 or 2, wherein applying substantially the same pressure and/or pressure drop comprises applying a pressurizing fluid to substantially all of the different sources of droplet fluid.

4. The method of claim 3, wherein the pressurizing fluid comprises air.

5. An article, comprising:

a microfluidic device comprising a plurality of droplet-making units, substantially each of the droplet-making units in fluidic communication with a different source of droplet fluid and a common source of carrier fluid, wherein the droplet-making units are positioned at a repeat spacing of about 9 mm, about 4.5 mm, or about 2.25 mm.

6. The article of claim 5, wherein at least some of the different sources of droplet fluid are contained within an ANSI microwell plate.

7. The article of claim 6, wherein the microfluidic device is able to access fluid in at least 1/4 of the wells within the ANSI microwell plate.

8. The article of claim 6, wherein the different sources of droplet fluid are contained within a 96-well ANSI microwell plate.

9. The article of claim 6, wherein the different sources of droplet fluid are contained within a 384-well ANSI microwell plate.

10. The article of claim 6, wherein the different sources of droplet fluid are contained within a 1,536-well ANSI microwell plate.

11. The article of claim 5, wherein the repeat spacing is about 9 mm.

12. The article of claim 5, wherein the repeat spacing is about 4.5 mm.

13. The article of claim 5, wherein the repeat spacing is about 2.25 mm.

14. The article of any one of claims 5-13, wherein the plurality of droplet-making units are substantially identical.

15. The article of claim 14, wherein the droplet-making units are substantially identical disregarding rotations, reflections, and translations.

16. An article, comprising:

a microfluidic device comprising a plurality of droplet-making units, substantially each of the droplet-making units in fluidic communication with a different source of droplet fluid and a common source of carrier fluid,

wherein at least one of the droplet-making units comprises:

an inlet for receiving droplet fluid from one of the different sources of droplet fluid, the inlet in fluidic communication via a first microfluidic channel with an intersection of microfluidic channels; and

a second microfluidic channel extending from the intersection, the second microfluidic channel in fluid communication with the common source of carrier fluid;

wherein at least one of the first or second microfluidic channels has a length within the droplet-making unit that is greater than two times the largest dimension of the droplet-making unit.

17. The article of claim 16, further comprising a third microfluidic channel extending from the intersection.

18. The article of claim 17, wherein the third microfluidic channel is in fluid communication with the common source of carrier fluid.

19. The article of any one of claims 17 or 18, wherein at the intersection, the second microfluidic channel and the third microfluidic channel intersect at an angle of about 180^{o}.

20. An article, comprising:

a microfluidic device comprising a plurality of droplet-making units, substantially each of the droplet-making units in fluidic communication with a different source of droplet fluid and a common source of carrier fluid,

wherein at least one of the droplet-making units comprises:

an inlet for receiving droplet fluid from one of the different sources of droplet fluid, the inlet in fluidic communication via a first microfluidic channel with an intersection of microfluidic channels; and

a second microfluidic channel extending from the intersection, the second microfluidic channel in fluid communication with the common source of carrier fluid;

wherein at least one of the first or second microfluidic channels exhibits a first section and a second section that is substantially antiparallel to the first section.

21. The article of claim 20, wherein each of the first and second microfluidic channels exhibits a first section and a second section that is substantially antiparallel to the first section.

22. The article of any one of claims 20 or 21, wherein at least one of the first or second microfluidic channels exhibits a first section, a second section that is substantially antiparallel to the first section, and a third section that is substantially parallel to the first section.

23. An article, comprising:

a microfluidic device comprising a plurality of droplet-making units, substantially each of the droplet-making units in fluidic communication with a different source of droplet fluid and a common source of carrier fluid;

a pressurizing fluid in fluidic communication with substantially all of the different sources of droplet fluid; and

a pressure source able to alter the pressure of the pressurizing fluid.

24. A method, comprising:

providing a microfluidic device comprising a plurality of fluidic units, substantially each of the fluidic units in fluidic communication with a different source of a first fluid and a common source of a second fluid;

applying substantially the same pressure and/or pressure drop to substantially all of the different sources of the first fluid to cause the first fluid to move from the different sources of the first fluid into the microfluidic device; and

producing, within substantially each of the fluidic units the microfluidic device, a plurality of mixtures of the first and second fluids, substantially each mixture of the plurality of mixtures comprising first fluid from only one of the different sources of first fluid and the second fluid from the common source of the second fluid.

25. An article, comprising:

a microfluidic device comprising a plurality of fluidic units, substantially

each of the fluidic units in fluidic communication with a different source of a first fluid and a common source of a second fluid,

wherein at least one of the fluidic units comprises:

an inlet for receiving first fluid from one of the different sources of the first fluid, the inlet in fluidic communication via a first microfluidic channel with an intersection of microfluidic channels; and

a second microfluidic channel extending from the intersection, the second microfluidic channel in fluid communication with the common source of the second fluid;

wherein at least one of the first or second microfluidic channels has a length within the fluidic unit that is greater than two times the largest dimension of the fluidic unit.

26. An article, comprising:

a microfluidic device comprising a plurality of fluidic units, substantially each of the fluidic units in fluidic communication with a different source of a first fluid and a common source of a second fluid,

wherein at least one of the fluidic units comprises:

an inlet for receiving first fluid from one of the different sources of the first fluid, the inlet in fluidic communication via a first microfluidic channel with an intersection of microfluidic channels; and

a second microfluidic channel extending from the intersection, the second microfluidic channel in fluid communication with the common source of the second fluid;

wherein at least one of the first or second microfluidic channels exhibits a first section and a second section that is substantially antiparallel to the first section.

27. An article, comprising:

a microfluidic device comprising a plurality of fluidic units, substantially each of the fluidic units in fluidic communication with a different source of a first fluid and a common source of a second fluid;

a pressurizing fluid in fluidic communication with substantially all of the different sources of first fluid; and

a pressure source able to alter the pressure of the pressurizing fluid.

CLAIMS

1. A method, comprising:

providing a microfluidic device comprising a plurality of droplet-making units, substantially each of the droplet-making units in fluidic communication with a different source of droplet fluid and a common source of carrier fluid;

applying substantially the same pressure and/or pressure drop to substantially all of the different sources of droplet fluid to cause droplet fluid to move from the different sources of droplet fluid into the microfluidic device; and

producing, within the microfluidic device, a set comprising a plurality of droplets, substantially each droplet of the set comprising droplet fluid from only one of the different sources of droplet fluid, the plurality of droplets of the set being contained within carrier fluid from the common source of carrier fluid.

2. The method of claim 1, wherein applying substantially the same pressure and/or pressure drop comprises providing the microfluidic device in a pressure chamber, and applying a common pressure via the pressure chamber.

3. The method of any one of claims 1 or 2, wherein applying substantially the same pressure and/or pressure drop comprises applying a pressurizing fluid to substantially all of the different sources of droplet fluid.

4. The method of claim 3, wherein the pressurizing fluid comprises air.

5. The method of any one of claims 1-4, wherein at least some of the different sources of droplet fluid are contained within an ANSI microwell plate, and applying the same pressure and/or pressure drop comprises applying a pressure to at least a portion of the ANSI microwell plate.

6. The method of any one of claims 1-5, further comprising applying pressure to the common source of carrier fluid to move the carrier fluid from the common source of carrier fluid into the microfluidic device.

7. The method of claim 6, wherein the pressure applied to the different sources of droplet fluid and the pressure applied to the common source of carrier fluid are substantially the same.

8. The method of claim 7, further comprising altering the pressure applied to one or both of the pressure applied to the different sources of droplet fluid and the pressure applied to the common source of carrier fluid based on the plurality of droplets of the set produced within the microfluidic device.

9. The method of claim 8, comprising determining at least some of the plurality of droplets of the set produced within the microfluidic device, and altering the pressure applied to one or both of the pressure applied to the different sources of droplet fluid and the pressure applied to the common source of carrier fluid based on the determination.

10. The method of any one of claims 8 or 9, comprising determining a rate of production of droplets produced within the microfluidic device, and altering the pressure applied to one or both of the pressure applied to the different sources of droplet fluid and the pressure applied to the common source of carrier fluid based on the determination.

11. The method of any one of claims 8-10, comprising determining a composition of at least some of the plurality of droplets of the set produced within the microfluidic device, and altering the pressure applied to one or both of the pressure applied to the different sources of droplet fluid and the pressure applied to the common source of carrier fluid based on the determination.

12. The method of any one of claims 1-11, wherein the pressure applied to substantially all of the different sources of droplet fluid is greater than atmospheric pressure.

13. The method of any one of claims 1-11, wherein the pressure applied to substantially all of the different sources of droplet fluid is less than atmospheric pressure.

14. The method of any one of claims 1-13, wherein the carrier fluid and substantially each of the droplet fluids is substantially immiscible.

15. The method of any one of claims 1-14, wherein the plurality of droplets of the set is substantially monodisperse.

16. The method of any one of claims 1-15, wherein the plurality of droplets of the set have an overall average dimension of less than about 1 mm.

17. The method of any one of claims 1-16, comprising producing at least about 100 droplets per second.

18. The method of any one of claims 1-17, comprising producing at least about 10^3 droplets per second.

19. The method of any one of claims 1-18, comprising producing at least about 10^4 droplets per second.

20. The method of any one of claims 1-19, comprising producing at least about 1 ml of droplets per second.

21. The method of any one of claims 1-20, comprising producing at least about 10 ml of droplets per second.

22. An article, comprising:

a microfluidic device comprising a plurality of droplet-making units, substantially each of the droplet-making units in fluidic communication with a different source of droplet fluid and a common source of carrier fluid, wherein

the droplet-making units are positioned at a repeat spacing of about 9 mm, about 4.5 mm, or about 2.25 mm.

23. The article of claim 22, wherein at least some of the different sources of droplet fluid are contained within an ANSI microwell plate.

24. The article of claim 23, wherein the microfluidic device is able to access fluid in at least 1/4 of the wells within the ANSI microwell plate.

25. The article of claim 23, wherein the different sources of droplet fluid are contained within a 96-well ANSI microwell plate.

26. The article of claim 23, wherein the different sources of droplet fluid are contained within a 384-well ANSI microwell plate.

27. The article of claim 23, wherein the different sources of droplet fluid are contained within a 1,536-well ANSI microwell plate.

28. The article of claim 22, wherein the repeat spacing is about 9 mm.

29. The article of claim 22, wherein the repeat spacing is about 4.5 mm.

30. The article of claim 22, wherein the repeat spacing is about 2.25 mm.

31. The article of any one of claims 22-30, wherein the plurality of droplet-making units are substantially identical.

32. The article of claim 31, wherein the droplet-making units are substantially identical disregarding rotations, reflections, and translations.

33. The article of any one of claims 22-32, wherein the microfluidic device comprises at least 24 droplet-making units.

34. The article of any one of claims 22-33, wherein the microfluidic device comprises at least 96 droplet-making units.

35. The article of any one of claims 22-24 or 26-34, wherein the microfluidic device comprises at least 384 droplet-making units.

36. The article of any one of claims 22-24 or 27-34, wherein the microfluidic device comprises at least 1,536 droplet-making units.

37. The article of any one of claims 22-36, wherein the microfluidic device comprises a polymer.

38. The article of any one of claims 22-37, wherein the microfluidic device comprises poly(dimethylsiloxane).

39. The article of any one of claims 22-38, wherein the microfluidic device further comprises a plurality of tubes extending outwardly from substantially each of the droplet-making units.

40. The article of claim 39, wherein substantially each of the tubes fluidically connects one of the different sources of droplet fluid to the one of the droplet-making units.

41. The article of any one of claims 39 or 40, wherein at least one of the plurality of tubes comprises a polymer.

42. The article of claim 41, wherein the polymer comprises one or more of polyethylene, polypropylene, polyether ether ketone, fluorinated ethylene propylene.

43. The article of any one of claims 39-42, wherein at least one of the plurality of tubes comprises steel.

44. The article of any one of claims 39-43, wherein at least one of the plurality of tubes comprises glass.

45. The article of any one of claims 39-44, wherein at least some of the plurality of tubes are substantially parallel to each other.

46. The article of any one of claims 22-45, wherein the microfluidic device comprises a plurality of substantially parallel channels therein for distributing carrier fluid from the common source of carrier fluid to substantially each of the droplet-making units.

47. The article of claim 46, wherein at least some of the plurality of substantially parallel channels are microfluidic channels.

48. The article of any one of claims 22-47, wherein the microfluidic device comprises a plurality of substantially parallel channels therein for collecting droplets produced by substantially each of the droplet-making units.

49. The article of claim 48, wherein at least some of the plurality of substantially parallel channels are microfluidic channels.

50. The article of any one of claims 22-49, wherein substantially each of the droplet-making units comprises:

an inlet for receiving droplet fluid from one of the different sources of droplet fluid, the inlet in fluidic communication via a first microfluidic channel with an intersection of microfluidic channels; and

a second microfluidic channel extending from the intersection, the second microfluidic channel in fluid communication with the common source of carrier fluid.

51. The article of claim 50, wherein the inlet is substantially centrally positioned within the droplet-making unit.

52. The article of any one of claims 50 or 51, wherein at least one of the first or second microfluidic channels has a length within the droplet-making unit that is greater than two times the largest dimension of the droplet-making unit.

53. The article of any one of claims 50-52, wherein at least one of the first or second microfluidic channels exhibits a first section and a second section that is substantially antiparallel to the first section.

54. The article of any one of claims 50-53, further comprising a third microfluidic channel extending from the intersection, the third microfluidic channel in fluid communication with the common source of carrier fluid.

55. The article of any one of claims 22-54, wherein the substantially each of the droplet-making units comprises a dimensional restriction.

56. The article of any one of claims 22-55, wherein substantially each of the different sources of droplet fluid has at least one component in common.

57. The article of claim 56, wherein the common component is a solvent.

58. The article of any one of claims 22-57, wherein substantially each of the different sources of droplet fluid contains the same solvent and a different species contained within the solvent.

59. An article, comprising:

a microfluidic device comprising a plurality of droplet-making units, substantially each of the droplet-making units in fluidic communication with a different source of droplet fluid and a common source of carrier fluid,

wherein at least one of the droplet-making units comprises:

an inlet for receiving droplet fluid from one of the different sources of droplet fluid, the inlet in fluidic communication via a first microfluidic channel with an intersection of microfluidic channels; and

a second microfluidic channel extending from the intersection, the second

microfluidic channel in fluid communication with the common source of carrier fluid;

wherein at least one of the first or second microfluidic channels has a length within the droplet-making unit that is greater than two times the largest dimension of the droplet-making unit.

60. The article of claim 59, further comprising a third microfluidic channel extending from the intersection.

61. The article of claim 60, wherein the third microfluidic channel is in fluid communication with the common source of carrier fluid.

62. The article of any one of claims 60 or 61, wherein at the intersection, the second microfluidic channel and the third microfluidic channel intersect at an angle of about 180°.

63. The article of any one of claims 60-62, wherein the second microfluidic channel and the third microfluidic channel are each in fluidic communication with the common source of carrier fluid via a different inlet to the droplet-making unit.

64. The article of any one of claims 60-63, wherein the second microfluidic channel and the third microfluidic channel are each in fluidic communication with the common source of carrier fluid via a common inlet to the droplet-making unit

65. The article of any one of claims 59-64, wherein each of the first and second microfluidic channels has a length within the droplet-making unit that is greater than two times the largest dimension of the droplet-making unit.

66. The article of any one of claims 59-65, wherein each of the first and second microfluidic channels has a length within the droplet-making unit that is greater than three times the largest dimension of the droplet-making unit.

67. The article of any one of claims 59-66, further comprising an inlet filter in fluidic communication with the substantially centrally-positioned inlet.

68. The article of claim 67, wherein the inlet filter is positioned between the inlet and the first microfluidic channel.

69. The article of any one of claims 59-68, further comprising a carrier filter positioned between an inlet for carrier fluid to the droplet-making unit and the second microfluidic channel.

70. The article of any one of claims 59-69, wherein at the intersection, the first microfluidic channel and the second microfluidic channel intersect at an angle of about 90°.

71. The article of any one of claims 59-70, wherein the intersection further comprises an outlet channel.

72. The article of any one of claims 59-71, wherein the outlet channel is positioned at an angle of about 180° relative to the first microfluidic channel.

73. The article of any one of claims 59-72, wherein the first channel, the second channel, and the outlet channel define a T-junction.

74. The article of any one of claims 59-72, wherein the first channel, the second channel, and the outlet channel define a Y-junction.

75. The article of any one of claims 59-74, wherein the first microfluidic channel and the second microfluidic channel are substantially planar to each other.

76. The article of any one of claims 59-75, wherein the inlet is substantially centrally positioned within the droplet-making unit.

77. The article of any one of claims 59-76, wherein the inlet comprises the centroid of the droplet-making unit.

78. The article of any one of claims 59-77, wherein the inlet is substantially circular.

79. The article of any one of claims 59-78, wherein the inlet comprises a substantially circular filter.

80. The article of any one of claims 59-79, wherein the inlet intersects a tube extending outwardly from the droplet-making unit.

81. An article, comprising:

a microfluidic device comprising a plurality of droplet-making units, substantially each of the droplet-making units in fluidic communication with a different source of droplet fluid and a common source of carrier fluid,

wherein at least one of the droplet-making units comprises:

an inlet for receiving droplet fluid from one of the different sources of droplet fluid, the inlet in fluidic communication via a first microfluidic channel with an intersection of microfluidic channels; and

a second microfluidic channel extending from the intersection, the second microfluidic channel in fluid communication with the common source of carrier fluid;

wherein at least one of the first or second microfluidic channels exhibits a first section and a second section that is substantially antiparallel to the first section.

82. The article of claim 81, wherein each of the first and second microfluidic channels exhibits a first section and a second section that is substantially antiparallel to the first section.

83. The article of any one of claims 81 or 82, wherein at least one of the first or second microfluidic channels exhibits a first section, a second section that is

substantially antiparallel to the first section, and a third section that is substantially parallel to the first section.

84. An article, comprising:

a microfluidic device comprising a plurality of droplet-making units, substantially each of the droplet-making units in fluidic communication with a different source of droplet fluid and a common source of carrier fluid;

a pressurizing fluid in fluidic communication with substantially all of the different sources of droplet fluid; and

a pressure source able to alter the pressure of the pressurizing fluid.

85. A method, comprising:

providing a microfluidic device comprising a plurality of fluidic units, substantially each of the fluidic units in fluidic communication with a different source of a first fluid and a common source of a second fluid;

applying substantially the same pressure and/or pressure drop to substantially all of the different sources of the first fluid to cause the first fluid to move from the different sources of the first fluid into the microfluidic device; and

producing, within substantially each of the fluidic units the microfluidic device, a plurality of mixtures of the first and second fluids, substantially each mixture of the plurality of mixtures comprising first fluid from only one of the different sources of first fluid and the second fluid from the common source of the second fluid.

86. An article, comprising:

a microfluidic device comprising a plurality of fluidic units, substantially each of the fluidic units in fluidic communication with a different source of a first fluid and a common source of a second fluid,

wherein at least one of the fluidic units comprises:

an inlet for receiving first fluid from one of the different sources of the first fluid, the inlet in fluidic communication via a first microfluidic channel with an intersection of microfluidic channels; and

a second microfluidic channel extending from the intersection, the second

microfluidic channel in fluid communication with the common source of the second fluid;

wherein at least one of the first or second microfluidic channels has a length within the fluidic unit that is greater than two times the largest dimension of the fluidic unit.

87. An article, comprising:

a microfluidic device comprising a plurality of fluidic units, substantially each of the fluidic units in fluidic communication with a different source of a first fluid and a common source of a second fluid,

wherein at least one of the fluidic units comprises:

an inlet for receiving first fluid from one of the different sources of the first fluid, the inlet in fluidic communication via a first microfluidic channel with an intersection of microfluidic channels; and

a second microfluidic channel extending from the intersection, the second microfluidic channel in fluid communication with the common source of the second fluid;

wherein at least one of the first or second microfluidic channels exhibits a first section and a second section that is substantially antiparallel to the first section.

88. An article, comprising:

a microfluidic device comprising a plurality of fluidic units, substantially each of the fluidic units in fluidic communication with a different source of a first fluid and a common source of a second fluid;

a pressurizing fluid in fluidic communication with substantially all of the different sources of first fluid; and

a pressure source able to alter the pressure of the pressurizing fluid.