CLAIMS

1. A microfluidic device comprising:

a first fluidic input and a second fluidic input;

a fluidic intersection channel to receive fluid from the first fluidic input and the second fluidic input, wherein the fluidic intersection channel opens into a first mixing chamber on an upper region of a first side of the first mixing chamber, wherein the first mixing chamber has a length, a width, and a depth, wherein the depth is greater than about 1.5 times a depth of the fluidic intersection channel; and

an outlet channel on an upper region of a second side of the first mixing chamber, wherein the outlet channel has a depth that is less than the depth of the first mixing chamber, and wherein an opening of the outlet channel is offset along a width of the second side of the first mixing chamber relative to the fluidic intersection.

2. A microfluidic device comprising:

a first fluidic input channel and a second fluidic input channel, wherein the first and second fluidic input channels converge to a fluidic intersection channel having width and a depth extending from a top surface to a first bottom surface;

a first mixing chamber having a depth extending from the top surface to a second bottom surface, a width extending from a first side to a second side, and a length, wherein the depth of the first mixing chamber is greater than the depth of the fluidic intersection channel and the width of the first mixing chamber is greater than the width of the fluidic intersection channel, and wherein the first mixing chamber is fluidly connected to the fluidic intersection channel at the top surface and proximate the first side; and

an outlet channel, wherein the outlet channel is fluidly connected to the first mixing chamber at the top surface and proximate the second side of the first mixing chamber.

3. A microfluidic device comprising:

a first fluidic input and a second fluidic input; and

a fluidic intersection channel to receive fluid from the first fluidic input and the second fluidic input, wherein the fluidic intersection channel opens into a first mixing chamber on an upper region of a first side of the first mixing chamber, wherein the first mixing chamber has a width, a length and a depth, wherein the depth is greater than about 1.5 times a depth of the fluidic intersection channel;

a connection channel on an upper region of a second side of the first mixing chamber, wherein the connection channel has a depth that is less than the depth of the first mixing chamber, further wherein an opening of the connection channel is offset along the width of the second side of the first mixing chamber relative to the fluidic intersection, wherein the connection channel opens into a second mixing chamber; and

an outlet channel extending from the second mixing chamber.

4. The microfluidic device of any of claims 1-2, wherein the first mixing chamber is configured as a single mixer in which the outlet channel forms a mixer output without connecting in series to an additional mixing chamber.

5. The microfluidic device of claim 3, wherein the connecting channel has a width that is between about 75 μm and about 225 μm, a depth that is between about 75 μm and about 225 μm, and a length that is between about 225 and about 550 μm.

6. The microfluidic device of any of claims 1-2, further comprising:

a second mixing chamber having a depth extending from the top surface to a bottom surface of the second mixing chamber, a width extending from a first side to a second side of the second mixing chamber, and a length, wherein the depth of the second mixing chamber is greater than the depth of the outlet channel and the width of the second mixing chamber is greater than a width of the outlet channel, further wherein the second mixing chamber is fluidly connected to the outlet channel at the top surface and proximate the second side; and

a second outlet channel having a depth and a width, wherein the second outlet channel is fluidly connected to the second mixing chamber at the top surface and proximate the first side of the second mixing chamber.

7. The microfluidic device of any of claims 1-2, wherein the microfluidic device comprises a plurality of fluidly connected mixing chambers including the first mixing chamber.

8. A microfluidic mixing apparatus comprising:

a mixing chamber comprising a base defining a bottom surface, side walls, and an upper surface enclosing the mixing chamber;

a mixing inlet channel comprising an opening into the mixing chamber at a first side wall of the mixing chamber; and a mixing outlet channel comprising an opening into the mixing chamber at a second side wall of the mixing chamber;

wherein a vertical dimension of the mixing chamber is larger than a vertical dimension of the mixing inlet channel and is larger than a vertical dimension of the mixing outlet channel.

9 The microfluidic apparatus of claim 8, wherein the first side wall and the second side wall are opposing side walls of the mixing chamber.

10. The microfluidic apparatus of any of claims 8-9, wherein the mixing inlet channel and the mixing outlet channel connect to the mixing chamber at offset locations along the first side wall and the second side wall.

11. A microfluidic apparatus comprising cascading microfluidic mixers, wherein each of the cascading microfluidic mixers comprises:

a mixing chamber comprising a base defining a bottom surface, side walls, and an upper surface;

a mixing inlet channel comprising an opening into the mixing chamber at a first side wall of the mixing chamber,

a mixing outlet channel comprising an opening into the mixing chamber at a second side wall of the mixing chamber,

wherein a vertical dimension of the mixing chamber is larger than a vertical dimension of the mixing inlet channel and is larger than a vertical dimension of the mixing outlet channel; and

wherein cascading microfluidic mixers are connected to one another in a series so that the mixing inlet channel of each of the cascading microfluidic mixers after a first microfluidic mixer in the series is connected to the mixing outlet of a prior microfluidic mixer in the series.

12. A microfluidic apparatus comprising:

a first plate and a second plate;

an elastic layer disposed between the first plate and the second plate; and

a microfluidic path between the first plate and the second plate, wherein the microfluidic path comprises:

a plurality of blending chambers each comprising a fixed volume separated by a portion of the elastic layer, wherein a portion of the elastic layer is to deflect to drive fluid between blending chambers of the plurality of blending chambers;

a first microfluidic mixer, wherein the first microfluidic mixer comprises:

a first fluidic input and a second fluidic input;

a fluidic intersection to receive fluid from the first fluidic input and the second fluidic input, wherein the fluidic intersection opens into a first mixing chamber on an upper region of a first side of the first mixing chamber, wherein the first mixing chamber has a depth that is greater than 1.5 times a depth of the fluidic intersection;

a connection channel on an upper region of a second side of the first mixing chamber, wherein the connection channel has a depth that is less than the depth of the first mixing chamber, further wherein an opening of the connection channel is offset along a width of the second side of the first mixing chamber relative to the fluidic intersection, wherein the connection channel opens into a second mixing chamber on an upper region of a first side of the second mixing chamber, further wherein the second mixing chamber has a depth that is greater than 1.5 times

a depth of the connection channel; and an output channel from the second mixing chamber on an upper region of a second side of the second mixing chamber wherein the second side of the second mixing chamber is opposite from the first side of the second mixing chamber.

13. The microfluidic apparatus of claim 12, wherein an upper surface of the fluidic intersection is substantially level with an upper surface of the first mixing chamber.

14. The microfluidic apparatus of any of claims 12 - 13, wherein an upper surface of the connection channel is configured to be level with an upper surface of the first mixing chamber and an upper surface of the second mixing chamber.