comprising: stacking a plurality of shims such that a continuous flow path is formed through the shims; wherein the flow path extends in a direction substantially parallel to shim thickness; wherein the plurality of shims comprises at least three adjacent shims through which a flow path is formed and wherein a straight, unobstructed line is present through the flow path in said at least three shims. The three shims are configured such that a unit operation can be performed on a fluid in the flow path. The shims are bonded to form a device capable of performing a unit operation on a fluid.

[0013] In another aspect, the invention provides a process of making a device from a plurality of shims, passing a fluid through said device and conducting a unit operation on the fluid. In this process, a plurality of shims are stacked such that a continuous flow path is formed through the shims. The flow path is substantially parallel to shim thickness. The plurality of shims comprises at least three shims through which a flow path is formed and wherein a straight, unobstructed line is present through the flow path in said at least three shims. The flow path in the at least three shims does not mix with any other flow paths. The shims are bonded to form a device capable of performing a unit operation on a fluid. Then a fluid passes into the device such that a fluid passes through the flow path in said at least three shims; and at least one unit operation is performed on the fluid as it passes through the flow path in said at least three shims.

[0014] The invention further provides a process of conducting a unit operation on a fluid, comprising: stacking a plurality of shims such that a continuous flow path is formed through the shims; wherein the flow path is substantially parallel to shim thickness; wherein the plurality of shims comprises at least three shims through which a flow path is formed and straight, unobstructed line is present through the flow path in said at least three shims; bonding the shims to form a device capable of performing a unit operation on a fluid; passing a fluid into the device such that the fluid passes through the flow path in said at least three shims; and performing at least one unit operation on the fluid as it passes through the flow path in the at least three shims.

[0015] The invention also provides a process of conducting a unit operation on a fluid, comprising: stacking a plurality of shims such that a continuous flow path is formed through the shims; wherein the flow path is substantially parallel to shim thickness; wherein the plurality of shims comprises at least three shims through which a flow path is formed and wherein the flow path in said at least three shims has a minimum dimension (height or width) of at least 10 μm; bonding the shims to form a device capable of performing a unit operation on a fluid; passing a fluid into the device such that the fluid passes through the flow path in said at least three shims; and performing at least one unit operation on the fluid as it passes through the flow path in the at least three shims.

[0016] In another aspect, the invention provides a process of making a device from a plurality of shims, passing a fluid through said device and conducting a unit operation on the fluid. In this process, a plurality of shims are stacked such that a continuous flow path is formed through the shims; wherein the flow path is substantially parallel to shim thickness. The shims are bonded to form a device capable of performing a unit operation on a fluid; wherein the unit operation is selected from the group consisting of distilling, reacting, adsorbing, heating, cooling, compressing, expanding, separating, absorbing, vaporizing, condensing, and combinations of these. A fluid passes into the device such that the fluid passes through the flow path in said at least three shims; and at least one unit operation is performed on the fluid as it passes through the flow path in the at least three shims.

[0017] The invention further provides, a method of making a laminated device containing a component, comprising: stacking at least four adjacent shims; wherein each of the at least four shims comprises an aperture; wherein the apertures in each of the at least four shims form a continuous flow path through each of said at least four shims; wherein the aperture in each of said at least four shims is empty or is partially blocked by a mixing projection; and wherein a straight, unobstructed line is present through the continuous flow path or through the continuous flow path and mixing projections. The at least four shims are bonded together. In related aspects, the invention also includes an apparatus made by this method. The invention further includes processes, such as mixing, that use the apparatus made by this method.

[0018] Note that an aperture could alternatively be recited as internal edges of a shim defining an aperture or as a shim that has internal borders that define an aperture.

[0019] In a further aspect, the invention provides a laminated device that includes: a first set of microchannels wherein each microchannel has an inlet and an outlet, a header connected to the inlets of the first set of microchannels; a footer connected to the outlets of the first set of microchannels. The device includes a header or footer structure, in which the header has a surface that curves toward at least a portion of the inlets of the first set of microchannels, and/or the footer has a surface that curves toward at least a portion of the outlets of the first set of microchannels, and/or the footer comprises a roof, located on a side of the footer opposite the side that is connected to the outlets of the first set of microchannels, and the roof is sloped relative to the outlets of the first set of microchannels.

[0020] The invention also provides apparatus for vaporizing water that includes: an inlet leading to a first set of microchannels for a liquid to flow into; a second set of microchannels for a fluid to flow through; wherein the first set of microchannels is adjacent to the second set of microchannels; and wherein the vaporizer possesses a performance characteristic. For example, the vaporizer can have a characteristic such that, when tested with 1.5 ppm total dissolved solids (TDS) water of which the total solids comprises at least 7% Ca, 15% Mg and 2% Si is passed through the first set of microchannels at 280 psig, a 210° C. inlet temperature, and a flowrate of 20 mL/min and a flow air of air at 8 psig, 279 C and a flowrate of 247 SLPM, over 40% of the water boils with a pressure drop rise of less than 5 psig through the first set of microchannels after 1000 hours of operation. Alternatively, or additionally, the apparatus could be characterized by low pressure drop such that, when tested by flowing air at 247 SLPM and 279° C. through the second set of microchannels and water at 20 mL/min and 280 psig through the first set of microchannels, pressure drop through the first set of microchannels is 5 psig or less. Preferably, the microchannels are at least 1 cm (in some embodiments at least 5 cm) long. In apparatus and methods