wherein the first set of microchannels is adjacent to the second set of microchannels; and

wherein the vaporizer possesses a performance characteristic such that, when tested by flowing air at 247 SLPM and 279° C. as a heat transfer fluid and water at 20 mL/min and 280 psig, pressure drop through the device for the partially boiling water increases by less than 5 psig.

48. A laminated device capable of operating with fluids of different pressures, comprising:

at least one microchannel; and

at least one other chamber;

wherein the at least one microchannel is adjacent to the at least one chamber; and wherein the at least microchannel and the at least one chamber are separated by a wall having a thickness of 5 mm or less;

wherein the laminated device is characterized by a pressure resistance such that a first fluid stream 279 C and 8 psig is passed through the at least one microchannel, and a second fluid stream at 210 C and 280 psig is passed through the at least one other chamber for 1000 hours during which there are 10 thermal cycles to ambient temperature of the entire device; and wherein after 1000 hours operation, each fluid flow path is pressurized to 50 psig and held for 2 hours; and wherein the pressure remains substantially constant as measured by a leak rate of less than 10^{-6} standard cubic centimeters per second of helium to the environment; and further wherein the at least one other chamber is pressurized to 50 psig, leaving the at least one microchannel open to atmosphere, and held for 2 hours; and wherein the pressure in the at least one other chamber remains constant as measured by a leak rate of less than 10^{-6} standard cubic centimeters per second of helium indicating minimal internal leak paths.

49. A method of conducting a process with a two phase mixture in a microchannel device, comprising:

passing a fluid into the device of claim 47.

50. A method of vaporizing water comprising the steps of:

passing a liquid into the first set of microchannels in the apparatus of claim 52; and

simultaneously, passing a fluid into the second set of microchannels in the apparatus of claim 52;

wherein the fluid is at a temperature sufficient to vaporize at least a portion of the liquid.

51. The method of claim 50 wherein the liquid and the fluid flow in opposite directions.

52. Apparatus for vaporizing water comprising:

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 such that, when tested with 1.5 ppm 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.

53. The apparatus of claim 52 wherein the vaporizer possesses a performance characteristic such that, when tested with 1.5 ppm 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 5000 hours of operation.

54. The vaporizer of claim 52 comprising at least two sets of microchannels for a liquid to flow into;

and further comprising at least two sets of microchannels for a fluid to flow through;

wherein each set of microchannels is arranged in a row; and

wherein the sets of microchannels for a liquid to flow into and the sets of microchannels for a fluid to flow through are arranged in alternating rows.

55. The vaporizer of claim 54 wherein each row comprises at least three microchannels.

56. A laminated device capable of transferring heat to or from a fluid passage within the device, comprising:

a stack of shims that have been bonded together;

wherein the stack of shims comprises a first component having dimensions of height, width and thickness;

wherein at least a portion of the height of the first component is greater than 1 μm, at least a portion of the width of the first component is greater than 1 μm, and at least a portion of the thickness of the first component is greater than 1 μm; wherein height, width and thickness are mutually perpendicular;

wherein the stack of shims comprises a second component having dimensions of height, width and thickness;

wherein at least a portion of the height of the second component is greater than 1 μm, at least a portion of the width of the second component is greater than 1 μm, and at least a portion of the thickness of the second component is greater than 1 μm and wherein at least a portion of at least one of the height, width or thickness of the second component is less than 2 mm; wherein the directions of height, width and thickness are the same directions as the first component;

wherein the stack comprises shims, wherein at least 3 adjacent shims contain at least one aperture within each shim, the apertures being defined by borders within each shim, and the second component is within or is formed by the at least one aperture in each of said at least 3 adjacent shims; and

wherein the second component conforms to the first component in the directions of height, width and thickness.