[0018] FIG. 12 illustrates an insertable fin assembly that can be used in making a plurality of adjacent process microchannel of the type illustrated in FIG. 1.

[0019] FIGS. 13 and 14 are graphs disclosing results obtained in Example 1.

DETAILED DESCRIPTION OF THE INVENTION

[0020] The term "microchannel" refers to a channel having at least one internal dimension of height or width of up to about 10 millimeters (mm), and in one embodiment up to about 5 mm, and in one embodiment up to about 2 mm, and in one embodiment up to about 1 mm. In one embodiment, the height or width is in the range of about 0.05 to about 10 mm, and in one embodiment about 0.05 to about 5 mm, and in one embodiment about 0.05 to about 2 mm, and in one embodiment about 0.05 to about 1.5 mm, and in one embodiment about 0.05 to about 1 mm, and in one embodiment about 0.05 to about 0.75 mm, and in one embodiment about 0.05 to about 0.5 mm. Both height and width are perpendicular to the direction of flow through the microchannel.

[0021] The term "adjacent" when referring to the position of one channel relative to the position of another channel means directly adjacent such that a wall separates the two channels. This wall may vary in thickness. However, "adjacent" channels are not separated by an intervening fluid-containing channel that would interfere with heat transfer between the channels.

[0022] The term "fluid" refers to a gas, a liquid, or a gas or a liquid containing dispersed solids, or a mixture thereof. The fluid may be in the form of a gas containing dispersed liquid droplets.

[0023] The term "contact time" refers to the volume of the reaction zone within the microchannel reactor divided by the volumetric feed flow rate of the reactant composition at a temperature of 0° C. and a pressure of one atmosphere.

[0024] The term "residence time" refers to the internal volume of a space (e.g., the reaction zone within a microchannel reactor) occupied by a fluid flowing through the space divided by the average volumetric flowrate for the fluid flowing through the space at the temperature and pressure being used.

[0025] The term "reaction zone" refers to the space within the microchannel reactor wherein the reactants contact the catalyst.

[0026] The term "conversion of hydrocarbon reactant" refers to the hydrocarbon reactant mole change between the reactant composition and the product divided by the moles of the hydrocarbon reactant in the reactant composition.

[0027] The term "selectivity to desired product" refers to the moles of the desired oxygenate or nitrile produced divided by the moles of the desired oxygenate or nitrile produced plus moles of other products (e.g., CO, CO_2) produced multiplied by their respective stoichiometric factors. For example, for the oxidation of ethylene to ethylene oxide with carbon dioxide as an unwanted side product, the production of one mole of ethylene oxide and one mole of carbon dioxide would correspond to a selectivity of $100\times(1/(1+½))=67\%$.

[0028] The invention will describe initially with respect to FIG. 1. Referring to FIG. 1, the inventive apparatus 100 comprises a process microchannel 110, a fin assembly 141 comprising a plurality of parallel spaced fins 140 positioned within the process microchannel 110, and a heat exchanger 170 positioned adjacent to the process microchannel.

[0029] The process microchannel 110 has a height indicated in FIG. 1 by the vertical line extending from point 112 to point 114, a width indicated by the horizontal line extending from point 114 to 116, and a length indicated by the line extending from point 114 to 118. The process microchannel 110 has a base wall 120, and an upper wall 122 that is parallel to an opposite base wall 120. The process microchannel also has vertical walls 124 and 126 which connect walls 120 and 122.

[0030] The fins 140 are mounted on fin support 142 which overlies base wall 120. The fins 140 project from the fin support 142 into the interior of the process microchannel 110. The fins 140 extend to and contact the interior surface of upper wall 122. The fin channels 144 between the fins 140 provide passage ways for fluid to flow through the process microchannel 110 parallel to its length, as indicated by directional arrows 146. Each of the fins 140 has an exterior surface 148 on each of its sides, this exterior surface provides a support base for a catalyst or sorption medium. With a catalytic reaction, one or more fluid reactants flow through the fin channels 144 in the direction indicated by directional arrows 146, contact the catalyst supported on the exterior surface 148 of the fins 140, and react to form a product. With a fluid separation process, a fluid flows through the fin channels 144 in the direction indicated by directional arrows 146, contacts the sorption medium supported on the exterior surface 148 of the fins 140, and one or more components of the fluid are sorbed by the sorption medium.

[0031] Each of the fins 140 may have a height ranging from about 0.02 mm up to the height of the process microchannel 110, and in one embodiment from about 0.02 to about 10 mm, and in one embodiment from about 0.02 to about 5 mm, and in one embodiment from about 0.02 to about 2 mm. The width of each fin may range from about 0.02 to about 5 mm, and in one embodiment from about 0.02 to about 2 mm and in one embodiment about 0.02 to about 1 mm. The length of each fin may be of any length up to the length of the process microchannel 110, and in one embodiment from about 5 mm to about 500 cm, and in one embodiment about 1 cm to about 250 cm, and in one embodiment about 1 cm to about 100 cm, and in one embodiment about 2 cm to about 25 cm. The gap between each of the fins 140 may be of any value and may range from about 0.02 to about 5 mm, and in one embodiment from about 0.02 to about 2 mm, and in one embodiment from about 0.02 to about 1 mm. The number of fins 140 in the process microchannel 110 may range from about 1 to about 50 fins per centimeter of width of the process microchannel 110, and in one embodiment from about 1 to about 30 fins per centimeter, and in one embodiment from about 1 to about 10 fins per centimeter, and in one embodiment from about 1 to about 5 fins per centimeter, and in one embodiment from about 1 to about 3 fins per centimeter. Each of the fins may have a cross-section in the form of a rectangle or square as illustrated in FIGS. 1-5, or a trapezoid as illustrated in FIGS. 6 and 12. When viewed along its length,