comprising a fine channel provided with at least two inlet ports for feeding fluid, inlet channels communicated with the inlet ports, a confluent portion communicated with the inlet channels, a branch portion communicated with the fine channel, from which at least two outlet channels are branched to feed predetermined amounts of fluid, and outlet ports communicated with the outlet channels, the fine channel device being characterized in that the fine channel is provided with a plurality of partition walls arranged along a boundary formed by at least two kinds of fluid fed from the inlet ports so as not to cause mutual contamination of fluid wherein said plurality of partition walls are arranged with intervals in a flowing direction of fluid. Such structure can-avoid mutual contamination of said at least two kinds of fluid by the presence of partition walls and assures an effective mixing or chemical reaction of fluid, solvent extraction, separation and so on due to the effect of diffusion of molecules between adjacent flows of fluid.

[0042] The purpose of forming the partition walls is to prevent the mutual contamination of adjacent flows of fluid in the fine channel. Accordingly, the height of each partition wall can be substantially equal to the depth of the fine channel or can be a height to such extent that a kind of fluid does not run over the partition wall to mix with the other kind of fluid. Specifically, it is preferable that the height of the partition wall is the same as the depth of the fine channel.

[0043] The fine channel device having the above-mentioned structure can suppress the positional variation of the fluid boundary due to a change of the flow rate caused by a fluid supply pump and can prevent the wraparound phenomenon of fluid due to a difference of affinity between the inner wall of the fine channel and the supplied fluid. Further, the fine channel device can discharge plural kinds of fluid through predetermined outlet ports of the fine channel without causing the mixing of fluid.

[0044] In drawings:

[0045] **FIG. 1** is a diagram showing laminar flows in a Y-letter like fine channel;

[0046] **FIG. 2** is a diagram showing laminar flows in a double Y-letter like fine channel, which is referred to in Comparative Examples 2 and 3;

[0047] FIGS. **3**(*a*), **3**(*b*) and **3**(*c*) are diagrams showing how the position of the fluid boundary varies;

[0048] FIGS. **4**(*a*) and **4**(*b*) are diagrams for explaining Hagen-Poiseuille formula;

[0049] **FIG. 5**(*a*) is a diagram showing the inner structure of fine channel used in Comparative Example 1 and **FIG. 5**(*b*) shows the structure of the fine channel device used for Comparative Example 1;

[0050] **FIG. 6**(*a*) is a diagram showing the inner structure of fine channel used for Examples 1, 2, 3, 5 and 6, and **FIG. 6**(*b*) shows the structure of the fine channel device used for Examples 1, 2, 3, 4, 5 and 6;

[0051] **FIG. 7** is a schematic plan view showing the shape of a partition wall formed in a curved portion of fine channel according to the present invention;

[0052] **FIG. 8** shows schematic plan views of partition walls formed in vicinities of the confluent portion and the branch portion of the fine channel according to several embodiments of the present invention wherein **FIG. 8**(*a*) shows a case that partition walls are formed apart from the confluent portion and the branch portion of the fine channel; **FIG. 8**(*b*) shows a case that the partition wall formed closest to the branch portion of the fine channel is connected to the branch portion; **FIG. 8**(*c*) shows a case that the partition wall formed closest to the confluent portion of the fine channel is connected to the confluent portion and the partition wall formed closest to the branch portion of the fine channel is connected to the branch portion, and **FIG. 8**(*d*) shows a case that partition walls in vicinities of the confluent portion and the branch portion of the fine channel are respectively connected continuously in a following direction of fluid;

[0053] **FIG. 9** is a diagram showing a case that directions of two kinds of fluid flowing adjacently in the fine channel are opposite to each other;

[0054] FIGS. **10(1)-10(5)** is a schematic flow diagram showing how a thin film of inorganic material is formed between adjacent partition walls in a flow direction of fluid in the fine channel device of the present invention;

[0055] **FIG. 11** show diagrams of fine channels formed in the fine channel device of the present invention in cases that a metallic film is disposed in the fine channel, an upper portion of **FIG. 11** being a diagram viewed from an upper portion;

[0056] FIGS. **12**(*a*) to **12**(*d*) are diagrams showing several embodiments of projections formed in the fine channel of the present invention, the projections being to stir fluid while the fluid boundary is maintained;

[0057] **FIG. 13** are diagrams showing means for supplying, discharging and recovering fluid by using the fine channel of the present invention wherein **FIG. 13**(*a*) is a diagram showing means for supplying fluid by a liquid supply pump located at the outside of the fine channel device and **FIG. 13**(*b*) is a diagram showing means for supplying fluid by a micropump embedded in the fine channel device;

[0058] **FIG. 14** is a diagram showing an example of reaction system using a phase transfer catalyst;

[0059] **FIG. 15** is a diagram showing a concept of reaction system using a temperature dependence phase transfer catalyst;

[0060] **FIG. 16** is a diagram showing a reaction system using a temperature dependence phase transfer catalyst;

[0061] **FIG. 17** is a diagram showing a concept of the fine channel device used for the temperature dependence phase transfer catalyst;

[0062] **FIG. 18** is a diagram showing the fine channel device adapted to irradiate light to a portion of the fine channel formed in the fine channel device to supply energy thereto;

[0063] FIGS. **19**(*a*) to **19**(*d*) are diagrams showing several examples for chemical operations by forming laminar flows of fluid containing a catalyst and fluid containing a substrate in a fine channel formed in the fine channel device of the present invention;

[0064] **FIG. 20** is a diagram showing an example in which fine particles are mixed in fluid flowing in one side of the fine channel according to the present invention;