A Passive Micro-Mixer for Use With Micro-Fluidic Sensors in Medical, Pharmaceutical and Chemical Applications

The invention provides the means, materials and methods for creating an in-line passive micro-mixer to be combined with a micro-fluidic sensor. This device makes use of variations in side-wall shapes to alter the flow rates of miscible liquids. These side-wall shapes are comprised of polymer resins cast from a silicon wafer mold.

The field of micro-fluidics is growing rapidly, with lucrative commercial applications in pharmaceuticals, medical diagnostics and chemistry. A primary manifestation of micro-fluidics is miniaturized devices such as lab-on-a-chip (LOC) sensors. These robust sensors detect a variety of parameters in a minimal sample volume. When multiple samples are combined, mixing in a micro-scale is often crucial to the effective functioning of micro-fluidic devices. Quick, efficient mixing is especially important for the operation of LOC bio-analytical systems. The ideal solution to this problem would be mixing of the solutions/analytes within the micro-fluidic sensor. Currently, two main technologies exist for solving this problem: active mixers and passive mixers. The active micro-mixer requires external power sources and control circuitry which increase both costs and complexity of the device. Whereas, the passive micro-mixers have very complicated shapes that are hard to fabricate and require costly molds that are difficult to manufacture.

Technical Details

UCF scientists have developed a micro-mixer that fits within a micro-fluidic (lab-on-a-chip) sensor. This device is a passive micro-mixer (requires no power source or external energy) that is in-line with the flow of samples into and out of the micro-fluidic sensor. The device mixes solutions/analytes by changing the flow rates within the sensor through variations in the shape of the side-walls. The inexpensive manufacture of these devices is done with photolithography techniques on silicon wafers to create a mold. The actual micro-mixer itself is composed of inert polymer resins. This micro-mixer is easily combined with micro-fluidic sensors to create an inexpensive disposable diagnostic cartridge for detecting a variety of parameters in solution.

Benefits

- Passive micro-mixer
- Inexpensive, easy fabrication
- Combines easily with micro-fluidic sensors

Applications

- Pharmaceutical
- Medical diagnostics
- Combinational chemistry

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