Lab-on-a-Chip Devices for Obtaining Chemical Information

Stephen C. Jacobson, Christopher T. Culbertson, Maxine A. McClain, B. Scott Broyles, Jean Pierre Alarie, and J. Michael Ramsey

Oak Ridge National Laboratory, Oak Ridge, Tennessee 37831-6142, USA

In the area of chemical analysis, faster and cheaper analytical tools are widely sought. These devices should also generate information that is as reliable and accurate as standard laboratory techniques. For liquid phase analysis, microfabricated fluidic devices (microchips) have the potential to provide these advantages. Because microfabrication techniques are used, these devices are intrinsically compact and may soon be inexpensive. In addition, the ability to fabricate elaborate channel manifolds enables multiple chemical processing and analysis steps to be combined both serially and in parallel. These interconnecting channels have essentially no dead volume which contributes to the high performance of these microchips. To execute a complete assay, functional elements including filters, valves, pumps, mixers, reactors, separators, cytometers, and detectors can be easily coupled together and operated under computer control. We are developing microchips to perform various chemical and biochemical assays, and the design, fabrication, and testing of devices for cell assays and high performance separations will be discussed.

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