

Microfluidic Devices for Rapid Chemical Measurements

Christopher T. Culbertson

Oak Ridge National Laboratory, P.O. Box 2008, Oak Ridge, TN 37831-6142

email: culbertsonc@ornl.gov fax: 865-574-8363

Advances in sensor technology can further improve the quality of life in the 21st century. This is especially true in the area of chemical analyses where smaller, faster and cheaper devices and more reliable and accurate results would have profound consequences in fields such as medical diagnostics, environmental science, and forensic analysis. The development of microfabricated fluidic devices (microchips) over the last decade have the potential to provide such advances as they are compact and many chemical processing and analysis steps can be combined either serially or in parallel onto them. It is this ability to combine sample processing and analysis steps onto a single monolithic structure that has given rise to the Lab-on-a-chip concept. Already microchips have been successfully demonstrated for a variety of electrically driven electrophoretic and chromatographic separation techniques and for other functional elements such as valves, mixers, diluters, and concentrators.¹⁻¹² Several of these functional elements now have been integrated onto monolithic devices with various separation techniques to provide chemical processing of an analyte sample either before or after the separation step. In addition, cell lysis, PCR amplification, and microchip gel electrophoresis have been combined for genetic analysis. The design, fabrication, and testing of several of these devices will be presented.

Research sponsored by National Center for Research Resources, National Institutes of Health. Oak Ridge National Laboratory is managed and operated by UT-Battelle, LLC, under contract DE-AC05-00OR22725 with the U.S. Department of Energy.

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