Lab-on-a-Chip: Microscale Chemistry and Analysis

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Miniaturization of electronic devices has resulted in the ability to process larger quantities of coded information more rapidly at a lower cost. Similar multiple benefits are being demonstrated in micro- and nanofabricated fluidic devices, or "lab-on-a-chip" technology. These devices are manufactured using micromachining, a technique that evolved from the microelectronics industry, to form conduits at the micrometer to nanometer scale. Although most microfluidics activities, to date, have been focused on assays, similar benefits may be derived from performing chemical synthesis in domains of reduced size. A broad array of capabilities has been demonstrated at the micron scale for chemical and biochemical measurements such as DNA, RNA, peptide, and protein separations. Moreover, integrated devices performing multiple serial steps of an assay, chemical conversions, isolation of targets and quantification, have been reported. Such experiments have been performed at volume scales that are more than 10,000 times smaller than conventional experiments while providing information 100 times faster. The technology may be applied to such diverse problems as drug discovery, clinical diagnostics, environmental monitoring, and forensics. On overview of Lab-on-a-Chip technology will be given and perspectives on the future provided.

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