

# Lab-on-a-Chip Technology (Vol. 1) Fabrication and Microfluidics



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Lab-on-a-chip (LOC) devices integrate and scale down laboratory functions and processes to a miniaturized chip format. Many LOC devices are used in a wide array of biomedical and other analytical applications including rapid pathogen detection, clinical diagnosis, forensic science, electrophoresis, flow cytometry, blood chemistry analysis, protein and DNA analysis. LOC devices can be fabricated from many types of material including various polymers, glass, or silicon, or combinations of these materials. A broad variety of fabrication technologies are used for LOC device fabrication. LOC systems have several common features including microfluidics and sensing capabilities. Microfluidics deals with fluid flow in tiny channels using flow control devices (e.g. channels, pumps, mixers and valves). Sensing capabilities, usually optical or electrochemical sensors, can also be integrated into the chip.

This invaluable book describes the latest methods and novel technologies being developed for the fabrication of LOC devices and new approaches for fluid control and manipulation. Expert authors from around the world describe and discuss the newest technologies for the prototyping of devices, including replication and direct machining methods of fabrication. Part I of the book covers all aspects of fabrication including laser micromachining, silicon and glass micromachining, PMMA and COC microfluidic substrates, and xurography (LOC prototyping with a cutting plotter). Part II focuses on fluid control and manipulation for LOC systems. As well as providing examples of the use of pumps in microfluidics, topics covered include electrokinetic pumping (electroosmosis), electrochemical pumping and electrowetting, and the fabrication of a microchip for rapid polymerase chain reaction (PCR).

This comprehensive volume presents the current technologies in the field and includes theoretical and technical information to enable both the understanding of the technology and the reproduction of experiments. The book aims to help the reader to understand current LOC technologies, to perform similar experiments, to design new LOC systems and to develop new methodologies and applications. An essential book for biologists and clinicians using LOC technology and developing applications and also for engineering, chemical and physical science researchers developing analytical technologies. The book will also be useful as a teaching tool for bioengineering, biomedical engineering and biology.

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