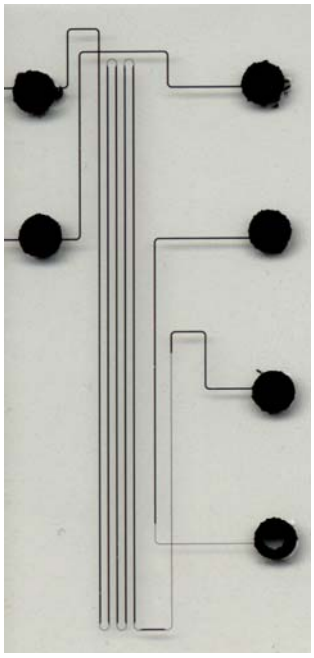
OAK RIDGE NATIONAL LABORATORY
MANAGED BY UT-BATTELLE FOR THE DEPARTMENT OF ENERGY
FACT SHEET

# Microfluidic Devices (Lab-on-a-Chip)

## Technical Concept

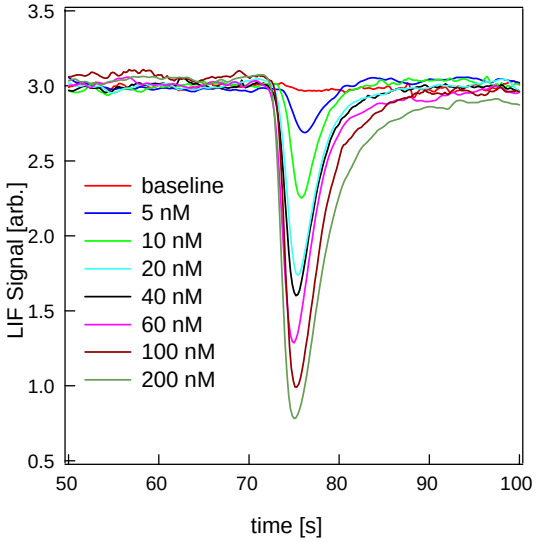


*Microfluidic device for two-dimensional liquid phase separations of BW and CW agents. The microchip is 2"x 1"and the narrow channels are 75 μm wide and 10 μm deep. The microchannels and fluid reservoirs are filled with black ink for contrast.*

Over the past decade at ORNL, we having been exploring both fundamental issues and applications of microfluidic devices for chemical and biochemical analysis, i.e., lab-on-a-chip technologies. Interest in microfabricated instrumentation for chemical sensing and analysis has grown considerably primarily because these miniature instruments have the potential to provide information rapidly and reliably at low cost. We have taken the approach of developing functional elements including filters, valves, pumps, mixers, reactors, separators, cytometers, and detectors, and coupling these elements together to perform a complete assay under computer control. These devices can be applied to a variety of scenarios related to monitoring liquid-borne CW, BW, and nuclear targets. Also, the instruments can be battery operated and hand portable and used for in-situ remote monitoring and field applications. In almost all cases investigated, these miniature instruments have shown performance either equivalent to or better than conventional laboratory devices and appear to offer the rare combination of better-faster-cheaper simultaneously.

## Highlights

- Glass, quartz, and polymeric microchips
- Rapid and high performance chromatographic and electrophoretic separations
- DNA, protein, and peptide assays
- Flow cytometry of single particles and cells
- Chemical and biochemical reactions and analysis
- Electrospray interface for mass spectrometer




*Data from integrated microfluidic device for monitoring water-borne nerve agents with 1 ppb limit of detection.*

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