# Microfluidic Platforms for Miniaturization, Integration, Automation and Parallelization of Tests on Commercially Available Instruments

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Microfluidics is an enabling technology for miniaturization, integration, automation and/or parallelization of tests in diagnostics, drug development or biology research. During the last decade several products were enabled by microfluidics and introduced into the market, but in general the current market penetration and user acceptance especially in the field of diagnostics is less than expected.

Assay miniaturization requires the sequential combination of many different microfluidic unit operations such as reagent storage and release, extraction of certain molecular species from complex samples, metering, mixing, incubation, enrichment and/or amplification and detection. Those microfluidic operations have to be combined ideally in a seamless monolithic manner on a low-cost substrate. Although all of those unit operations have been demonstrated in the past, until now the development of fully integrated tests in a sample-in/result-out manner is seldom realized and bears high development risks. In addition, suitable instrumentation for the processing and read-out of the microfluidic chips has to be developed. The end-user will only benefit from microfluidics research if the processing instruments are available on the market. This results in additional investments for both the developer and user. The required high initial investments in instruments can impede a fast market penetration.

This analysis stimulated us to focus on centrifugal microfluidics as the microfluidic platform. On the one hand it enables an easy way to implement a wide range of different assays and on the other hand the lab-on-a-chip cartridges can be processed on commercially available instruments, like lab-centrifuges, real-time-PCR cyclers, or DVD drives. The microfluidic cartridges are made from thin polymer films in a micro-blister technology derived from the low-cost technology for the packaging of pills. We demonstrate the implementation of a wide range of different applications ranging from DNA extraction to genotyping of antibiotic resistant bacteria as an upgrade for existing or minimally modified lab equipment.