FLAT FLUIDICS: PROGRAMMABLE ON-CHIP NETWORKS FOR BIOLOGICAL AND CHEMICAL APPLICATIONS

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We present a novel approach towards the needs of a versatile microfluidic chip based microfluidic system with unique properties and functionality. Like for microarrays and in contrast to many existing microfluidic technologies, the fluid handling is performed on the flat surface of a programmable chip, where fluidic tracks and functional blocks such as valves, dispensers, mixers, and sensing elements are chemically defined using standard lithographic techniques. The actuation of the fluid, the driving and adressing of the functional elements as well as possible sensors are based on electrically excited mechanical acoustic waves, which propagate along the surface of a chip. The combination of such fluidic networks and our unique pumping technology results in fully programmable microfluidic processor chips. The whole system has no moving parts, and is easily fabricated employing standard semiconductor technologies. Moreover, due to the planar nature of the chip all functional blocks are readily accessible from the outside, e.g., by pipettes or spotting robots. This unique feature makes our programmable fluidic processors frilly compatible to existing laboratory environments and most any chemical and biological processes and assays.
Typical areas for the application of this novel technology are the hybridization of DNA or proteomic microarrays, where the ability of our surface acoustic wave technology to efficiently mix smallest amounts of fluid is of vital importance.

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