Abstract:

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The microfluidic toolbox – merging lab-on-a-chip technologies with lab automation

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Despite the widely accepted advantages of microfluidic systems, the commercial success in this field has been developing slower than expected. One of the reasons for this delay can be found in the insular nature of many microfluidic systems which do not interface well with existing equipment or laboratory automation systems. In enabling this interface, the benefits of both technologies, namely the short process time and low reagent consumption of microfluidic systems and the high throughput and unsupervised operation of laboratory robotic systems can be combined. In this paper, we present strategies to interface microfluidic chips with existing equipment and introduce three microfluidic platforms as examples. One of the basic principles is the adoption of existing geometrical (semi-)standards for the microfluidic device, namely the SBS titerplate format and the microscopy slide and the CD format. Fluidic interfaces are placed according to the spacing of wells in a titerplate and can consist of a variety of ports, starting with open wells, where on a hydrophilic substrate the surface forces allow for a self-filling of the microfluidic structure. Alternatively for medical or diagnostic applications, Luer compatible fittings can be integrated in the device or simple olives for silicone tubings or Nanoports for high-pressure applications. Injection molding as a fabrication method allows fabrication of these fluidic interconnects in the same step as the microfluidic structure. We will present examples of a titerplate format microfluidic system for cell-based experiments as well as microscopy slide format devices for molecular diagnostics including PCR and sample prep steps.