A World-to-Chip Interface for Digital Microfluidics,

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Abstract:

Digital microfluidics (DMF) is a fluid handling technique that enables manipulation of discrete droplets on an array of electrodes. There is considerable enthusiasm for this method because of the potential for array-based screening applications. A limitation for DMF is nonspecific adsorption of reagents to device surfaces. If a given device is used to actuate multiple reagents, this phenomenon can cause undesirable cross-contamination. A second limitation for DMF (and all other microfluidic systems) is the "world-to-chip" interface; it is notoriously difficult to deliver reagents and samples to such systems without compromising the oft-hyped advantages of rapid analyses and reduced reagent consumption. We introduce a new strategy for digital microfluidics, in which a removable plastic "skin" is used to (a) eliminate cross-contamination and (b) bridge the world-to-chip interface. We demonstrated the utility of this format by implementing on-chip protein digestion on immobilized enzyme depots. This new method has the potential to transform DMF from being a curiosity for aficionados into a technology that is useful for biochemical applications at large.

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