

BLISTER TECHNIQUES

FOR ON-CARTRIDGE REAGENT STORAGE

ABSTRACT

Blister packaging techniques have existed in the pharmaceutical industry for some time, and are beginning to be used in point-of-care diagnostics. Blister packs can store reagents, buffers or other solutions directly on the microfluidic cartridge. This on-cartridge liquid storage can enable point-of-care microfluidic systems, for example where ease of use or long-term storage are considerations.

The advantages of blister-on-a-chip storage include limiting gas exchange with stored solutions, reagent waste and cost reduction, ability for instrument or user actuation, and the containment of biological materials within the disposable diagnostic system. The incorporation of reagents in blisters (instead of bulk or other on-cartridge methods) enables simple manufacturing automation and scale-up resulting in a significant reduction of cartridge complexity and costs.

Technical challenges in implementing blisters include blister design to fit cartridge and reagent volume specification, air-free blister filling, reproducible blister rupture, controlled reagent release (volume and rate), and bubble free reagent delivery.

MiniFAB will provide an overview of design and manufacturing techniques relevant to optimising blisters for different applications. Examples include cold or thermo-forming blisters enabling a wider material selection and optimisation of sealing to cartridges, flexible design for instrument or manual actuation, adaptation of blisters to different geometries, and optimisation of blister wall thickness and flexibility.

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CONCEPTS & PLANNING

- 1 Determination of size, shape and volume requirements
- 2 Selection of appropriate barrier materials
- 3 CAD design of blisters and blister tooling
- 4 System integration considerations and DFM
- 5 Actuation methods

PROTOTYPE BLISTER FORMING/FILLING/SEALING

- 1 Cold- and thermoforming possible
- 2 Semi-automated filling of reagents into blisters
- 3 Various sealing strategies employed
- 4 Standard tool set (50µl-600µl) for rapid turnaround
- 5 Easily customised tooling to meet project specific requirements
- 6 Extensive material library available at MiniFAB

REPRODUCIBLE FABRICATION

- 1 Low to medium volume production on prototyping instrument
- 2 Functional testing without excessive CAPEX
- 3 Early reagent compatibility and stability studies
- 4 Colour-coded thermoformed blisters for "simple" diagnostic devices

INTEGRATED BLISTERS

- 1 Simple application of blisters to diagnostic cartridge body
- 2 Controlled rupture and bubble free release of reagent
- 3 Simplified assay automation and cartridge / instrument interfaces

