



- 1 *Micro-injection chips fabricated by using semiconductor technology. 4"-wafer containing 180 chips.*
- 2 *Single injection chip.*
- 3 *SEM-image of the on-chip micro needle.*

## MICRO-INJECTION CHIP

### State of the art

Commercially available cell injection systems consist of a micro needle, a pump and a tubing connecting these both components. This macroscopic setup is suboptimal for injecting substances into cells which are in the micrometre range. In particular it is difficult to dose typical volumes of 0.1 - 0.3 pl in a reproducible manner. Due to this difficulty many cells burst during the injection procedure.

### Our Innovation

At Fraunhofer IBMT a new micro-injection chip for cell injections has been developed. The IBMT chip monolithically integrates a micro needle, a thermo pneumatic micro pump connected to this needle, and a sensor. The dimensions of the chip are 2.2 x 2.2 x 1 mm<sup>3</sup>. The micro needle as well as the area around the micro needle are made of translucent materials (silicon dioxide, glass). Filling of the chip is done by

simply dipping the needle into the fluid to be injected.

In contrast to commercially available injection systems the size of connecting tube and pump of the IBMT chip is adapted to the volume to be injected. Once filled, the chip can be used to perform several hundreds of injections. The injection volume can be adjusted and controlled very precisely.

The injection chip can be easily used in combination with a micro robot. When using such a combination performing micro-injections requires much less dexterity than with state of the art injection systems.

Semiconductor technology is used for chip fabrication. This allows batch fabrication which leads to low prices per chip which are in the range of several Euros.

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