

Intracellular contacting

Hollow nanoneedles for biomedical applications

Precision at the nanoscale – combining fluidics and electronics for the next generation of biomedical tools

The highly scalable hollow nanoneedle platform paves the way for advanced biomedical applications by enabling direct interaction with living cells. Designed for intracellular delivery, electrical recording, stimulation, and sensing, these devices combine fluidic and electrical functionalities within a post-CMOS-compatible, wafer-based MEMS process.

Their adaptable design and large-scale manufacturability make them a powerful foundation for innovative research in drug development, screening, and cellular analysis.

Technology

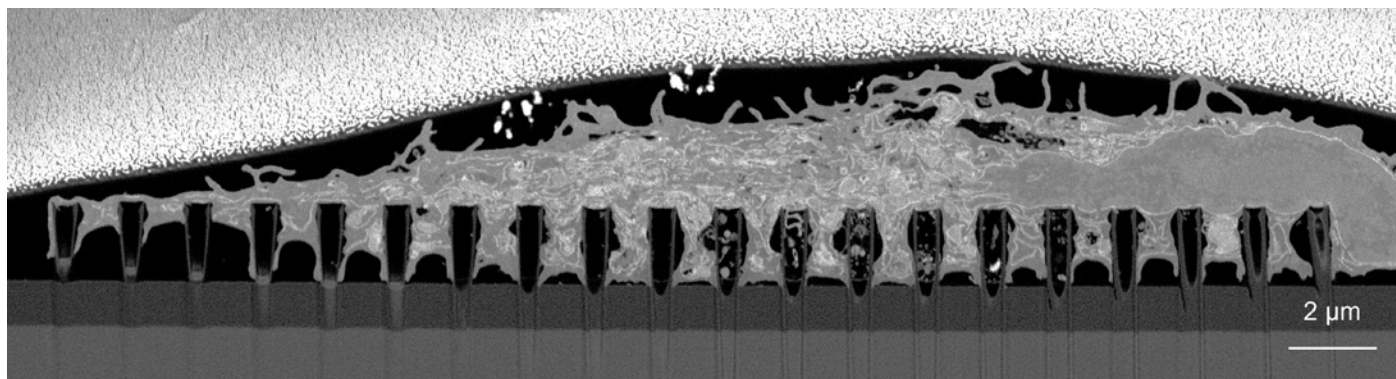
- Scalable and post-CMOS-compatible hollow nanoneedles with backside fluidic connection for intracellular drug delivery and electrical recording

Customer Benefits

- Geometry/arrangement of nanoneedles and fluidic connection easily adaptable
- High-volume production through wafer-based MEMS manufacturing

System Advantages

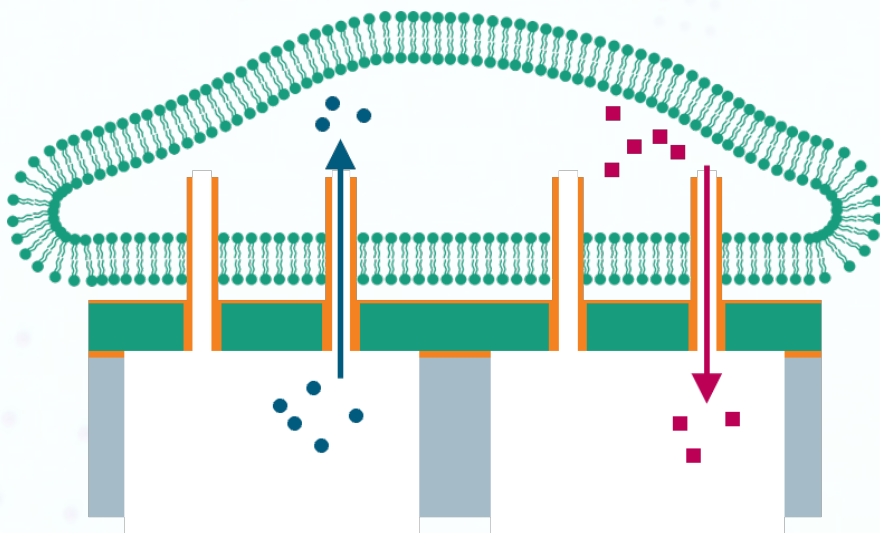
- Post-CMOS compatibility
- Monolithic integration of electrical and fluidic functionalities
- High scalability



Cross-sectional scanning electron micrograph of an immune cell interfaced by a nanoneedle array. The central needles are filled with cell contents extracted from the cytosol. © Fraunhofer IMS

Application Fields

- Precise intracellular delivery for transfection, drug development or screening, etc.
- Recording of intracellular electrical signals across a cell network
- Extraction from the cytosol, electrical stimulation, biochemical sensing
- Combinations of the above using a single device



How the hollow nanoneedle platform works. © Fraunhofer IMS

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