



Fraunhofer
IMS

Fraunhofer Institute for Micro-
electronic Circuits and Systems IMS

Monolithically integrated in one device

Highly scalable micro-
and nanofluidic devices
on CMOS for biomedical
applications





Business Unit Industry and Health

Industry: Production without downtime, emissions and cyber incidents

Smart industrial applications for industry control systems and monitoring in tough work environments to predict further work steps and make intelligent decisions.

Health: Affordable health through intelligent medicine

Highly-sensitive, smart medical sensors for care, hospitals and at home to improve prevention, diagnostics and therapy.

Fraunhofer IMS

Smart Sensor Systems for a safe, secure, and future

As a trusted research and development partner for industry, our goal is to develop customized sensor systems for your specific needs in the areas of biomedical sensors, optical systems, open source semiconductors, embedded AI, technology services, and even quantum technology.

The teams in the four business units – **Health, Industry, Mobility, and Space and Security** – are committed to implementing outstanding and versatile microelectronics that can be utilized across all your projects. For example, these solutions feature high integration capability, enormous energy efficiency, and reliable functionality even under harsh conditions.

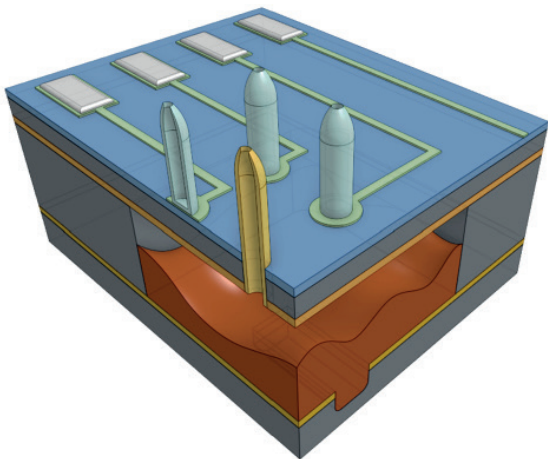
Membranes for microfluidic

Biomedical applications:

- Blood cell filtration
- Model of vascular walls, and blood-brain barrier
- Pathogen detection
- Drug delivery
- Cell fractionation
- In-situ electrolysis and genome analysis
- Cell counting
- Automated clogging detection

Other industries:

- Food processing (e.g., beverage clarification)
- Chemical and energy industry (e.g., hydrogen separation)
- Microplastic analysis and separation



Schematic drawing of the combination of 3D-ALD nanostructures designed as injection needles and a nanofluidic cavity enables intracellular drug delivery and in-situ monitoring of physiological parameters.

Fabrication

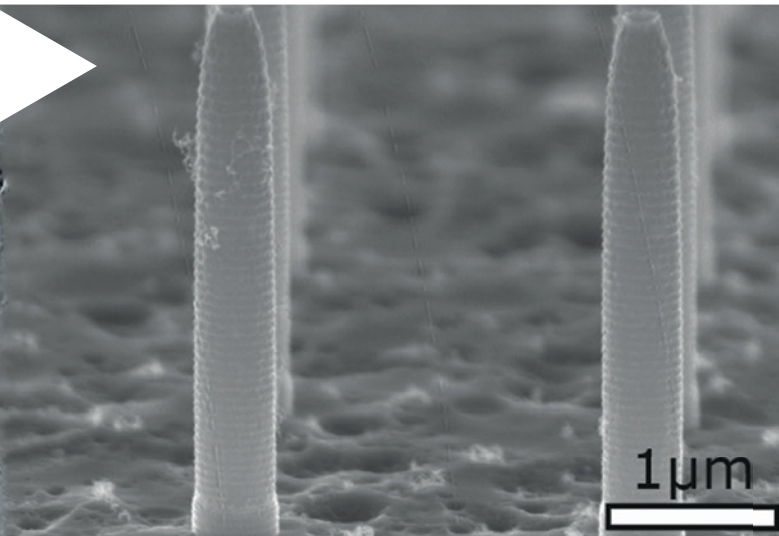


Fabrication:

- 200 mm wafer scale (silicon based)
- CMOS-compatible microsystem technology
- Combination of 350 nm projection lithography, ALD and DRIE
- Glas wafer etching for microfluidic structures

Benefits:

- Extremely thin structures
- Highly scalable
- High aspect ratio
- Biocompatible and biostable



Conductive nanoneedles for cell contacting made from ALD materials.





Microscope image of a membrane etched free with a nano-needle array using vapor phase etching.

Nanoneedle-electrodes

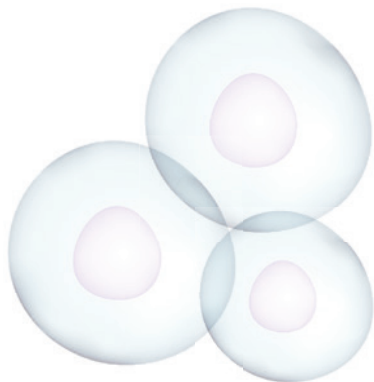
Applications:

- Intracellular electrical recording
- Electrical cell stimulation

Intracellular applications:

- Electrical recording
- Electrical stimulation
- Drug delivery
- Extraction of cell contents
- Biochemical sensing





Contact

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