

Bavarian research & innovation

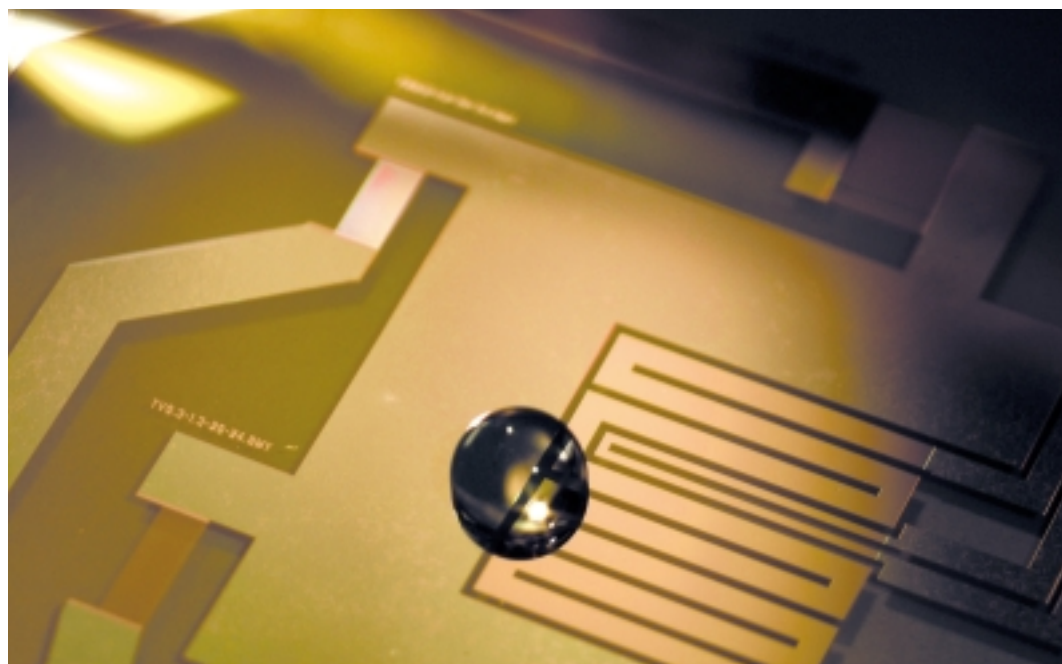


Bavarian Research Cooperation for Miniaturised Analysis Techniques
using Nanotechnology in Biochemistry, Chemistry and Physics

“ANALYSIS LABORATORY THE SIZE OF A THUMBNAIL”

In the fields of medicine, diagnostics as well as pharmaceuticals, chemical process technology and environmental analysis, fast quantitative detection of chemical and biological substances is essential. The scientists in the ForNano research cooperation are developing components for analytical laboratories which will fit on a thumbnail sized chip. These microchips would allow laboratory analysis while only requiring a minute quantity of sample and reagent. This would greatly reduce the use of reagents which not only cut costs, but also provides more environmentally friendly solutions. In addition, thanks to the shorter reaction times, the microchip lab would deliver the analysis results faster than conventional tests.

Nanotechnology methods form the basis for the new developments. ForNano is actively researching new methods of analysis that are capable of detecting substances with a high degree of sensitivity using even the tiniest quantities of liquid. Alongside the analytical techniques, chips are being developed on which liquids can be moved or living cells examined. The idea is for numerous processes to take place in parallel on the chip. To this end, researchers are



On the thumbnail-sized chip shown, reactions take place in droplets with a volume measuring just a few nanolitres. Integrated nanopumps transport these droplets without contact. Advalytix, a start-up company of the Center for Nanoscience, is developing programmable biochips from these components. (Source: Advalytix AG, Brunthal)

working on methods for analysing and detecting numerous samples simultaneously in a single sample.

In ForNano, scientists from the fields of physics, chemistry and medicine work together with partners from industry.

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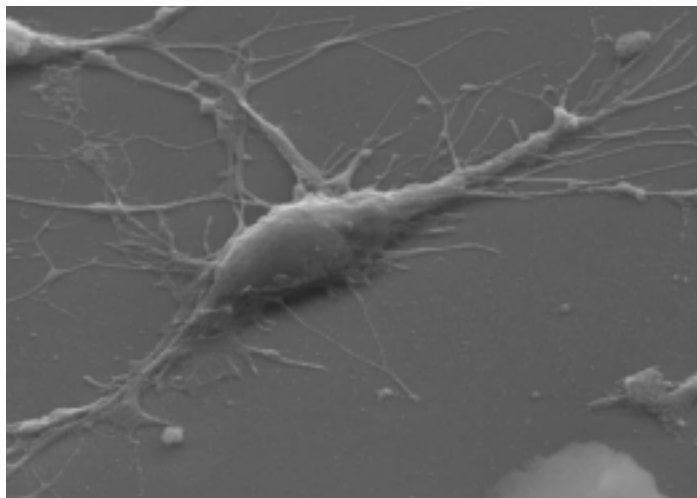
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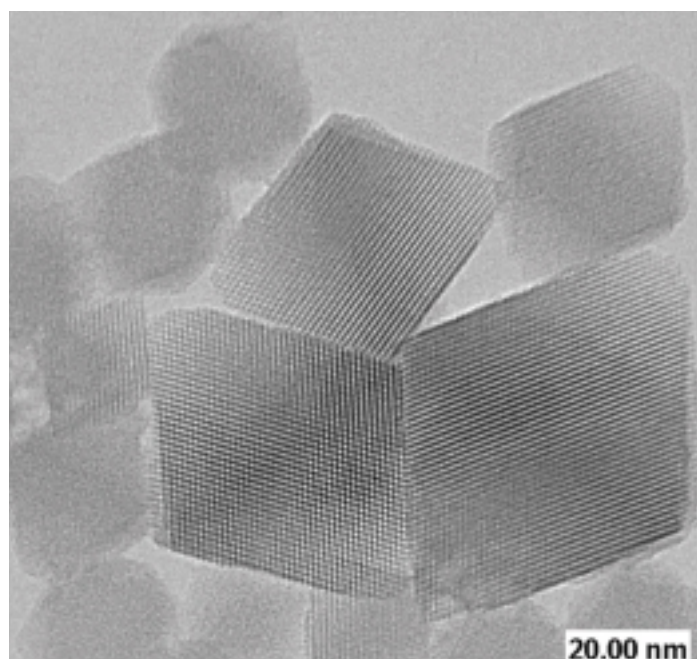
Funded by the Bavarian Research Foundation.

RESEARCH TOPICS:

- **Lab-on-a-chip: Nanostructured modules for integrated chemical laboratories with parallel analysis based on a chip**
Prof. Dr. Thomas Bein, Department of Chemistry and CeNS, LMU München, in collaboration with Nanoscape GmbH and Advalytix AG.
- **Micro- and nanofluidics on piezoelectric substrates**
Prof. Dr. Achim Wixforth, Experimental Physics I, University of Augsburg and CeNS, together with Prof. Dr. Jörg P. Kotthaus, Chair of Semiconductor Physics and CeNS, LMU München, in collaboration with Advalytix AG.
- **Bond strengths between polynucleic acids on DNA chips**
Prof. Dr. Hermann Gaub, Chair of Applied Physics and CeNS, LMU München, in collaboration with NanoType GmbH.
- **Silicon-nanochannel sensor arrays for cells**
Prof. Dr. Martin Stutzmann, Dr. Martin Brandt, Dr. Christoph Nebel, Chair of Experimental Semiconductor Physics II, Walter Schottky Institute of the TU München, in collaboration with Garching Analytics GmbH and Wacker Siltronic AG.
- **Two-dimensional microelectrophoresis of membrane proteins on textured solid body surfaces for proteome analysis**
Prof. Dr. Thomas Bayerl, Chair of Experimental Physics V – Biophysics, University of Würzburg, in collaboration with Nimbus Biotechnologie GmbH.
- **Nanostructured electrode systems for electrophoretic separation of membrane proteins**
Prof. Dr. Alfred Forchel, Chair of Technical Physics, Microstructure Laboratory, University of Würzburg, in collaboration with Nanoplus Nanosystems and Technologies GmbH.
- **Optical sensor technology with nanoparticles**
Prof. Dr. Jochen Feldmann, Chair of Photonics and Optoelectronics and CeNS, LMU München, in collaboration with Roche Diagnostics GmbH.
- **Single Virus Tracing: Development of a method for decoding the infectious entry pathway of a virus into a living cell with nanometer resolution**
Prof. Dr. Christoph Bräuchle, Department of Chemistry and CeNS, LMU München, together with Prof. Dr. Micheal Hallek, Medical Clinic III and Gene Centre, LMU München.
- **Optical detection of cAMP**
Prof. Dr. Martin Lohse, Chair of Pharmacology and Toxicology, University of Würzburg, in collaboration with ProCorde GmbH and Advalytix AG.



Nerve cell on a chip substrate
Picture: Fertig/Kriele, LMU Munich and Nanion Technologies GmbH



Nanoscale porous crystals
Picture: Prof. Thomas Bein, LMU Munich