

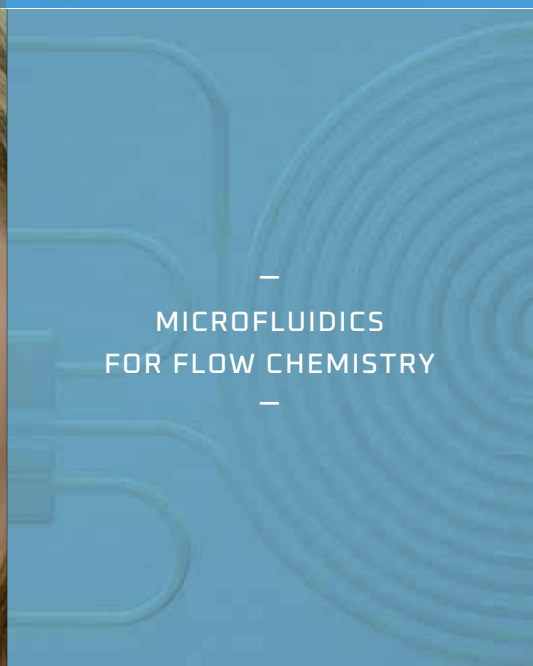
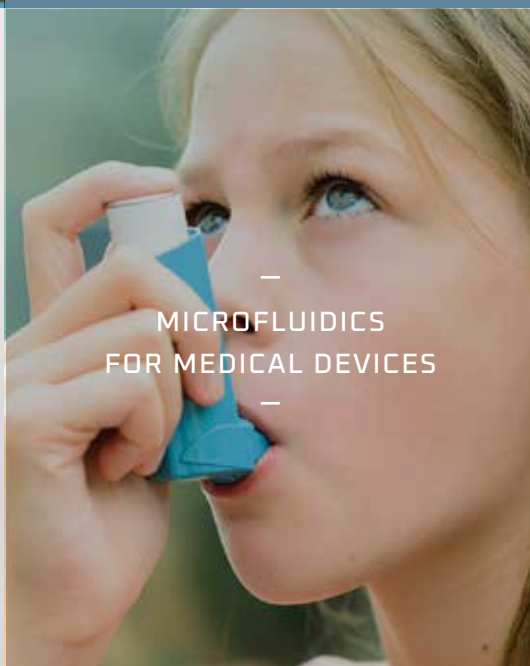
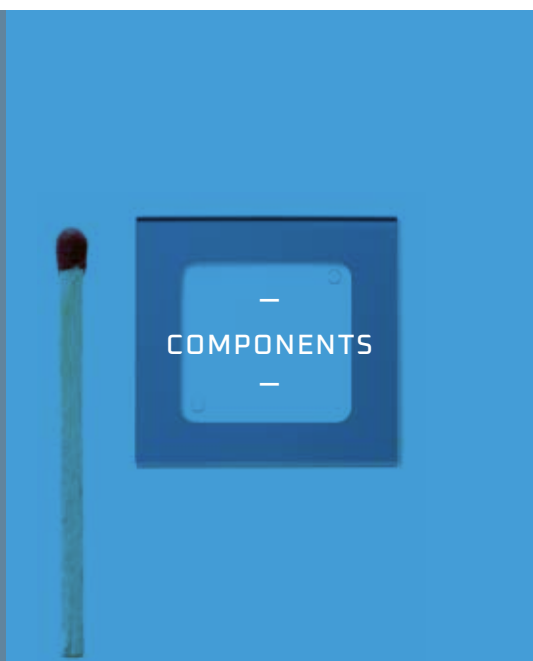
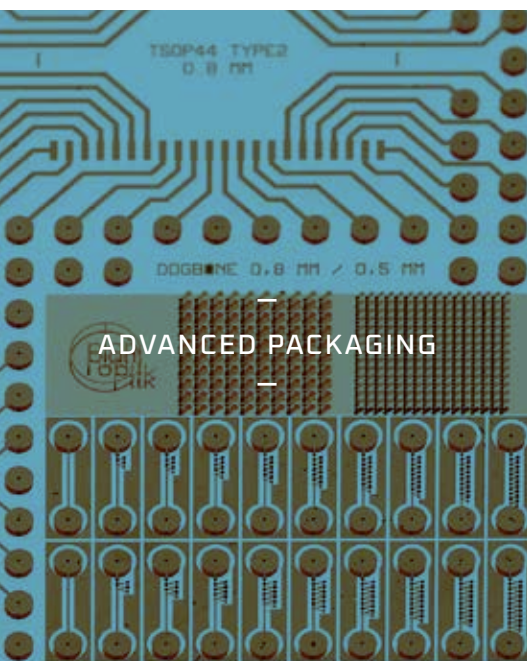
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# GLASS DRIVEN SOLUTIONS FOR MICROSYSTEMS

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NEXT LEVEL PARTS AND WAFERS FOR MICROELECTRONICS AND MICROFLUIDICS



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RELIABLE PARTNERSHIPS

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## MICROSTRUCTURED COMPONENTS INDIVIDUALLY DEVELOPED

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Are you developing a new microsystem?  
Are you combining microelectronics, micro-  
mechanics or microfluidics to create a new  
product? Are you developing a sensor, an  
electronic device, a fluidic system or some-  
thing that has never existed before? Team up  
with PLANOPTIK.



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### Together until production

In us you will find a partner who will work with you to develop electronic, mechanical, optical, chemical or biological microcomponents and has a firm grasp of materials such as glass, silicon and copper.

PLANOPTIK also manufactures the jointly developed microcomponents and elements in high volumes using state-of-the-art wafer-based manufacturing processes.

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## ADVANCED PACKAGING

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# PERFECTLY ARRANGED MICROCHIPS AND SENSORS IN ELECTRONIC DEVICES

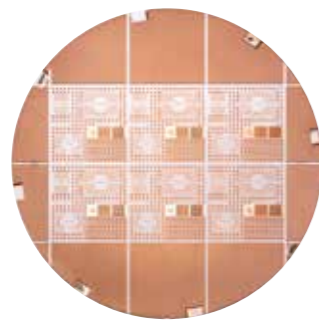
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In the area of advanced packaging, PLANOPTIK products support the most compact arrangement of microchips, sensors, semiconductors and other electronic components in a device.

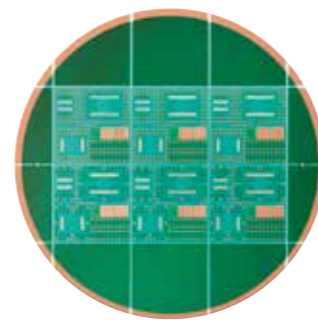
The more densely the electronic parts are packed, the smaller and more energy efficient the electronic device, such as a smartphone, can be.

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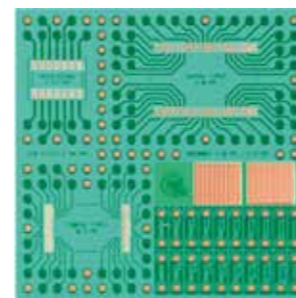
### How to create an interposer



Glass wafer with micro holes,  
copper coated



Wafer additionally coated  
with solder resist



Interposer after dicing



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Glass interposers enable chips and sensors to be stacked in the smallest of spaces. Individually developed.

PLANOPTIK develops tiny micro circuit boards made of glass on which microchips and other semiconductors can be attached and networked. The glass plates contain micro holes and are thinly coated with copper and then lithographically processed to produce the conductive contacts and connections.

One application for this is interposers, which enable microchips and sensors to be stacked and networked on top of each other in a particularly space-saving manner. PLANOPTIK AG also manufactures these products on the basis of wafers.

Today, glass is the trend material for fastening and connecting microelectronics because glass is particularly hard and inflexible, hardly reacts to high temperature changes and has a good electrical insulating effect.

Given the ever smaller and more complex arrangements of chips and other semiconductors, these material properties are playing an increasingly important role in the future of semiconductor technology. PLANOPTIK is a pioneer in this field.

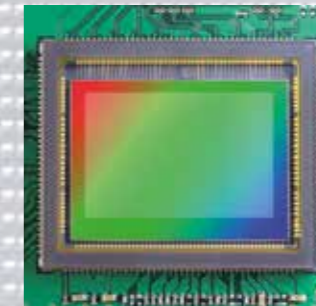
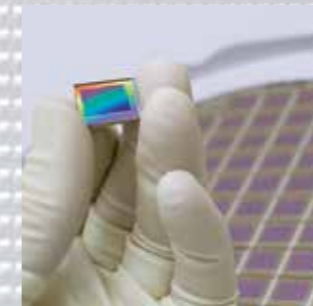
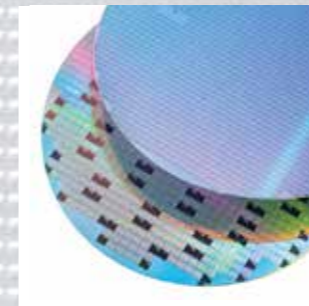
## — WAFER- AND PANEL-LEVEL PACKAGING

## — YOUR CHIPS AND SENSORS PROTECTED BY GLASS —

—  
Covering light and pressure sensors and other semiconductors with glass,  
jointly developed and manufactured millions of times on the basis of  
glass wafers

Sensors and other chips often need to be protected or encapsulated. Glass is a particularly suitable material for this. As a transparent cover, it protects image and light sensors, for example. In the case of pressure, acceleration or gyro sensors, it encapsulates the sensitive micromechanics in the sensor and often contains microstructures itself for additional functions. Functional applications with silicon are also possible.

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Glass wafers for covering and protecting chips and sensors



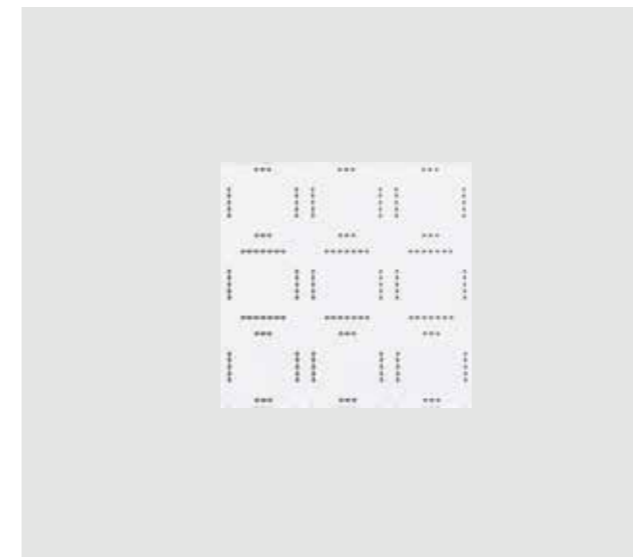
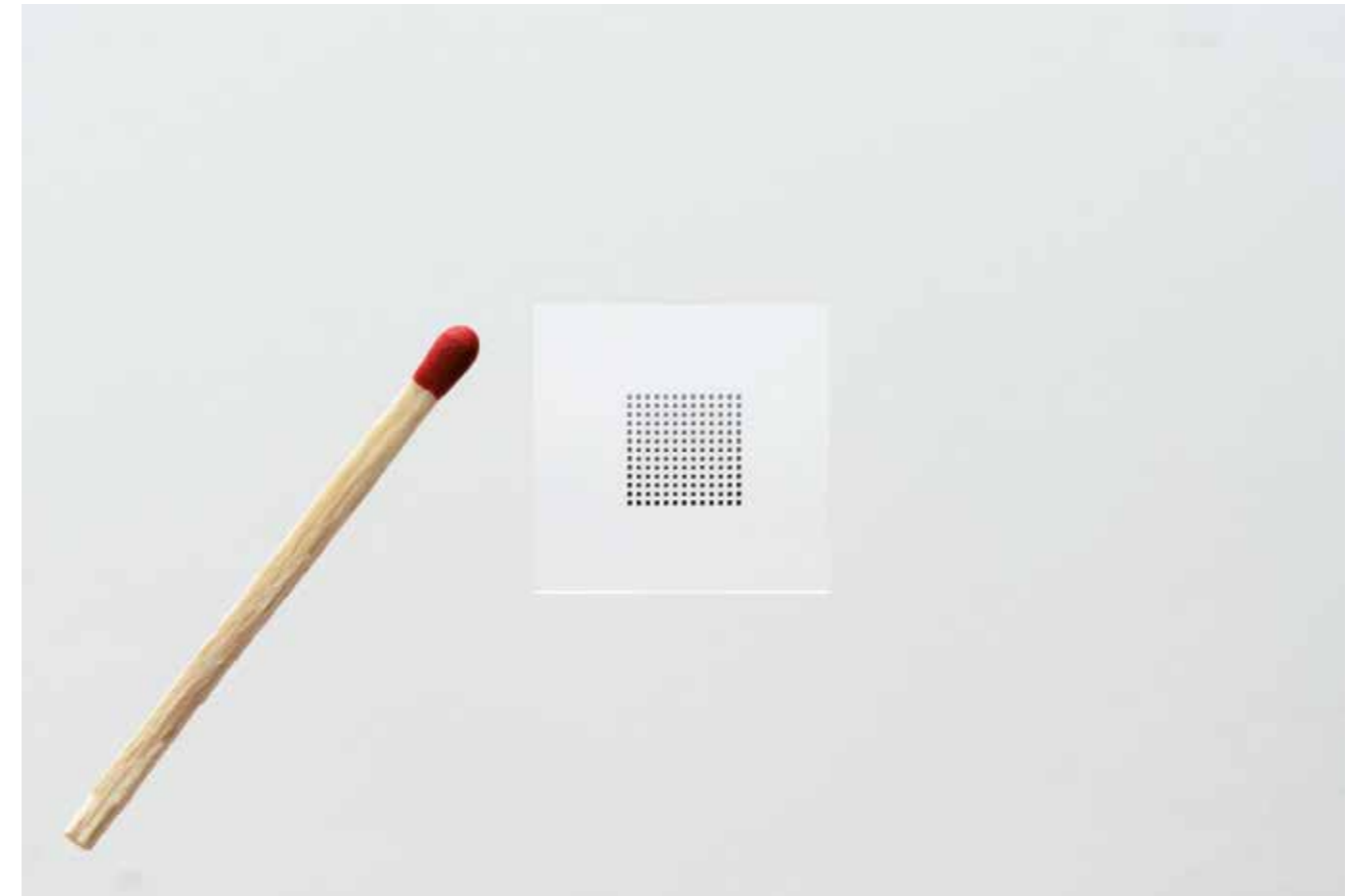
To make this possible, sensors and microchips are covered with glass during their production. To do this, the silicon wafer is bonded to a glass wafer from PLANOPTIK before it is cut into microchips. Only then does the customer cut the silicon wafers, which are then covered with glass.

The sensors and chips created by dicing are automatically encapsulated with glass and then protect the photo sensor, for example.

—  
COMPONENTS

—  
FINISHED COMPONENTS  
SUCH AS NOZZLES, ANTENNAS  
OR INDUCTION COILS

—  
Your ideas implemented using the latest methods of microsystem  
technology for integration into your product



PLANOPTIK's product portfolio goes far beyond wafers and microstructured elements. Together with its customers, PLANOPTIK develops entire components or microcomponents for series production.

Examples include fully functional micro antennas, induction coils for sensors or fully functional micro nozzles with structure sizes starting from 3  $\mu\text{m}$ .



## CARRIER WAFERS AND TOOLS



# OUR WAFERS AS CARRIERS FOR THE PROCESSING OF ULTRA-THIN WAFERS



### Wafers from PLANOPTIK adapted to your production processes in the semiconductor industry

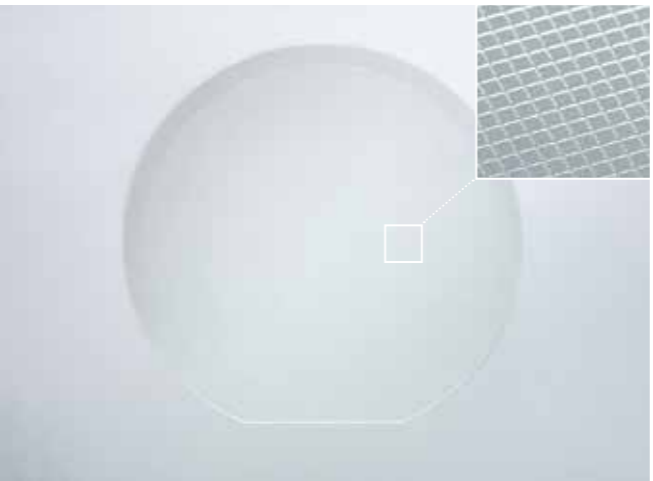
Ultra-thin wafers made of brittle materials such as silicon, gallium arsenide and other materials need to be stabilized for processing. Therefore, they are temporarily bonded to carrier wafers from PLANOPTIK and then released again after completion.

PLANOPTIK supplies the largest semiconductor manufacturers with carrier wafers that are individually adapted to the customer's manufacturing processes and machines.

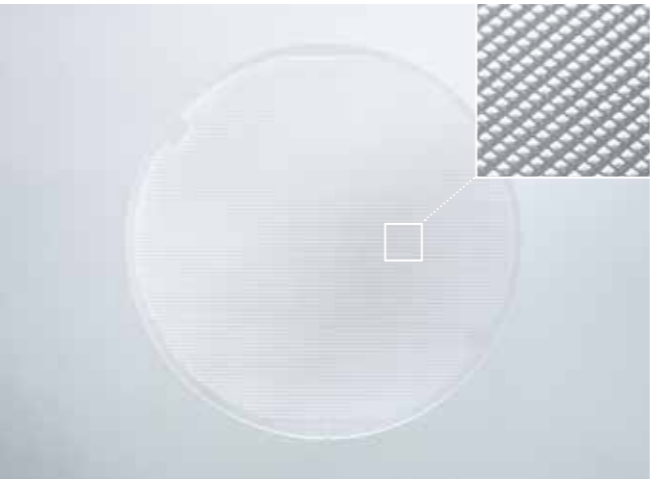
PLANOPTIK's carrier wafers support different processes for each customer in which the wafers are connected and then separated from each other again.



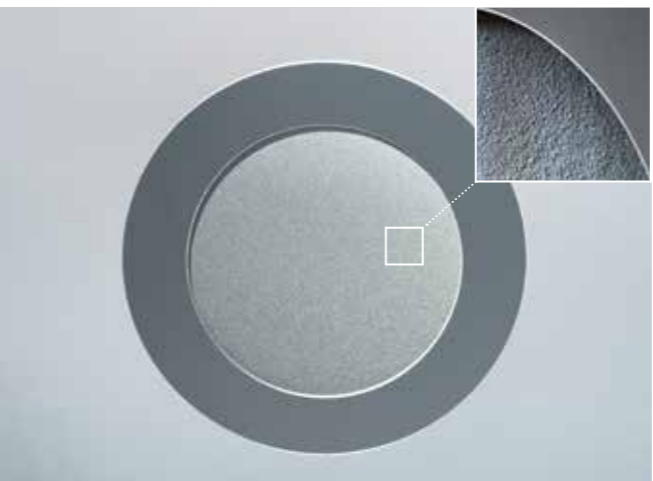
For laser release processes, PLANOPTIK provides highly transparent carrier wafers that transmit the relevant laser wavelength.



For carrier wafers that are released again by heat after bonding, PLANOPTIK offers wafers with special surface structures.



PLANOPTIK provides carrier wafers, which are to be chemically dissolved after the silicon wafers have been manufactured and processed, with up to 100,000 micro holes with a diameter of 100 µm through which the solvent reaches the wafer's bonding layer.



Adapter carrier wafers are used by PLANOPTIK customers when smaller wafers need to be processed in machines that are actually designed for large wafers. The carrier wafers then have a larger diameter than the wafers to be processed.

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MICROFLUIDIC SOLUTIONS

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# MICROFLUIDIC COMPONENTS FOR MEDICAL DEVICES

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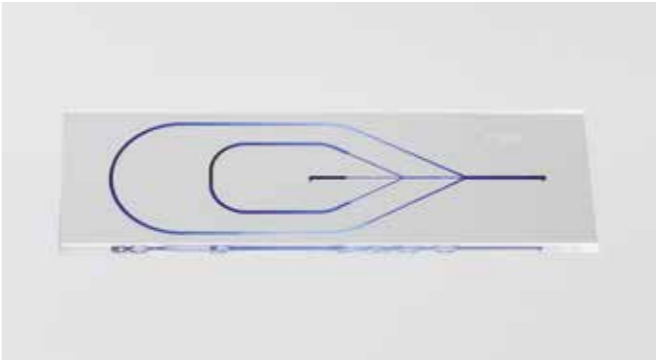
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Individually developed for diagnostics and treatment



PLANOPTIK develops and produces customer-specific microstructured parts made of glass, glass-silicon combinations and silicon for the microdosed processing of liquids and gas.

The technologies are used, for example, in diagnostic areas such as lab-on-chip or for micronozzles to generate nanomist in inhalers.



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LAB-ON-CHIP

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How wafers are turned into microcomponents for nano-inhalers



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WAFER  
POLISHED

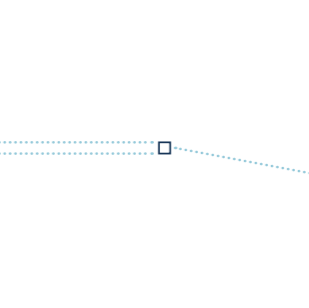
First, the wafers are polished with a surface roughness in the Angstrom range.



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WAFER  
MICROSTRUCTURED

In the second step, the wafers are provided with hundreds of microstructures using innovative manufacturing processes.



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MICROCOMPONENT  
AFTER DICING

The wafers are then diced to create individual micro-components.



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MICROCOMPONENT FOR  
CUSTOMER'S INHALATOR

Finally, the microcomponents are inserted into the end product by the customer.

—  
MICROFLUIDICS FOR PRODUCTION

—  
MICROREACTORS AND MIXERS  
FOR FLOW CHEMISTRY  
—  
—

Microreactors enable chemical processes in very small volumes

The use of microreactors and fluidic chips in Flow Chemistry and Photochemistry comes along with several advantages: Such as increased safety in chemical manufacturing processes with risky or expensive chemicals or drugs. Furthermore, rapid changes in reaction conditions such as temperature, flow rate and pressure are also possible. This allows the controlled formation of various products.

The most important advantage is, that flow reactions are highly scalable, this enables the preparation of processes for the later industrial application on a large scale. Microfluidic devices out of glass offer superior performance in terms of chemical resistance, UV transmission as well as a high temperature and pressure rates. Major breakthroughs using PLANOPTIK's flow reactors are in the production of Efavirenz (Anti-HIV), Amiodarone (Ovarian Cancer) and mRNA vaccines.

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Customized integration into existing systems



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MICROFLUIDIC CHIPS



—  
FLOW CHEMISTRY REACTORS



—  
PRECISION SYRINGE PUMPS

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