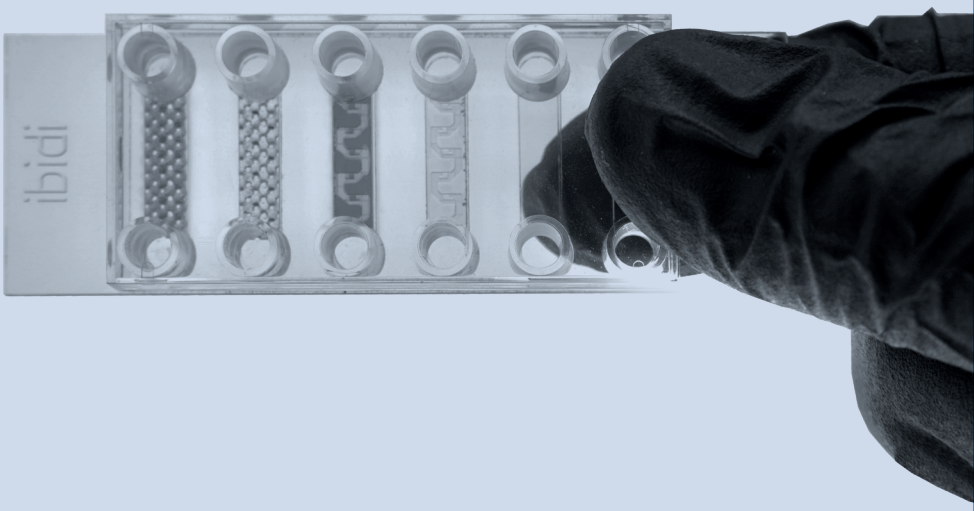
nanoONE

Rethinking microfluidics
production of microfluidic
and microphysiological systems



upnano

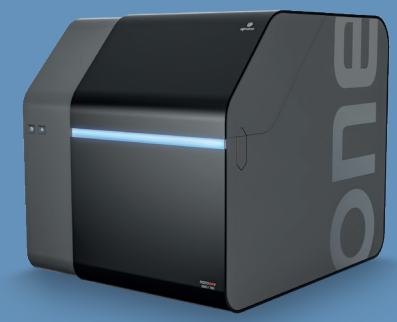
Microfluidics plays a critical role in the biopharmaceutical industry (drug screening, diagnostics, LOC and OOC). A major limitation preventing broader range use is the challenging transfer from PDMS-based research to industry-compatible formats like injection molding, hot embossing, and sheet processes. Even if it is successful, there are drawbacks in design, usability, and high upfront manufacturing costs.

The NanoOne offers a solution for research and industry by using pre-existing infrastructure – 3D printing in injection-molded microfluidic chips.

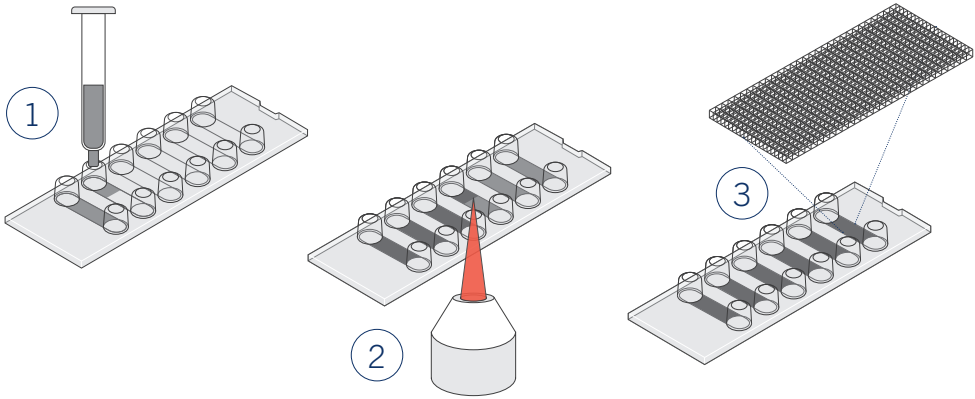
Setting new standards

The NanoOne 3D printing platform raises the standards to new heights in the production of microfluidic and microphysiological systems.

- Unmatched manufacturing speeds and minimal post processing
- Remarkably fast iterations and design freedom
- Highly reproducible process with >95% yield
- Supreme process scalability
- Ability to fabricate external-chip fluid interfaces
- Cell-compatible resin portfolio
- Finest channel diameter of 10 µm
- Complex (3D) geometries



In-chip printing of ultrafine elements and scaffolds for 3D cell cultures



Sterile manufacturing of in-chip structures is done in three simple steps:

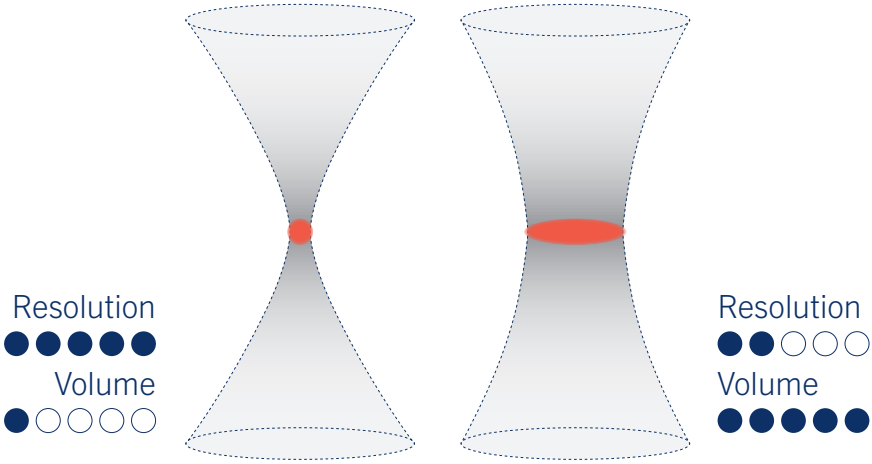
1. Injection of the printing resin into channels
2. 3D printing of structures inside channels using the NanoOne
3. Rinsing of the structure to remove residual unpolymerized resin

To complement UpNano's five biocompatible resins, BIO INX© offers a portfolio of EN ISO 10993-5:2009 certified hydrogel materials developed and optimized for the NanoOne platform.

HYDROBIO INX® U200 HYDROTECH INX® U100 HYDROTECH INX® U200 DEGRAD INX® U100

Adaptive resolution

Our patented printing technology allows the user to print both fine details and macroscopic elements in a single print.



High resolution
The laser is precisely focused to achieve the highest possible resolution.

Used to fabricate microscale fine channels.

High speed
The focus is enlarged to increase throughput while maintaining part integrity.

Used for macroscale connectors and internal bulk areas.

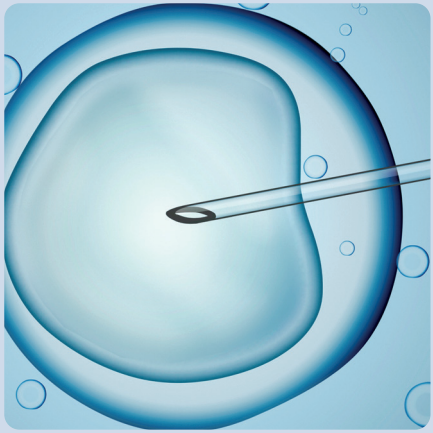
Printing of integrated microfluidic chips – a groundbreaking use case

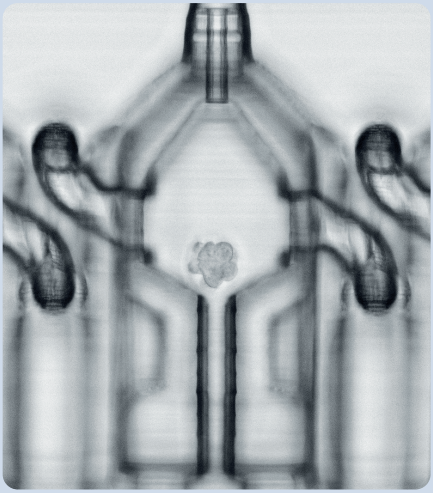
To increase in vitro fertilization (IVF) success rates and reduce stress on embryos, the NanoOne 2PP-3D printing system developed a unique environment for the critical life phase between fertilization and implantation of the embryo.

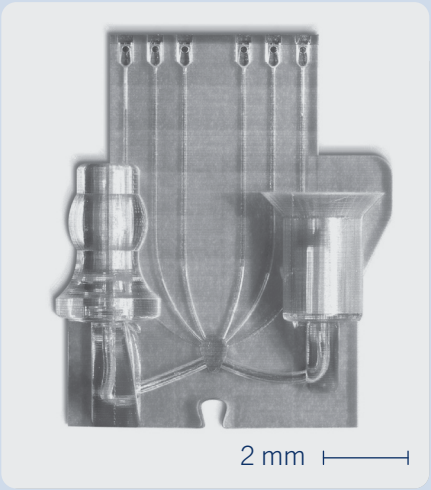
This first-of-its-kind 3D printed microdevice incorporates 0.05 mm channels in diameter, allowing an embryologist to precisely monitor and control the culturing process of the fertilized egg, eliminating the need for IVF practitioners to move cells between petri dishes, a process that is fraught with risk.

And it is exactly those miniscule features that proved challenging in the production of the device. Australian National Fabrication Facility (ANFF) at the University of South Australia managed this perfectly using the UpFlow resin, which was specifically developed for microfluidics, together with UpNano's NanoOne 2PP 3D printer.

The new procedure allows nanoliter per hour dynamic flow of nutrients across the embryos, which is more aligned to what occurs in the reproductive tract compared to current static culture conditions.







This is just one example to prove the versatile ways our NanoOne can simplify and enhance the success of microfluidic processes.

Read publication

ANFF

The innovative UpFlow is our low-viscosity and ultra-low-fluorescent 2-photon resin specifically designed for microfluidic production.

Key properties

- Optically transparent & ultralow fluorescence – ideal for cell-based imaging
- Low viscosity enabling the production and cleaning of the finest channels
- Non-cytotoxic according to EN ISO 10993-5:2009
- Customer structures currently in clinical trials

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