

Perfectly matching **Printing Materials**

Think big. Print nano.



High-performance 3D printing materials

Benefit from perfectly matching high-performance printing materials for sophisticated microfabrication tasks, available for specific applications on different scales

Nanoscribe offers maskless lithography systems and 3D printers for microfabrication. High-performance printing materials play a crucial role in this technology to fully benefit from the precision potential of Two-Photon Polymerization. Our printing materials are recognized as the standard for high-precision microfabrication. Sub-micrometer resolution and outstanding shape accuracy as well as easy handling are key features of these photoresins. IP Photoresins are polymer printing materials for high-resolution microfabrication.

They are optimized for Two-Photon Polymerization (2PP) and Two-Photon Grayscale Lithography (2GL[®]) with the properties required for high-precision additive manufacturing. The printer software offers advanced parameter presets optimized for specific photoresins and different applications. Meanwhile, the printing material classes also include a nanocomposite for 3D printing fused silica glass microstructures. With resins developed by our partner BIO INX[®], Nanoscribe offers advanced bioprinting materials for biosciences and engineering.

Printing material categories

Small Features

Medium Features

Large Features

Universal

IP-Dip

IP-S

IP-Q

IP-L

Functional

IP-G

IP-Visio

IP-n162

IP-PDMS

GP-Silica

Biomaterials

Hydrobio INX N400

Hydrotech INX N100

Degrad INX N100

Our printing material portfolio

“Perfectly matching printing materials for every application”



IP Photoresins

Negative-tone photopolymers for high resolution 3D printing

“Explore microstructuring of glass by 3D printing”



GP-Silica

Silica nanocomposite material for 2PP-based glass printing

“Bring your applications to life with BIO INX biomaterials”



BIO INX Photoresins

Hydrogels and biodegradable materials for 3D Microfabrication

Precise and clean dispensing of printing materials

Nanoscribe's photoresins are available in lightproof and resealable cartridges. Take advantage of convenient dosing by hand or automatic dispensing onto substrates, wafers, chips and other microparts – precise and bubble-free.

All printing materials are optimized for 2PP-based microfabrication and feature outstanding properties required in high-precision additive manufacturing.

Open system for custom-made materials

The microfabrication devices from Nanoscribe are designed as open systems, suitable for a broad selection of materials. The variety of materials extends further to third-party UV-curable photoresists, hydrogels or nanoparticle composite resins, and custom-made materials.

To satisfy the needs of material developers for testing new resins, a variety of materials and processes allow optical, mechanical, electrical, chemical and biological properties to be tuned as needed, e.g., in optics, photonics or biomedical engineering.

Post-print processes, e.g., casting, atomic layer deposition (ALD), chemical vapor deposition (CVD) or galvanization, allow modification of the 3D printed structures and permit the inclusion of further materials including ceramics, metals, glass or other plastics.

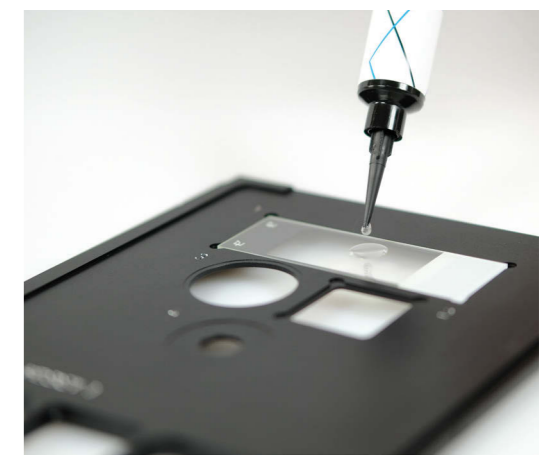
Further material options

Third-party photoresists

SU-8 – negative-tone, epoxy-based resists
AZ[®] photoresists – positive-tone resists
ORMOCER[®] polymers – inorganic-organic hybrid polymers

Custom-made materials

Hydrogels - e.g., degradable resins
Composite materials
Liquid-crystal elastomers



Polymer printing with IP Photoresins

High-performance photoresins specifically designed for microfabrication by Two-Photon Polymerization, available in cartridges for convenient dispensing by hand or automatic dispensing.



Nanoscribe IP Photoresins are established standard materials for high-resolution microfabrication. Submicrometer resolution and shape accuracy as well as easy handling are key features of these negative-tone photoresins. Choose the photoresins best suited to your applications. Benefit from submicron features, overhanging elements, optical-quality surfaces, high-speed mesoscale fabrication, biocompatibility or high refractive index.

IP Photoresins are highly-efficient printing materials. The printer software offers specific parameter presets optimized for different photoresins and applications. They make the 3D printing or maskless lithography workflow straightforward and speed up the design iteration cycles for scientific and industrial use cases ranging from biomimetic surfaces, microoptical elements to mechanical metamaterials and 3D cell scaffolds.

Nanoscribe 2PP photoresins

	IP-Q ^b	IP-S ^b	IP-Dip ^b	IP-L	IP-G	IP-Visio	IP-n162	IP-PDMS
State	Liquid	Liquid	Liquid	Liquid	Sol-gel	Liquid	Liquid	Liquid
Refractive index ^a @ 589 nm, 20 °C	1.513	1.515	1.552	1.519	1.515	1.511	1.622	1.450
Young's modulus ^a [GPa]	n/a	5.1	4.5	3.9	3.4	n/a	n/a	0.015
Pre / post bake	no/no	no/no	no/no	no/no	yes/no	no/no	no/no	no/no
Degradation temperature ^a [° C]	242	286	371	362	n/a	n/a	n/a	n/a
Biocompatibility	n/a	yes ^c	yes ^d	yes ^d	n/a	yes ^c	n/a	yes ^c

^a Measured on 3D printed or UV-cured structures; results depend on the printing conditions and geometry

^b Upon request available without photoinitiator

^c Non-cytotoxic according to ISO 10993-5

^d Non-cytotoxic, evaluated by our customers, partly under stricter requirements than ISO 10993-5

Universal polymer printing materials

	Properties	Application areas	Key Features
IP-Q	High-speed fabrication of mesoscale structures with print volumes > 10 mm ³ , designed for Dip-in Laser Lithography (DiLL)	<ul style="list-style-type: none"> ▶ 3D Microfabrication on the mesoscale ▶ Biomedical engineering ▶ Mechanical components 	<ul style="list-style-type: none"> ▶ Refractive index matched material for Nanoscribe's large features set
IP-S	Smooth surfaces for micro- and meso-scale fabrication with smooth surfaces and shape accuracy in optical quality, designed for Dip-in Laser Lithography (DiLL)	<ul style="list-style-type: none"> ▶ 3D Microfabrication on the mesoscale ▶ Microoptics ▶ Integrated photonics ▶ Microfluidics 	<ul style="list-style-type: none"> ▶ Refractive index matched material for Nanoscribe's medium features set ▶ Biocompatible
IP-Dip	Finest submicron features and high aspect ratio structures, designed for Dip-in Laser Lithography (DiLL)	<ul style="list-style-type: none"> ▶ 3D Microfabrication on the submicron scale ▶ Microoptics ▶ Micromechanics & MEMS ▶ Integrated photonics 	<ul style="list-style-type: none"> ▶ Refractive index matched material for Nanoscribe's small features set ▶ Biocompatible
IP-L	Finest submicron features and low shrinkage, designed for oil immersion configuration	<ul style="list-style-type: none"> ▶ 3D Microfabrication on the submicron scale ▶ Material engineering ▶ Integrated photonics 	<ul style="list-style-type: none"> ▶ Refractive index matched material for Nanoscribe's small features set ▶ Biocompatible

Functional polymer printing materials

	Properties	Application areas	Key Features
IP-G	Complex 3D designs including overhanging elements. Submicron features and low Shrinkage, designed for oil immersion configuration	<ul style="list-style-type: none"> ▶ Micromechanics & MEMS ▶ Material engineering 	<ul style="list-style-type: none"> ▶ Sol-gel material ▶ Low shrinkage
IP-Visio	Non-cytotoxic material for biocompatible microstructures with low autofluorescence for microscopy of subcellular components, designed for Dip-in Laser Lithography (DiLL)	<ul style="list-style-type: none"> ▶ Multi-cell scaffolds ▶ Tissue engineering ▶ Biomedical devices ▶ Life sciences 	<ul style="list-style-type: none"> ▶ Non-cytotoxic ▶ Low autofluorescence ▶ Protein absorbent resin for cell attachment
IP-n162	High refractive index and low absorption for infrared. For polymer, infrared or – combined with IP-S – for achromatic microoptics, designed for Dip-in Laser Lithography (DiLL).	<ul style="list-style-type: none"> ▶ Microoptics ▶ Integrated photonics 	<ul style="list-style-type: none"> ▶ High refractive index ▶ Low absorption at 1200-1550 nm ▶ Low Abbe number and high dispersion
IP-PDMS	2PP printing of soft, flexible and highly elastic structures, designed for Dip-in Laser Lithography (DiLL).	<ul style="list-style-type: none"> ▶ Life science ▶ Microfluidics ▶ Micromechanics & MEMS ▶ Material engineering 	<ul style="list-style-type: none"> ▶ Highly elastic with low Young's modulus ▶ Low refractive index ▶ Non-cytotoxic ▶ Highly flexible

Glass printing with silica nanocomposites

GP-Silica is the world's first photoresin for the 2PP-based 3D Microfabrication of fused silica glass, available in cartridges for convenient dispensing by hand or automatic dispensing.

Nanoscribe GP-Silica is the world's first photoresin for high-resolution 3D Microfabrication by Two-Photon Polymerization (2PP). High optical transparency combined with thermal, mechanical and chemical stability enable to explore new applications in microfluidics, microoptics and other microtechnology fields. GP-Silica is the centerpiece of the Glass Printing Explorer Set and was developed in a joint research project with our partner Glassomer.

GP-Silica at a glance

	Properties	Application area	Key features
GP-Silica	The world's first photoresin for 3D Microfabrication of fused silica glass. Designed for Dip-in Laser Lithography (DiLL).	<ul style="list-style-type: none"> Life science Microfluidics Micromechanics & MEMS Material engineering 	<ul style="list-style-type: none"> High mechanical, chemical and thermal stability Optical transparent from the UV- to IR-region Smooth optical quality surfaces Inorganic material

Glass Printing Explorer Set

Our Glass Printing Explorer Set offers everything you need for printing freeform microstructures made of fused silica glass out of the box. The set includes the photoresin GP-Silica, silicon substrates, several print accessories and detailed processing instructions for a successful print. These instructions contain recommendations and notes on print job preparations, a preset of printing parameters and detailed information about the thermal post-process.

Properties of GP-Silica in comparison

	GP-Silica	IP-Q
Young's modulus [GPa]	68.3	~ 5
Thermal stability [°C]	> 1,000 ^a	242 ^b
Refractive index at 589 nm, 20 °C	1.458	1.513
Lateral resolution [µm] ^c	20	5
Post-processing	Sintering	–
Surface roughness Ra [nm] ^c	< 10	< 10
Sintering shrinkage [Vol. %]	27 (isometric)	–

^a Glass transition temperature T_g

^b Degradation temperature

^c Dependent on structure and printing parameters

Biomaterials printing with BIO INX Photoresins

Bring your applications to life with hydrogels and biodegradable materials of our partner BIO INX for high resolution 3D Microfabrication in life sciences such as tissue engineering.

Nanoscribe's Two-Photon Polymerization (2PP) technology offers highest resolution for microfabrication on the scale of biological tissues and cells and is therefore a key enabling technology in the field of 3D bioprinting. This requires biomaterials that are compatible with 2PP technology to drive new innovations in life sciences and biology.

Our partner BIO INX develops materials for 3D bioprinting and has decades of academic experience in the field of polymers and biomaterials. The BIO INX Photoresins we offer include three state-of-the-art bioresins that are specifically optimized for Nanoscribe's Photonic Professional systems. These high-quality biomaterial photoresins bring tissue engineering and regenerative medicine one step closer to clinical practice.

BIO INX materials at a glance

	Properties	Application areas	Key Features
Hydrobio INX N400 New	This natural, gelatin based hydrogel is biodegradable and allows for cell encapsulation during printing with subcellular precision.	Tissue engineering of soft tissues that resembles the natural extracellular matrix (ECM). Printing of scaffolds for both cell seeding and cell encapsulation.	<ul style="list-style-type: none"> Biocompatible Biodegradable Easy handling Stability Photodegradable
Hydrotech INX N100	Synthetic, mechanically robust hydrogel. The material is non-biodegradable and biologically inert.	Tissue engineering and life science applications that require the soft properties of a hydrogel.	<ul style="list-style-type: none"> Biocompatible Biostable hydrogel Easy handling Mechanical integrity
Degrad INX N100	First biodegradable polyester for 2PP-based bioprinting. This material is highly elastic and enables highest resolution printing.	Tissue engineering and life science applications that require biomaterials with high mechanical stability and flexibility.	<ul style="list-style-type: none"> Biocompatible Biodegradable High resolution Strong and flexible material

Technical specifications

	Hydrobio INX N400	Hydrotech INX N100	Degrad INX N100
Material class	Natural hydrogel	Synthetic hydrogel	Polyester
Bio-degradable	Yes	No	Yes
Printable feature size	≥ 1 µm	≤ 1 µm	≤ 1 µm
Mechanical properties	Storage modulus G' = 2 – 18 kPa	Young's modulus E = 30 – 40 MPa	Young's modulus E = 50 – 60 MPa
Swelling (vol.)	50 - 250 %	n/a	n/a



Why Nanoscribe

Join the Nanoscribe community! As the pioneer and market leader in high-precision additive manufacturing, we are your reliable partner for microfabrication systems, software, and solutions. Founded in 2007 as a spin-off of the Karlsruhe Institute of Technology (KIT), we are a vibrant, award-winning company and part of the BICO Group since June 2021. With our field-proven systems, straightforward 3D printing workflows and all-in-one solutions, our more than 3,000 system users are driving future-shaping applications.

In our Nanoscribe community there are innovators and thought leaders across a broad spectrum of scientific research and industries including life sciences, microoptics, photonics, materials engineering, microfluidics, micromechanics and MEMS. Their fascinating innovations have now been published in over 1,300 contributions to a wide range of peer-reviewed journals.

HIGH-PERFORMANCE MATERIALS DEVELOPMENT

Nanoscribe offers grayscale lithography systems and 3D printers for microfabrication. High-performance printing materials play a crucial role in this technology to meet the requirements of Two-Photon Polymerization printing. For this reason, Nanoscribe invests in material development with an own R&D unit and in cooperation with experienced partners.

Our material development works in constant interaction with our hardware and software team as well as with our process and application engineers. Also, close collaboration with our customers allows us to develop tailor-made solutions to satisfy the market needs.



Nanoscribe GmbH & Co. KG
Hermann-von-Helmholtz-Platz 6
76344 Eggenstein-Leopoldshafen
Germany

Phone +49 721 981 980 200
Fax +49 721 981 980 130

info@nanoscribe.com
nanoscribe.com

Nanoscribe China Co., Ltd.
Shanghai, China
+86 135 1215 1378

Nanoscribe Inc.
Boston, USA
+1 857 444 4007

Nanoscribe is certified

ISO 9001: Quality Management Systems • ISO 14001: Environmental Management Systems