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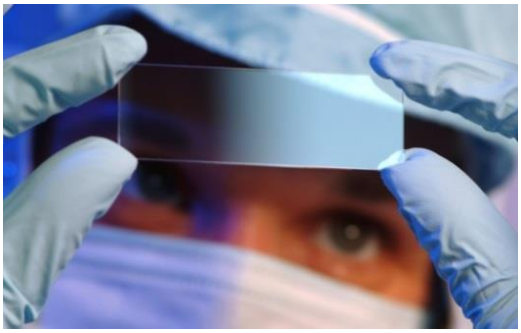
1. General



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Introduction

SCHOTT AG

SCHOTT in Mainz

SCHOTT is an international technology group with more than 125 years of experience in the areas of specialty glasses and materials and advanced technologies. We rank number one in the world with many of our products. With our high-quality products and intelligent solutions, we contribute to our customers' success and make SCHOTT part of everyone's life.

Our main markets are the household appliance, pharmaceuticals, electronics, optics, solar power, transportation and architectural industries. We are committed to managing our business in a sustainable manner and to supporting our employees, society and the environment.

SCHOTT has manufacturing facilities and sales offices close to its customers in all major markets, with approximately 16,000 employees, located in 35 countries around the world.

Ever since the co-founder, Otto Schott, first laid the foundation for the modern specialty glass industry, applications related to research and technology development have been important prerequisites for the company's success. SCHOTT's technological and economic expertise goes hand in hand with its social and environmental responsibility.

SCHOTT's products are used in a broad range of applications including pharmaceutical packaging, laboratory & chemistry, automotive, display & electronics, optics and sensor technology. As a specialty glass manufacturer, SCHOTT develops new and innovative products by working closely with its customers and partners to offer the highest quality product solutions tailored to customer requirements. SCHOTT constantly strives to meet and exceed the high expectations associated with its name and reputation as one of the world's leading specialty glass manufacturers.

Customers all over the world appreciate SCHOTT's commitment to pioneering high quality solutions for advanced technologies.

Safety, reliability and quality for pharmaceutical packaging

Receivers for concentrated solar power plants and thin-film photovoltaic applications

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Product group
Microarray solutions

In 2002, SCHOTT established a new unit called Microarray Solutions to produce a range of microarray products under the brand name NEXTERION® in order to meet the needs of the growing biochip market. This product group created a unique competence center for microarray applications in Jena, Germany, fusing SCHOTT's experience in the high precision processing of glass and thin film coating technology with a highly skilled life science team.

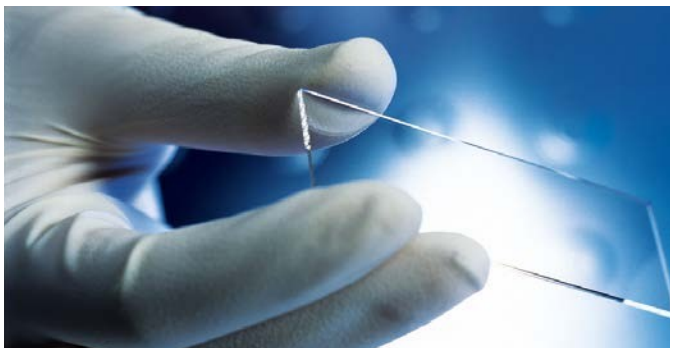
Since its formation, this new unit has dynamically expanded its product portfolio of microarray slides and reagents for DNA and protein microarrays. This is a result of developing new products in-house and acquiring the Quantifoil microarray business in 2003. SCHOTT now offers customers a comprehensive product range of both coated and uncoated microarray surfaces. The products are marketed under the brand name NEXTERION® or supplied as OEM products.

The SCHOTT Microarray Solutions group is based in Jena, an award-winning biotech cluster in Germany. There are significant benefits from the synergies gained by having international sales and marketing, R&D and state-of-the-art production facilities all on the same site. Using an interdisciplinary team of scientists, including glass technologists, physicists, biologists and chemists, and a strong commitment to innovation, SCHOTT develops new microarray products and formats.

SCHOTT in Jena

As a long established manufacturer of technical glass, SCHOTT is able to maintain stringent control over all process steps, from initial glass production right through to the supply of the products to the end user. All NEXTERION® products are manufactured according to the most stringent industry standards, guaranteeing that customers receive the highest quality, most reproducible products.

To support SCHOTT's ongoing commitment to the biotech market, a dedicated customer application support group was established. A team of technical experts is available to answer any technical queries and, if necessary, can undertake in-house protocol development and testing.



NEXTERION® Microarray Glass Substrate

Quality inspection

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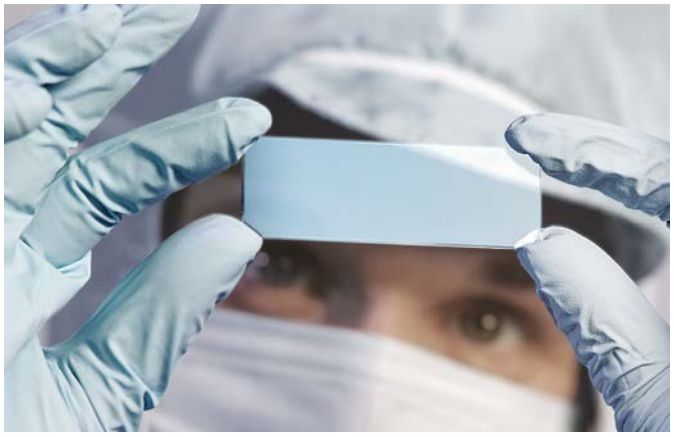
High quality borosilicate glass –

The solid foundation behind NEXTERION® Microarray Slides from SCHOTT



Visual quality inspection

Introduction

SCHOTT Microarray Solutions has exclusive access to 1.0 mm thick BOROFLOAT® 33 glass (Glass B) for the NEXTERION® microarray coated substrates. BOROFLOAT® 33 is a borosilicate glass that offers high chemical resistance, low fluorescence, and excellent flatness. The glass is precision cut into the microscope slide format for standard NEXTERION® slides and other formats, such as standard microplate or custom formats. All slides are laser-cut to create straight robust edges.

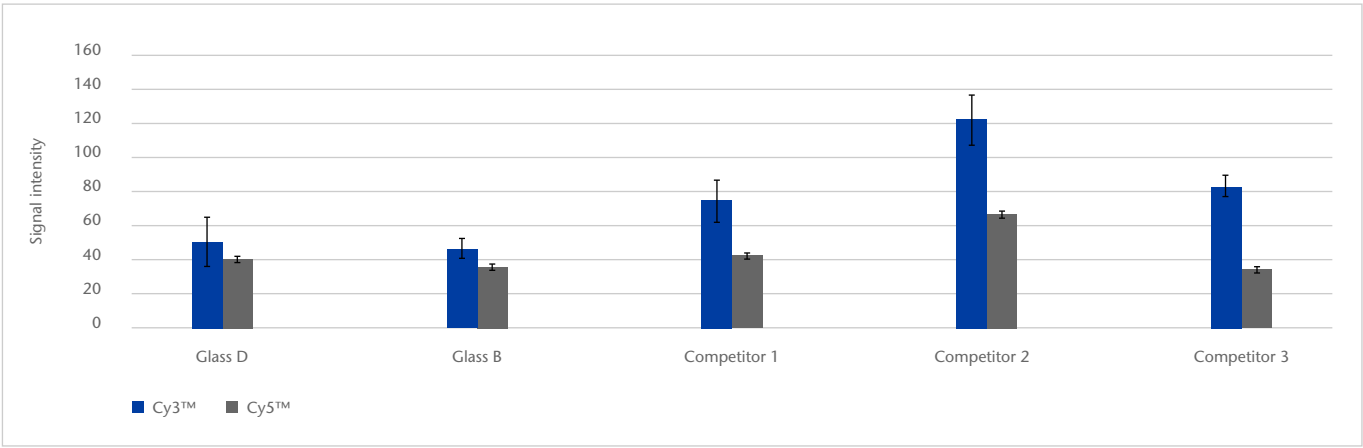
Additional information on different glass types and more detailed specifications can be found in the product flyer "Uncoated slides".

Chemical stability

BOROFLOAT® 33 glass exhibits excellent chemical stability and durability. The glass provides an inert support for biomolecule immobilization, and hybridization, and does not leach alkali ions over time. For this reason, borosilicate glasses are highly suited to microarraying applications.

Fluorescence

The high-purity borosilicate glass demonstrates extremely low and uniform fluorescence at the Cy3™ and Cy5™ (570 nm and 670 nm) emission wavelengths. The low fluorescence of the glass offers exceptionally low background signals during the scanning of a microarray, thereby maximizing the signal-to-background ratios. Consequently, even very low signal intensities, such as those from weakly expressed genes, or low abundance proteins, can be reliably detected.



Autofluorescence of NEXTERION® Glass D and Glass B vs. competitors

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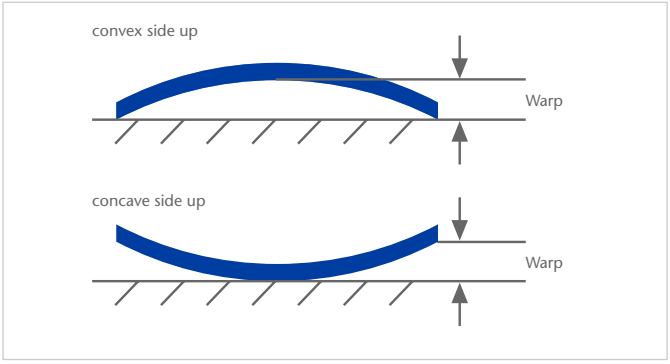
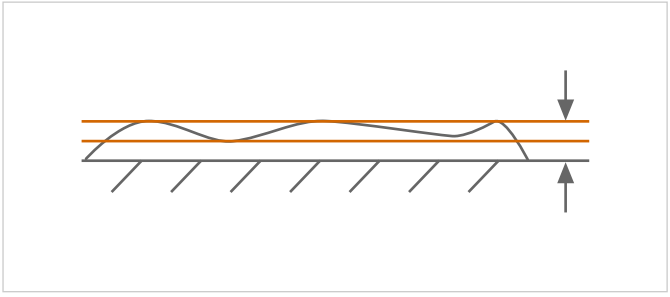
Flatness

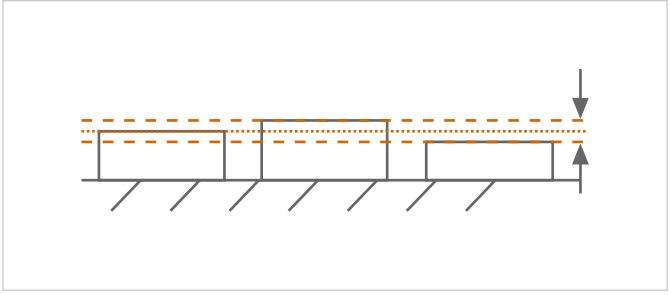
Flatness is an extremely important characteristic for microarray slides, especially as the printing process requires a plain slide surface to precisely deposit the probes. BOROFLOAT® 33 is manufactured by a float glass process to produce an exceptional flatness of ≤ 50 µm and a high quality surface finish. "Flatness" is defined by SCHOTT as the accumulated overall possible thickness deviation. This includes warp, intra-slide thickness deviation, and inter-slide thickness tolerance.



Bow and warp



Intra-slide thickness deviation



Inter-slide thickness tolerance

Laser cutting

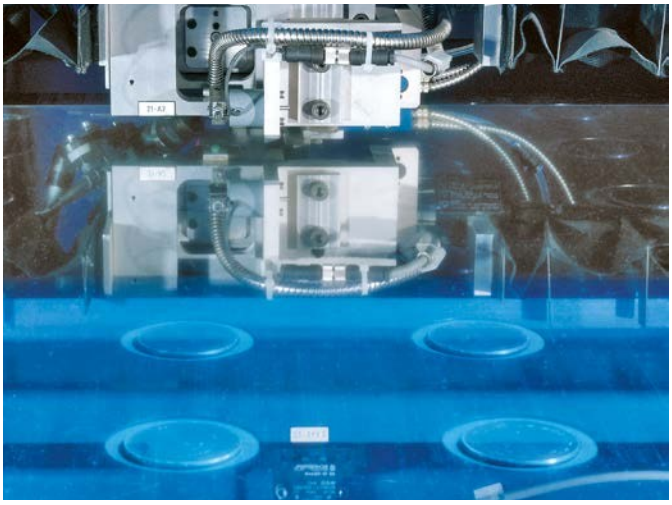
All uncoated and coated substrates are cut to size using an innovative laser system to obtain precise, and highly accurate cut edges with no micro-cracks. A laser beam precisely heats the glass followed by a jet of cold liquid. This thermally induced tension causes a fissure in the glass. This results in the highest possible quality cut, in terms of edge quality and strength. Laser cut edges have a high strength that resists subsequent fragmentation or chipping. This helps to ensure the microarray slide surface remains free of particle contamination.

Edge of a laser cut slide

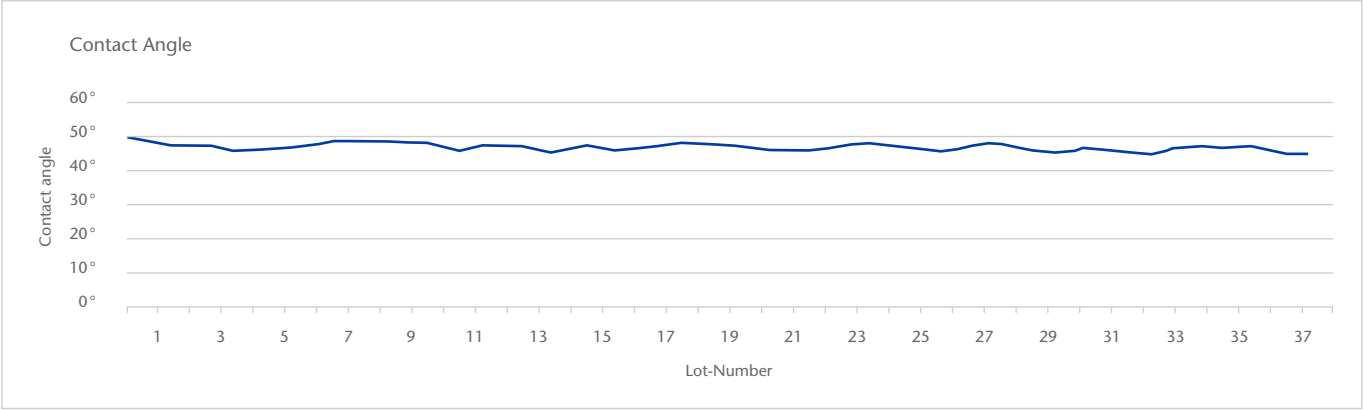
Edge of a conventional slide

State-of-the-art production facility for premium quality microarray slides and reagents

SCHOTT pursues a policy of continued technical excellence to deliver high quality products and services. The company is dedicated to product consistency and reliability – providing scientists with highly reproducible microarray slides. To ensure this, SCHOTT uses only high quality glass substrates and operates a modern and efficient microarray slide production plant. This manufacturing facility, located in Jena, one of Germany's leading biotech clusters, is equipped with state-of-the-art production technology and runs a stringent quality control system. The SCHOTT Technical Glass Solutions GmbH successfully implemented the DIN EN ISO 9001 quality management system, as part of SCHOTT's commitment to offering the highest quality products.



Laser cutting of glass



The contact angle of SCHOTT NEXTERION® coated slides is controlled within every batch and from batch to batch. High consistency is a key criterion for our quality control process.

Unique features of the advanced production facility

- DIN EN ISO 9001 certified production process.
- Use of borosilicate glass manufactured from high purity raw materials to produce slides with extremely low auto-fluorescence.
- Innovative laser-cutting process produces glass slides with tight geometric tolerances, as well as smooth edges free of chips or micro-fractures.
- Highly efficient automated glass cleaning process is used prior to coating to ensure contamination free surfaces.
- Clean slide surfaces are maintained throughout the entire production process, with all steps carried out under class 100 cleanroom conditions.
- Extensive intra-slide and batch-to-batch consistency tests are performed to ensure the highest possible product reproducibility.
- 100 % quality control system ensures geometric precision, and slides free of visible defects and particles.
- Slides are packaged in specially designed slides boxes and sealed in laminated foil pouches for protection during transportation and storage.

General information on coated slides

NEXTERION® barcoded slides

NEXTERION® coatings

SCHOTT offers a wide range of functional coating chemistries for DNA and protein microarraying.

NEXTERION® coated slides are available with a standard functional coating, or also with an additional reflective dielectric layer (NEXTERION® HiSens slides). These innovative, next generation microarray slides were developed to identify low expressor genes, or low-abundant proteins, by offering a significant increase in sensitivity over traditional transparent glass slides. The functional coating and protocol are the same as for standard slides.

The following table indicates the most appropriate slide coating for specific microarray applications (NEXTERION® multiwell slides and plates or optically coated HiSens version of the recommended NEXTERION® coating are also available):

Probe type	Functional coating	NEXTERION® coating	Comments
Oligonucleotides	Epoxysilane	E	First choice for all types of oligonucleotide arrays
	Aminosilane	A+	Popular option for oligonucleotide arrays
	3-D thin film	H	Oligos have to be amino-modified
cDNA/PCR	Aminosilane	A+	
	Epoxysilane	E	
	Aldehydesilane	AL	Alternative for amino-modified cDNA/PCR probes
Bacterial artificial chromosomes (BAC)	Aminosilane	A+	
	Epoxysilane	E	
	Aldehydesilane	AL	Use with amino-modified BACs
aCGH	Aminosilane	A+	
Peptides	Epoxysilane	E	
	Aldehydesilane	AL	Alternative for robust peptide probes
Proteins	3-D thin film	H	
	Epoxysilane	E	
Cells/Tissues	3-D thin film	H	Optimal environment for cells and tissues
Antibodies	Epoxysilane	E	Aldehydesilane /AL
	3-D thin film	H	
Glycans	3-D thin film	H	

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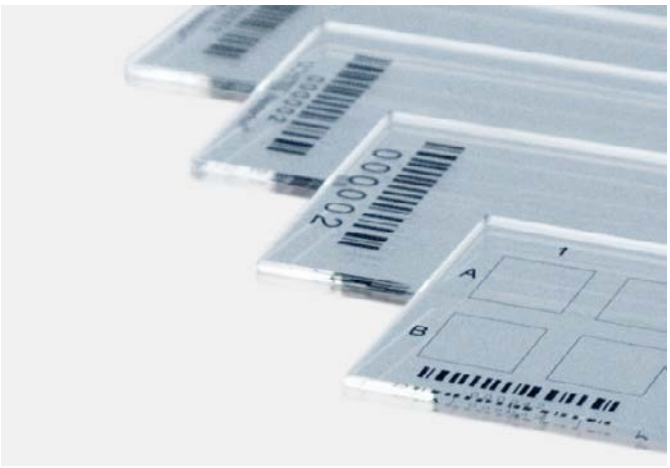
Barcoding

NEXTERION® coated slides are available with or without a barcode. The types of barcodes available are either a label barcode or a special black laser bonded foil barcode.

The barcodes are fully compatible with commercial automated hybridization stations, and are robust enough to withstand standard hybridization and washing procedures.

The barcodes conform to code 128, and are readable with all commonly available microarray scanners and hand-held bar-code readers.



Different barcode options

Packaging

NEXTERION® coated slides are packed in convenient 25 or 30-slide containers for high throughput applications. The boxes are made of a specially developed plastic material to minimize out-gassing, and maintain the slide coating properties. The slide boxes are sealed in tough protective laminated foil pouches under an inert atmosphere.

The specially developed packaging protects the slides from damage due to breakage and external contamination. It also offers protection from the adverse effects of light and humidity during transportation and long-term storage.

25-slide box

Box for 5 MTP plates or 30 slides

5-slide box

Laminated foil pouch with an inert atmosphere to provide a protective environment

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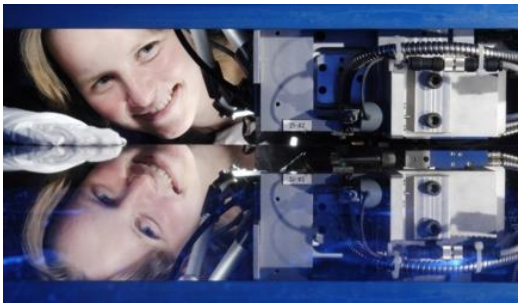
2. Technical support



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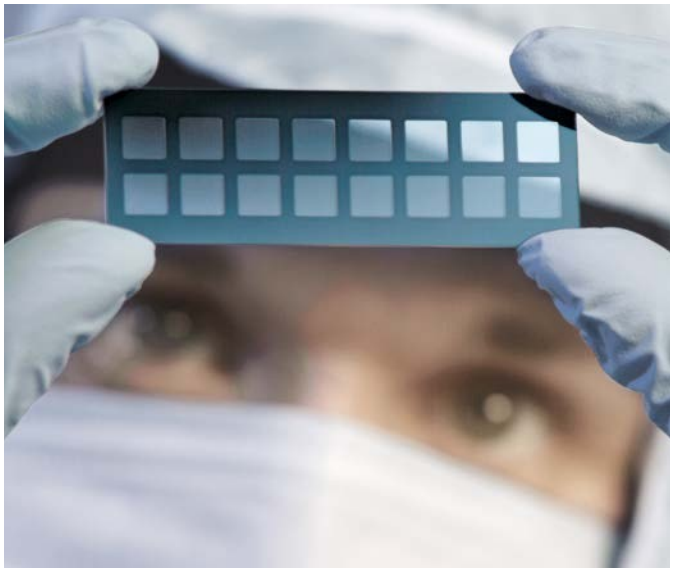
Application and technical support



Visual inspection of microarray slides

Introduction

The NEXTERION® microarray slides and reagents are typically used in "open platform" microarray systems, where users have a wide range of choices of hardware, software and protocols. To help ensure that customers get the best performance from the NEXTERION® microarray products, SCHOTT has established technical support teams in Europe and North America to provide worldwide customer assistance.

Facilities

SCHOTT has fully equipped molecular biology and protein biochemistry laboratories at its main production site in Jena, Germany. The laboratories are equipped for printing, hybridizing, and scanning microarrays in a number of formats. These facilities are invaluable for troubleshooting technical issues, and replicating customer slide processing conditions to solve microarray application problems.

Technical assistance

The technical support in the North American market is done by our distribution partner Applied Microarrays Inc. in cooperation with SCHOTT. Our experts offer support and advice in many aspects of the microarray process including:

- Selection of the most appropriate coating for particular applications
- Selection of optimum printing conditions
- Print buffer selection
- Selection of hybridization reagents and conditions
- Optimized process parameters for automated hybridization stations
- Troubleshooting slide processing issues

The technical support team may be contacted via e-mail, or by telephone for a rapid response. For more in-depth troubleshooting telephone based conferences, or on-site visits could be arranged. The field based technical support personnel have a direct link to the applications and product development group in Germany to ensure a rapid resolution of technical problems.

Technical support for all questions to NEXTERION® substrates

Trouble shooting in fully equipped laboratories

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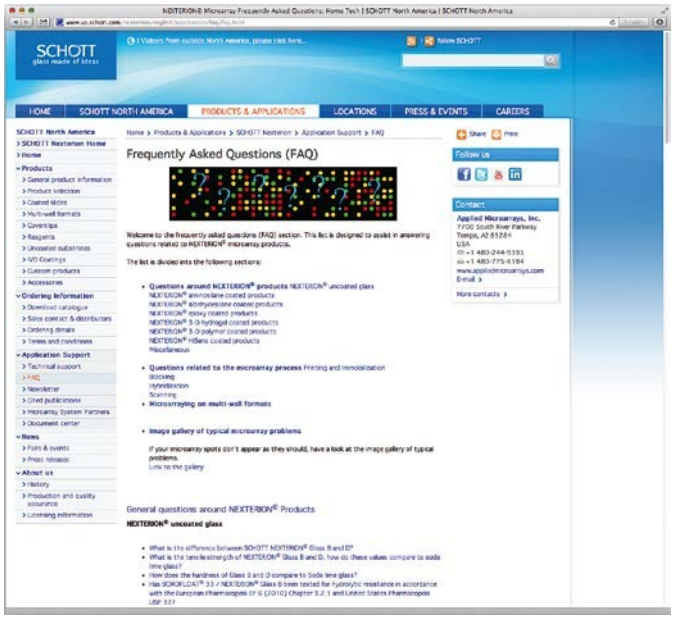
Technical documentation

Technical support documentation from SCHOTT Microarray Solutions is available in printed form, on request via the customer service department or online (www.schott.com/nexterion), where you can access:

- A frequently asked questions (FAQ) list
- New product information
- Product catalogue
- Technical information including:
  – Optimized protocols
  – Instruction manuals for multi-well printing
- Distributor contact details and links
- Cited publication list
- Material safety data sheet (on request)



NEXTERION® FAQ-List

For rapid technical assistance please contact our technical support at:

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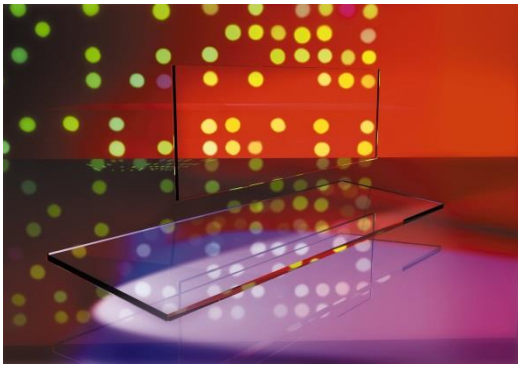
3. Coated substrates



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Aldehydesilane coating

NEXTERION® Slide AL

Introduction

NEXTERION® Slide AL offers a good alternative to NEXTERION® Slide E (Epoxysilane slides) when an efficient covalent, and directed binding of amino-modified bio-molecules is required. NEXTERION® Slide AL is coated with an "active" slide chemistry coating that chemically binds bio-molecules to provide a high binding capacity, and minimize non-specific binding. The uniform surface features aldehyde groups that readily react with primary amines. Both 5' or 3' amine modified PCR products and oligonucleotides work well with this surface chemistry.

The covalent bond formed at the terminus of the nucleic acid offers both stability, and maximal base pairing opportunity. The covalent binding diminishes sample loss during the course of experiments, and permits more harsh wash steps, which reduce background and allow for greater sensitivity. Additional immobilization steps, such as baking or UV cross-linking, are not required for immobilization. Furthermore, peptides, proteins (such as antibodies), cells, and tissues can be immobilized on NEXTERION® Slide AL via random binding to amine sites on the probes. The slides are easy to use, and are compatible with all commercially available arraying and scanning instruments.

Type of coating	Immobilization method	Typical probes	Ordering information			
			NEXTERION® product	Barcode option	Item number	Slides per pack
Aldehydesilane 2-D surface	Amine reactive chemistry Covalent binding	• Amino-modified PCR products, BACs and oligonucleotides	Slide AL	None	1064874	25
				Laser	1064876	25

Key product features

- Stable and covalent binding of probes such as amino-modified nucleic acids, cells, and peptides
- Optimal accessibility of probes through specific end-point attachment

Typical applications

- Array CGH using whole genome tiling path BAC arrays
- miRNA expression profiling
- Indel oligonucleotide arrays for genotyping
- 16S rRNA-based taxonomic microarray
- Protein-DNA interaction studies
- Protein-protein interaction studies

Suitable probe types

- Amine-PCR products and BACs
- Amino-modified oligonucleotides
- Small protein fragments such as peptides
- Cells and tissues

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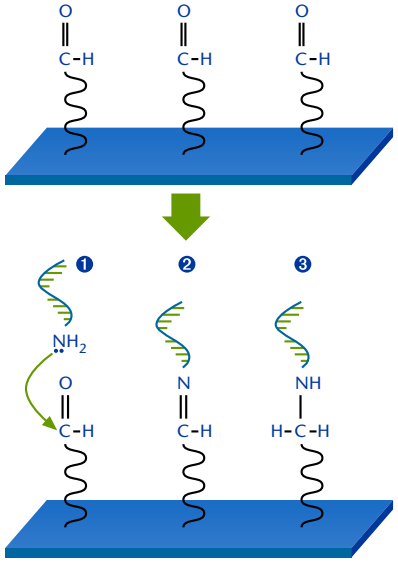
Immobilization chemistry

The DNA product is spotted onto the aldehydesilane slide. The primary amino linkers (NH_2) on the DNA attack the aldehyde groups to form covalent bonds (Schiff's base). The attachment is stabilized by a dehydration reaction. To minimize the fluorescent background, unreacted aldehyde groups are reduced to non-reactive primary alcohols by treatment with sodium borohydride. In addition, this step reduces the double bond between the probe and surface, producing an irreversible covalent immobilization. Additional steps for immobilization, such as baking or UV cross-linking, are not required.

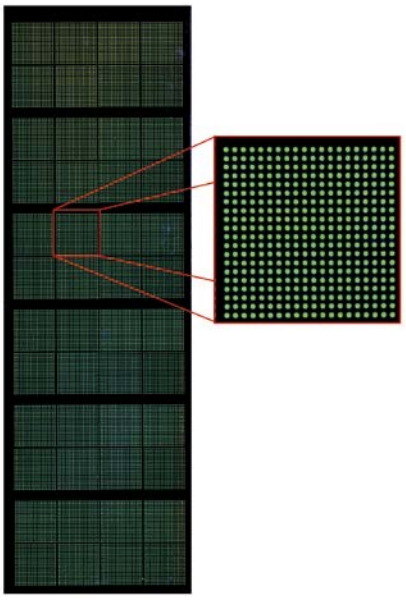


Coating chemistry of NEXTERION® Slide AL

Product details

Highly reproducible coating

NEXTERION® Slide AL is produced using an innovative process developed by SCHOTT to produce a consistent and reproducible coating. All slides are individually examined for physical defects and the presence of particles before and after coating. The density of the aldehyde groups on the coating remain constant over the entire surface of the slides, and has been optimized to provide optimal binding capacity. The surface hydrophobicity is tightly controlled to optimize the performance with both contact and non-contact printers.



High intra-slide reproducibility of NEXTERION® Slide AL (20 k array of BSA labelled with Atto 547)

Packaging and storage

NEXTERION® Slide AL are packaged in chemically stable plastic boxes and sealed in an inert atmosphere. The slides are ready-to-use from the box, and are stable for 9 months in the sealed packaging when stored at room temperature.

Format

The slides are available in packs of 25 slides with optional code 128 barcodes enabling automated sample tracking. The aldehydesilane coating is also available in multi-well slide and microplate formats. For further information, refer to the section on "Multi-well formats".

Protocols

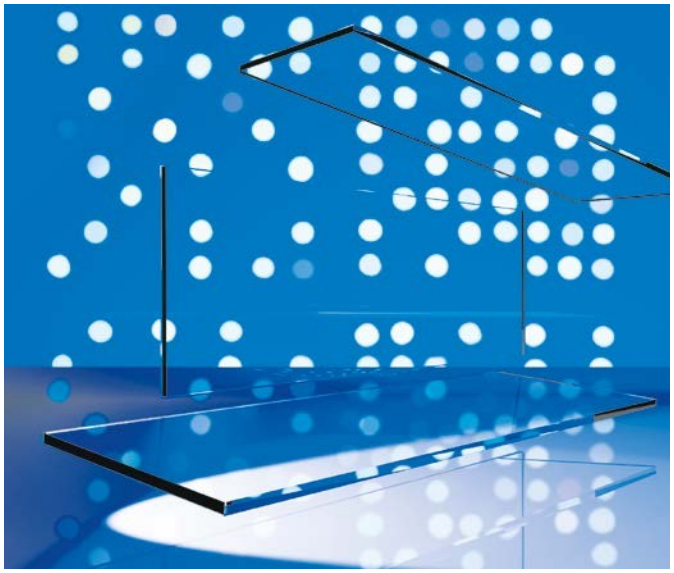
Separate NEXTERION® Slide AL protocols are available for DNA or protein microarray applications.

Compatible reagents

Protocol step	Recommended NEXTERION® products	Alternatives	Additional information
Spotting	NEXTERION® Spot (1066029)	NEXTERION® Spot + detergents like cetyltrimethylammonium-bromid, Triton X-100, sarcosyl, Tween or SDS with a final concentration between 0.005 and 0.05 % (to increase the spot size)	**Recommended Spotting Concentrations:** PCR products: 0.1 – 1 µg/µL Oligonucleotides: 10 – 20 µM Peptides: 100 – 500 µg/mL **Recommended Spotting Conditions:** Constant relative humidity 40 – 50 % at 20 – 24 °C (68 to 75 °F). Spotting solutions may be used with, or without protein-stabilizing agents
		3x SSC	
		3x SSC + 1.5 M betaine (low evaporation buffer for long spotting runs)	
Chemical deactivation	–	1.0 g $NaBH_4$ in 300 mL PBS and 100 mL ethanol	
Hybridization	NEXTERION® Hyb (formamide free) (1066075)	3 – 5x SSC + 0.1 % SDS	Add competitor DNA if appropriate

Aminosilane coating

NEXTERION® Slide A+



Introduction

Aminosilane-coated slides remain the most popular choice for printing PCR products, and long oligonucleotides, despite the emergence of innovative three-dimensional microarray surfaces, and other "active" surface chemistries, such as epoxysilane.

Aminosilane surfaces provide available amine groups for initial ionic attachment of the negatively charged phosphate groups in the DNA backbone. The density of the amino-groups on NEXTERION® Slide A+ remains constant over the entire surface of the slide and is adjusted to yield optimal binding.

Type of coating	Immobilization method	Typical probes	Ordering information			
			NEXTERION® product	Barcode option	Item number	Slides per pack
Aminosilane 2-D surface	Ionic interaction followed by cross-linking via an additional UV or baking step	• Long oligo-nucleotides • PCR products • BACs	Slide A+	None	1064875	25
				Laser	1064877	25

Key product features

- Printed slides have a long shelf life
- Compatible with a wide range of spotting buffers
- Coatings with uniform aminosilane density
- Regular spot uniformity and morphology

Typical applications

- ArrayCGH
- Transcriptional profiling
- SNP genotyping
- Splice variant detection
- DNA methylation profiling

Suitable probe types

- BACs or PACs
- Oligonucleotides ≥ 40 mers
- PCR fragments
- cDNA

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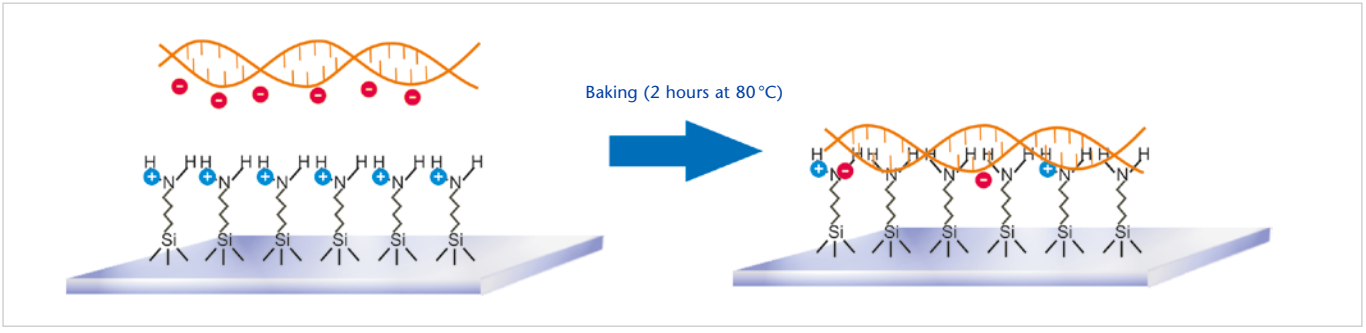
Immobilization chemistry

NEXTERION® Slide A+ has a high concentration of primary amino-groups available at the surface. These groups become protonated and therefore positively charged when placed in contact with a near-neutral, aqueous solution. Negatively charged probe molecules, such as DNA, will initially form multiple ionic interactions with the positively charged amino surface coating. Additional amino-modifications of the nucleic acids are not required, but such modifications do not interfere with the immobilization. After spotting, the probes are covalently linked to the slide surface by either heating, or a brief exposure to ultraviolet (UV) light. Other types of negatively charged biomolecules may also be coupled to aminosilane surfaces.



Coatimg chemistry of NEXTERION® Slide A+

Product details

Reproducible results

SCHOTT slides are manufactured from a high quality, low intrinsic fluorescence borosilicate glass. The glass slides are cleaned and coated in a class-100 environmentally controlled clean room to ensure contamination and artifact-free surfaces. The aminosilane coating is applied using a unique and innovative method developed and optimized by SCHOTT, that allows the production of large lot sizes with excellent intra-lot, and inter-lot reproducibility. Each slide lot is tested using both physical and functional quality control checks. The density of the aminosilane groups in the coating remains uniform over the entire surface of the slides, and is optimized to maximise the DNA binding capacity. The surface hydrophobicity is tightly controlled to optimize the performance with both contact and non-contact microarray printers.

NEXTERION® Slide A+ is compatible with the most commonly used aminosilane protocols and a wide range of spotting buffers. This makes it easy to evaluate and switch to the NEXTERION® aminosilane slides from competitor slides.

Packaging and storage
NEXTERION® Slide A+ are packaged in specially developed compatible plastic boxes, and sealed under an inert atmosphere, to ensure the substrates have a long and stable shelf life. The slides are ready-to-use from the box, and are stable for up to 9 months when stored at room temperature in the sealed packaging.

Protocols
NEXTERION® Slide A+ protocols are available on the NEXTERION® website.

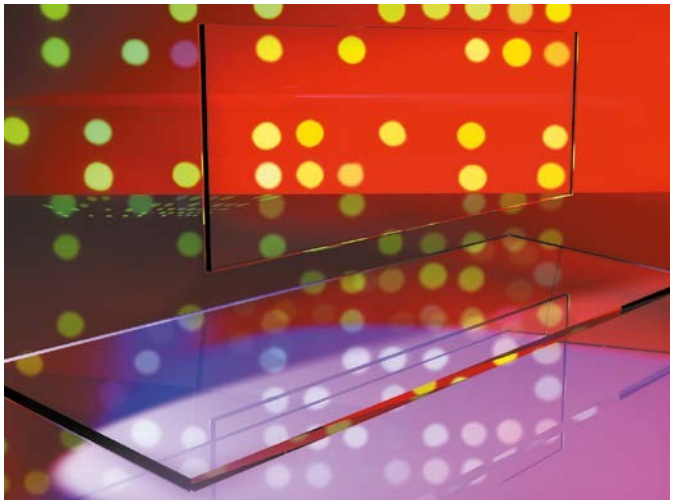
Format
NEXTERION® Slide A+ are available in packs of 25 slides with optional code 128 barcodes enabling automated sample tracking. The NEXTERION® A+ coating is also available in multi-well slide and microplate formats. For further information, refer to the section on "Multi-well formats".

Compatible reagents

Protocol step	Recommended NEXTERION® products	Alternatives	Additional information
Spotting	NEXTERION® Spot (1066029)	NEXTERION® Spot A HD (Composition can be provided)	**Recommended Spotting Concentrations:** Oligonucleotides 2–20 µM PCR Products 0.5–1 mg/mL **Recommended Spotting Conditions:** Constant 40–50% relative humidity at 20 to 25 °C
		25–50% DMSO	
		3x SSC 3x SSC containing	
		1.5 M betaine	
Blocking		NEXTERION® Block A Kit (Composition can be provided)	
Hybridization	NEXTERION® Hyb (1066075)	NEXTERION® Oligo Hyb (Composition can be provided) 3–5x SSC + 0.1% SDS	Add competitor DNA if appropriate

Epoxysilane coating

NEXTERION® Slide E



Introduction

NEXTERION® Slide E is the market-leading epoxysilane coated slide from SCHOTT. The slides are manufactured from high quality borosilicate glass that has an ultra flat surface and low inherent fluorescence.

The glass is coated with a multi-purpose epoxysilane layer that will covalently bind most types of bio-molecules including amino- and non-modified DNA, RNA, and proteins. The defect-free surface features a uniform epoxysilane layer that provides a high covalent coupling efficiency together with a very low background.

The slides are easy to use, and are fully compatible with all commercially available arraying and scanning instruments.

Type of coating	Immobilization method	Typical probes	Ordering information			
			NEXTERION® product	Barcode option	Item number	Slides per pack
Epoxysilane 2-D surface	Amino-, thiol- and hydroxyl- reactive chemistry Covalent binding	• Amino-modified or unmodified oligos, mRNA, PCR and BACs • Proteins	Slide E	None	1066643	25
				Laser	1064016	25

Suitable probe types

- Amino-modified oligonucleotides 20–70 mers
- Unmodified oligonucleotides 20–70 mers
- Amino-modified PCR products
- ZIP-code oligonucleotides
- PCR products
- BAC/PACs
- L-DNA
- cDNA
- RNA
- Serum samples
- Antibodies
- Peptides
- Glycans

Key product features

- Covalent and directed binding of DNA and proteins
- Multi-purpose microarray slide coating
- Hydrophobic coating enables the spotting of high-density arrays
- Stability of the epoxy chemistry supports long print runs

Typical applications

- Transcriptional profiling
- MicroRNA
- Array-CGH
- SNP detection
- ZIP-code universal microarray
- Pathogen identification
- Subtelomere arrays
- Functional protein arrays

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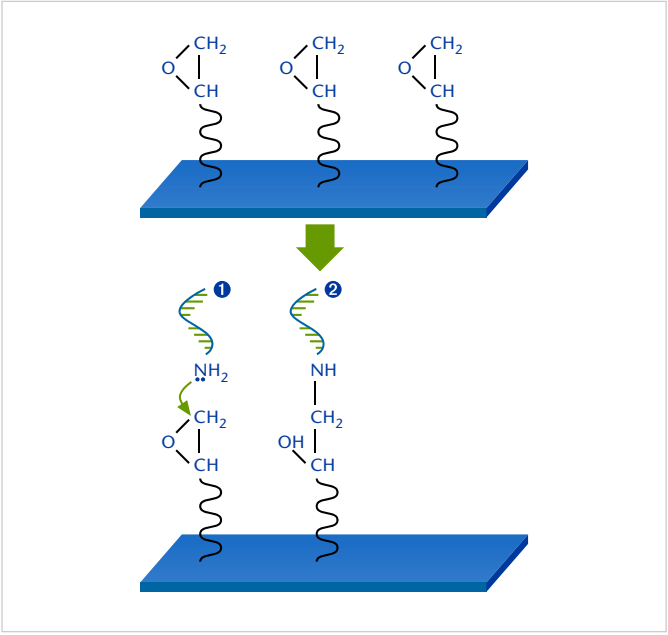
Immobilization chemistry

The diagram shows a schematic representation of an amino-modified DNA molecule coupling to NEXTERION® Slide E. Amino-modified nucleic acids bind via the terminal amino group, as well as via exocyclic amino groups of the bases, and hydroxyl groups of the sugar-phosphate backbone. Unmodified nucleic acids will bind to an epoxysilane surface with almost the same efficiency via the exocyclic amino groups of the bases, and hydroxyl groups of the backbone.



Coating chemistry of NEXTERION® Slide E

Other bio-molecules, such as proteins, bind via their exposed amine-, thiol- and hydroxyl-groups. The reaction with the epoxy group is rapid and irreversible and no additional baking or UV cross-linking steps are required. Any unreacted epoxy group may be chemically deactivated after printing to significantly reduce non-specific binding of the target molecules to the slide surface. Molecular spacers between the glass slide and the epoxy groups facilitate interactions between the printed bio-molecules and their binding partners in solution.

Product details

Highly reproducible coating

NEXTERION® Slide E is produced using an innovative proprietary process developed by SCHOTT to produce a uniform and reproducible epoxysilane coating on both sides of a high quality borosilicate glass slide. All slides are individually examined for physical defects and the presence of particles before and after coating. The epoxysilane surface is applied in tightly controlled, class-100 clean room facility, resulting in coated slides with highly uniform surface properties and low autofluorescence.

Fully optimized surface

NEXTERION® Slide E provides excellent spot morphologies and reproducible spot sizes with a variety of commonly used spotting buffers. The surface chemistry is robust and stable, and remains active even during very long print runs. The density of the epoxy groups in the coating is constant over the entire surface of the slides, and has been optimized to provide uniform spot size and shape and optimal binding capacity. Another important parameter, surface hydrophobicity, is also tightly controlled to optimize the performance of the slides with both contact and non-contact printers.

Packaging and storage

NEXTERION® Slide E are packaged in chemically stable plastic boxes and sealed under an inert atmosphere. The slides are ready-to-use from the box, and are stable for 12 months in the sealed packaging when stored at room temperature.

Format

The slides are available in packs of 25 slides with optional code 128 barcodes enabling automated sample tracking. The identical epoxysilane coating is also available in multi-well slide and microplate formats. For further information, refer to the section on “Multi-well formats”.

Protocols

Separate NEXTERION® Slide E protocols are available for DNA and protein microarray applications.

Compatible reagents

Process step	SCHOTT products	Alternatives	Remarks
Spotting	NEXTERION® Spot (1066029)	NEXTERION® Spot + detergents like Cetyltrimethylammonium-bromide, Triton X-100, sarcosyl, Tween or SDS with a final concentration between 0.005 and 0.05 % (to increase the spot size)	**Recommended Concentrations:** Oligonucleotides: 10 – 20 µM PCR products: 0.1 – 0.5 µg/µL
		3x SSC	
		NEXTERION® Spot LE (low evaporation buffer) (composition can be provided)	
Chemical deactivation of unreacted Epoxy groups	NEXTERION® Block E (1066071)	50 mM ethanolamine + 0.1 % SDS in 0.1 M Tris, pH 9.0	
		NEXTERION® Oligo Pre-Hyb (composition can be provided)	
Hybridization	NEXTERION® Hyb (1066075)	3 – 5x SSC + 0.1 % SDS	No formamide
		NEXTERION® Oligo Hyb (composition can be provided)	Contains formamide
Washing steps	–	NEXTERION® Wash A and B (composition can be provided)	

For customers with probes dissolved in DMSO, please refer to the SCHOTT NEXTERION® Internet site or contact our technical support team for further assistance

Three-dimensional thin film coating

NEXTERION® Slide H

Introduction

SCHOTT launched NEXTERION® Slide H as a dedicated slide surface for printing protein microarrays, as it is ideally suited for the covalent immobilization of peptides and proteins such as antibodies, antibody fragments, enzymes, or receptors. For many protein microarray applications NEXTERION® Slide H has proven to be a very attractive alternative to the commonly used nitrocellulose coated slide, especially where low background, or slide transparency are important considerations. Since its introduction, the slide coating has also been successfully used with amino-modified oligonucleotides, and has become the slide of choice for printing amino-linked glycan microarrays. Carbohydrate arrays are a rapidly growing area of microarray research and NEXTERION® Slide H is an excellent choice for use in the rapid screening of carbohydrate-protein interactions. The permeable, polymer coating has a large immobilization capacity, and helps to preserve the native three-dimensional structure of complex bio-molecules, thus maintaining conformation and functionality.

NEXTERION® Slide H produces excellent signal-to-background ratios and an exceptionally wide dynamic range compared to conventional "two-dimensional" coatings through a unique combination of low non-specific binding characteristics, and high probe loading capacity. Even very low intensity signals, such as those obtained from low-abundance analytes, or weakly expressed genes can be reliably detected and quantified on NEXTERION® Slide H. The robust coating matrix is fully compatible with commercial microarray printers and scanners. Simple and robust protocols are available, making NEXTERION® Slide H easy to use.

Type of coating	Immobilization method	Typical probes	Ordering information			
			NEXTERION® product	Barcode option	Item number	Slides per pack
Thin film 3-D polymer surface	Amine reactive chemistry Covalent binding	• Proteins • Amino-linked glycans • Amino-linked oligonucleotides	Slide H	Laser	1070936	25

Key product features

- Ideal substrate for printing protein, amino-modified glycans or oligonucleotide microarrays
- High probe loading capacity
- Exceptionally wide dynamic range
- Very low non-specific binding characteristics
- Optimal preservation of native structure and biological activity of protein probes
- Compatible with all common microarray printers and scanners

Suitable probe types

- Antibodies and antibody fragments
- Functional proteins such as enzymes or receptors
- Small protein fragments such as peptides
- Amino-modified oligonucleotides 16 to 70 mers
- Amino-linked glycans
- Cells

Typical applications

- Proteome expression profiling
- Functional protein arrays
- Transcriptional profiling
- Biomarker discovery
- Detection of protein modifications
- Carbohydrate–protein interactions
- Bacteria serotyping
- Immunoassays

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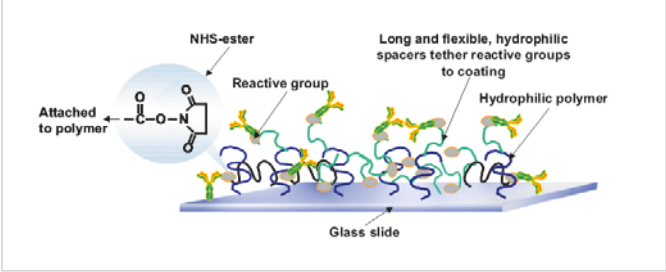
Immobilization chemistry

The coating on the SCHOTT NEXTERION® Slide H consists of a cross-linked, multi-component polymer layer, activated with N-Hydroxysuccinimide (NHS) esters to provide covalent immobilization of amine groups. All NEXTERION® microarray slides are manufactured from a high quality, low-fluorescence glass coated with low-fluorescence coatings. However, the non-specific binding of assay components still remains an important contributor to the off-feature background for many microarray applications. For most types of slide coatings the post-print processing protocol involves a method of adsorptive blocking to reduce non-specific binding. However, these procedures are difficult to perform in a consistent manner.



Coating chemistry NEXTERION® Slide H

The NEXTERION® Slide H coating has been engineered to exhibit a very low intrinsic non-specific background without the need for blocking. This is achieved by using a polymer-based layer that is extremely resistant to non-specific binding. The polymer coating has a three-part structure; NHS-ester reactive groups are attached to the cross-linked hydrophilic polymer layer via long, flexible spacers. The terminal amino group of amino-modified nucleic acids and glycans react immediately and irreversibly with the NHS-ester groups to form a covalent bond. Proteins and other bio-molecules bind via surface-exposed amine-groups. The flexible spacers tether the immobilized bio-molecules in a quasi-liquid environment that maintains the protein specificity and chemical conformation. The high accessibility of the tethered bio-molecules facilitates interactions with their binding targets in a solution.

Product details

Highly reproducible coating

NEXTERION® Slide H is fabricated using a proprietary thin-film deposition process optimized by SCHOTT to produce a uniform and reproducible polymer coating on one side of a high quality borosilicate glass slide. All slides are individually examined for physical defects and the presence of particles before and after coating. The surface is applied in a tightly controlled, class-100 clean room facility, resulting in coated slides with highly uniform surface properties and low auto-fluorescence.

Excellent spot morphology and signal-to-background ratios

NEXTERION® Slide H provides excellent spot morphologies and reproducible spot sizes over a wide range of probe concentrations for protein, oligonucleotide and other bio-molecule microarray applications.

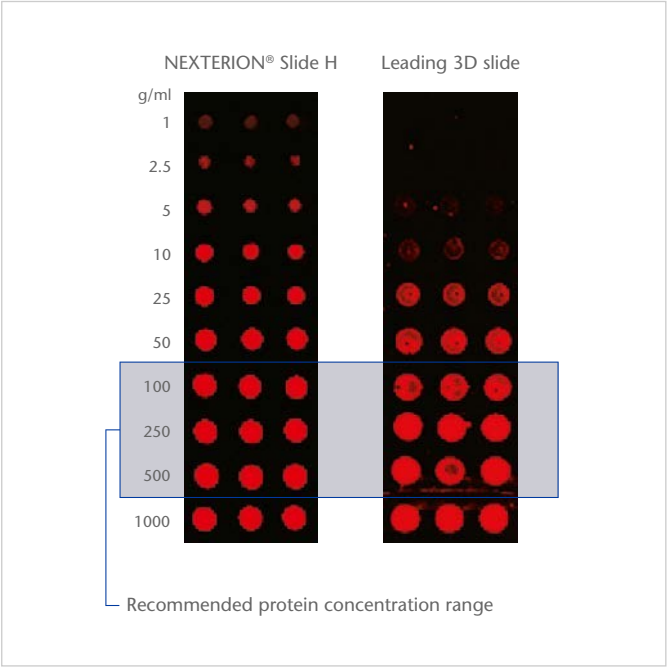


Figure shows scanned images of NEXTERION® Slide H when evaluated against the market leading three-dimensional competitor slide in an anti-IgG/IgG interaction study using a range of probe concentrations.

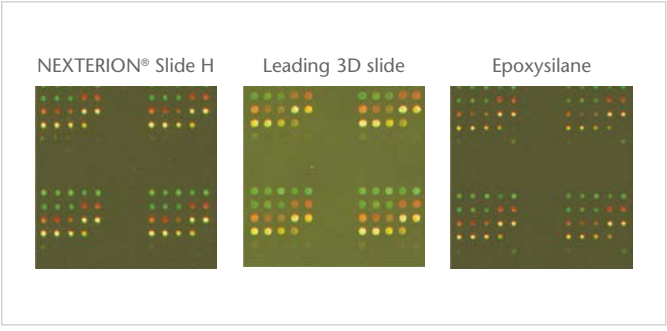


Figure illustrates the superior signal-to-background ratios on NEXTERION® Slide H when compared to the market leading three-dimensional slide, and a conventional two-dimensional coating. This was demonstrated in two-color hybridization experiments following the recommended protocols, using amino-modified oligonucleotide probes.

Packaging and storage
NEXTERION® Slide H are packaged in chemically stable plastic boxes and sealed under an inert atmosphere. The slides are ready-to-use from the box, and are stable for 12 months in the sealed packaging when stored at –20 °C.

Format
NEXTERION® Slide H is available in packs of 25 slides with code 128 barcodes enabling automated sample tracking. The identical coating is also available in a 16-well slide format. For further information, refer to the section on "Multi-well formats".

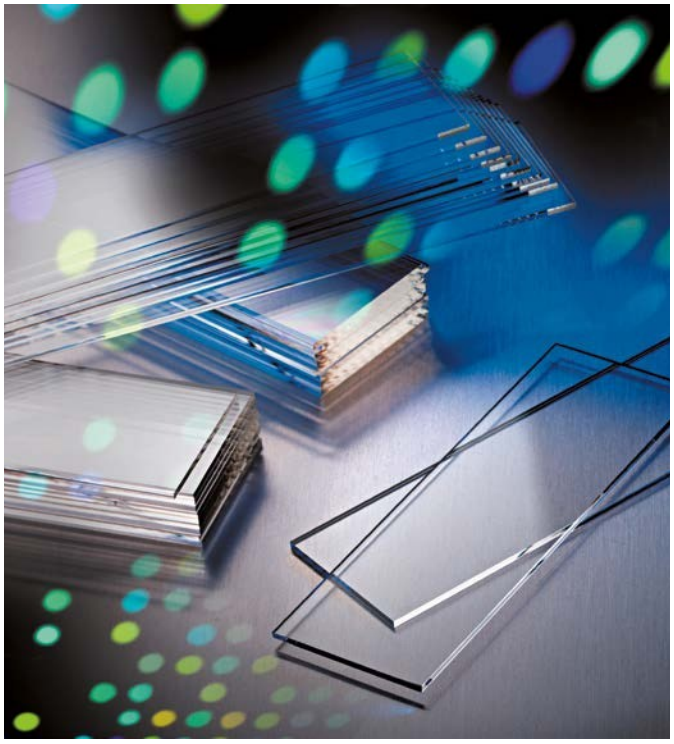
Protocols
Separate NEXTERION® Slide H protocols are available for DNA and protein microarray applications.

Compatible reagents

Process step	SCHOTT products	Alternatives	Recommended concentrations
Spotting (Protein)	–	150 mM phosphate, pH 8.5, 5 % glycerol, 0.1 mg/mL BSA, 0.01 % sarcosyl or Tween20®	Protein concentration 0.1 to 1 mg/mL
		NEXTERION® Spot PB (composition can be provided)	
Spotting (DNA)	NEXTERION® Spot (1066029)	300 mM sodium phosphate (pH 8.5) containing 0.005 % Tween20® and 0.001 % sarcosyl 150 mM sodium phosphate (pH 8.5) containing 0.001 % Tween20®	Oligonucleotides: 20 µM
Chemical deactivation of unreacted NHS-esters	–	50 mM ethanolamine in 50 mM sodium borate buffer pH 8.0 – 9.0	
Incubation (Protein)	–	137 mM NaCl, 2.7 mM KCl, 4.3 mM Na_2HPO_4, 1.4 mM KH_2PO_4, pH 7.5 with 0.5 % Tween20®	
Hybridization (DNA)	NEXTERION® Hyb (1066075)	2x SSC containing 0.1 % SDS and 0.1 % salmon sperm DNA (formamide can be added if required)	
		NEXTERION® Oligo Hyb (composition can be provided)	

Three-dimensional thin film coating

NEXTERION® Slide P



Introduction

SCHOTT specifically developed NEXTERION® Slide P as a dedicated slide surface for printing arrays for comparative genomic hybridization (aCGH), as it is ideally suited for the covalent immobilization of long amino-modified DNA molecules such as BAC and PAC clones.

NEXTERION® Slide P produces excellent signal-to-background ratios and an exceptionally wide dynamic range compared to conventional "two-dimensional" coatings through a unique combination of low non-specific binding characteristics, and high probe loading capacity. Since its introduction, the slide coating has also been successfully used for printing antibody and other protein arrays.

The permeable polymer coating has a large immobilization capacity, and helps to preserve the native three-dimensional structure of complex bio-molecules, thus maintaining conformation and functionality. The robust coating matrix is fully compatible with commercial microarray printers and scanners. Simple and robust protocols are available, making NEXTERION® Slide P easy to use.

Type of coating	Immobilization method	Typical probes	Ordering information			
			NEXTERION® product	Barcode option	Item number	Slides per pack
Thin film 3-D polymer surface	Amine reactive chemistry Covalent binding	• Amino-linked BACs, PACs • Antibodies • Proteins • Peptides • Glycans	Slide P	Laser	1167904	25

Key product features

- Ideal substrate for printing amino-modified BACs and antibody microarrays
- High probe loading capacity
- Exceptionally wide dynamic range
- Extremely low non-specific binding characteristics
- Optimal preservation of native structure and biological activity of protein probes
- Compatible with all common microarray printers and scanners

Typical applications

- Array comparative genomic hybridization (aCGH)
- Antibody profiling
- Protein expression profiling
- Functional protein arrays
- Characterization of binding molecules
- Biomarker discovery
- Substrate profiling

Suitable probe types

- Amino-modified BACs, PACs and PCR products
- Amino-modified oligonucleotides
- Antibodies
- Functional proteins such as enzymes or receptors
- Peptides
- Glycans

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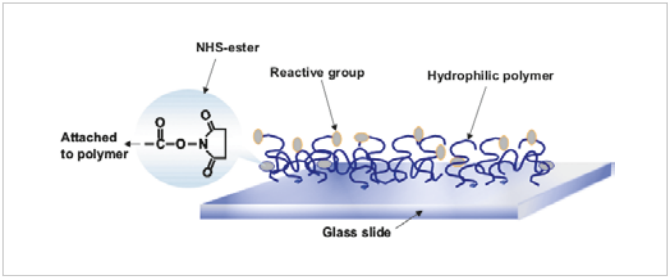
Immobilization chemistry

The coating on the SCHOTT NEXTERION® Slide P is a three-dimensional hydrophilic polymer activated with N-Hydroxy-succinimide (NHS) esters to provide covalent immobilization of amine groups. All NEXTERION® microarray slides are manufactured from a high quality, low-fluorescence glass coated with low-fluorescence coatings. However, the non-specific binding of assay components still remains an important contributor to the off-feature background for many microarray applications. For most types of slide coatings the post-print processing protocol involves a method of adsorptive blocking to reduce non-specific binding. However, these procedures are difficult to perform in a consistent manner.



Coating chemistry of NEXTERION® Slide P

The NEXTERION® Slide P coating has been engineered to exhibit an extremely low intrinsic non-specific background without the need for blocking. This was achieved by using a special polymer that is extremely resistant to non-specific binding. During in-house tests run by SCHOTT, NEXTERION® Slide P had the lowest background signal of any microarray slide coating ever tested. The polymer coating has a three-dimensional structure, with NHS-ester reactive groups attached to a hydrophilic polymer backbone. The terminal amino group of amino-modified nucleic acids react immediately and irreversibly with the NHS-ester groups to form a covalent bond. Proteins and other complex bio-molecules bind via surface-exposed amino-groups. The polymer coating maintains the immobilized bio-molecules in a quasi-liquid environment that maintains the protein specificity and chemical conformation. The three-dimensional polymer structure, combined with the end-point attachment chemistry, orients the immobilized bio-molecules away from the glass, facilitating the interactions of the attached bio-molecules with their binding targets in a solution.

Product details

Highly reproducible coating

NEXTERION® Slide P is fabricated using a proprietary thin-film deposition process developed by SCHOTT to produce a uniform and reproducible polymer coating on one side of a high quality borosilicate glass slide. All slides are individually examined for physical defects and the presence of particles before and after coating. The surface is applied in tightly controlled, class 100 clean room facility, resulting in coated slides with highly uniform surface properties and low auto-fluorescence.

Excellent spot morphology and signal-to-background ratios

NEXTERION® Slide P provides excellent spot morphologies and reproducible spot sizes over a wide range of probe concentrations for protein, oligonucleotide and other bio-molecule microarray applications.

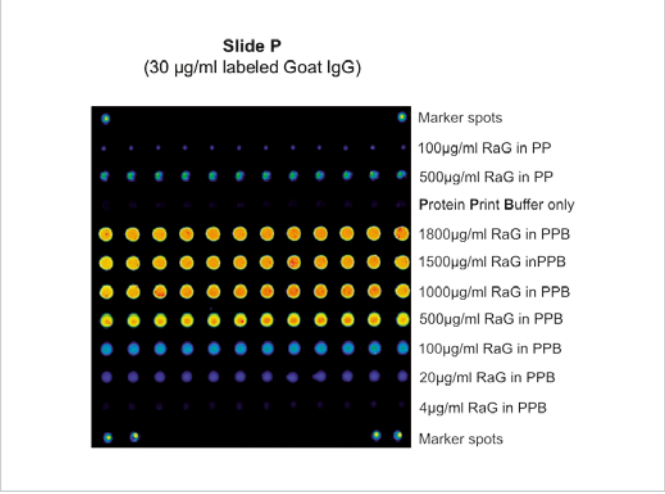


Figure shows scanned images of NEXTERION® Slide P evaluated in an anti-IgG/IgG interaction study over a range of probe concentrations dissolved in NEXTERION® Spot PB and a phosphate print buffer.

Packaging and storage

NEXTERION® Slide P are packaged in chemically stable plastic boxes and sealed under an inert atmosphere. The slides are ready-to-use from the box, and are stable for 12 months in the sealed packaging when stored at –20 °C.

Format

NEXTERION® Slide P is available in packs of 25 slides with code 128 barcodes enabling automated sample tracking. The identical P coating is also available in a 16-well slide and 96-well microplate formats. For further information, refer to the section on “Multi-well formats”.

Protocols

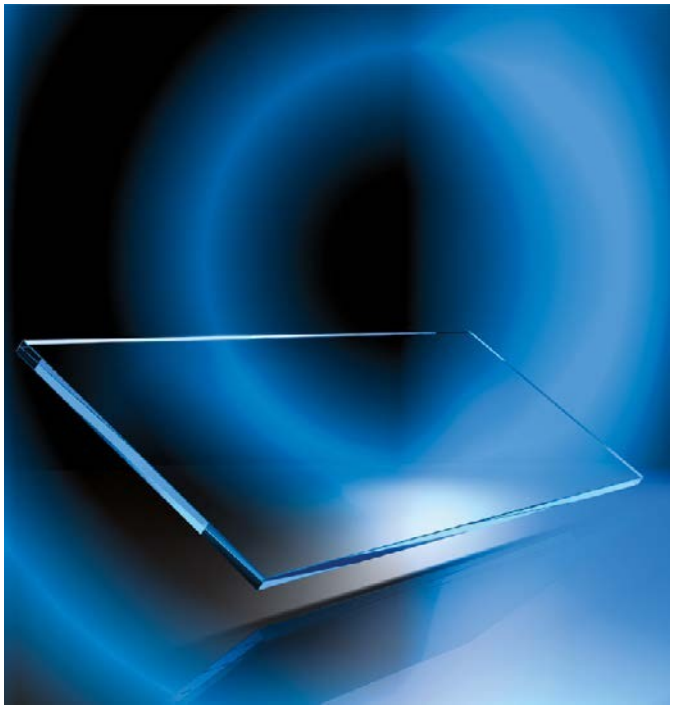
Separate NEXTERION® Slide P protocols are available for DNA and protein microarray applications.

Compatible reagents

Process step	SCHOTT products	Alternatives	Recommended concentrations
Spotting (Protein)	–	150 mM phosphate, pH 8.5, 5 % glycerol, 0.1 mg/mL BSA, 0.01 % sarcosyl or Tween20®	Protein concentration 0.1 to 1 mg/mL
		NEXTERION® Spot PB (composition can be provided)	
Spotting (DNA)	NEXTERION® Spot (1066029)	100 mM borate (pH 8.0), 50 % DMSO	Oligonucleotides: 20 µM
Spotting (Peptides)	–	10 – 50 % DMSO	
Chemical deactivation of unreacted NHS-esters	–	50 mM ethanolamine in 50 mM sodium borate buffer pH 8.0 – 9.0	
Incubation (Protein)	–	137 mM NaCl, 2.7 mM KCl, 4.3 mM Na_2HPO_4, 1.4 mM KH_2PO_4, pH 7.5 with 0.5 % Tween20®	
Hybridization (DNA)	NEXTERION® Hyb (1066075)	2x SSC containing 0.1 % SDS and 0.1 % salmon sperm DNA	
		NEXTERION® Oligo Hyb (composition can be provided)	

Streptavidin Coating

NEXTERION® Slide HS



Introduction

NEXTERION® Slide HS is especially developed for binding all types of biotinylated molecules.

Streptavidin is a protein purified from Streptomyces avidinii that binds biotin very tightly. This ability is widely exploited in molecular biology applications, such as the purification of proteins. Biotin-tagged molecules can be selectively bound to streptavidin molecules immobilized on a solid support. This feature can also be used for microarray applications, where Streptavidin-coated glass microscope slides represent the solid support.

NEXTERION® Slide HS is manufactured using high quality, low auto-fluorescence borosilicate glass. The specially developed two-stage coating process produces a very high density, as well as an extremely uniform coating of streptavidin molecules. The resulting surface has a very high binding capacity combined with a low signal variance across a single slide, between slides and between batches. These factors make Slide HS an ideal surface for developing diagnostic applications.

Type of coating	Immobilization method	Typical probes	Ordering information			
			NEXTERION® product	Barcode option	Item number	Slides per pack
Streptavidin	Non-covalent binding via biotin	Biotin tagged probes as: • Proteins • DNA • Chromosomes • Cells	Slide HS	No barcode, corner orientation mark is applied	1087816	25

Key product features

- Highly specific binding of biotinylated molecules
- Low non-specific binding
- High binding capacity
- Low intra-slide signal variance
- High density and uniform coating of streptavidin molecules

Suitable Probe Types

- All molecules that can be biotinylated

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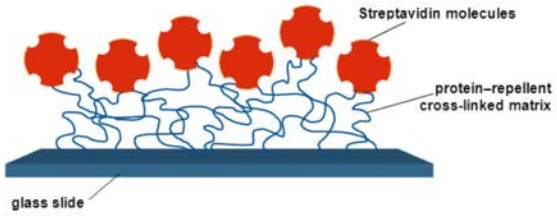
Immobilization chemistry

The NEXTERION® Slide HS coating consists of a three-dimensional thin film polymer base layer (H) and a top layer of highly uniform covalently linked streptavidin (S). First a protein-repellent, cross-linked, three-dimensional matrix is applied to the glass slide. Then a layer of Streptavidin molecules is covalently linked to the base coating. The underlying three-dimensional thin film polymer coating shows a very low non-specific binding, significantly reducing the background signals. This, in combination with the high binding capacity of the streptavidin, offers superior signal-to-noise ratios.



Coating Chemistry of NEXTERION® Slide HS

Only one side of NEXTERION® Slide HS is coated, which is indicated by a corner mark. A protective coating is added after manufacturing to protect the activity of the streptavidin layer. This coating must be removed prior to use.

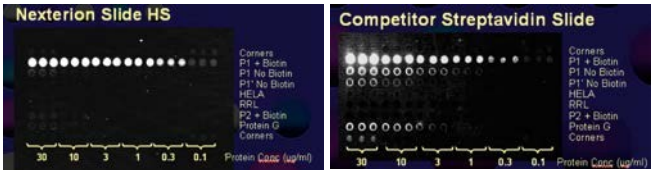
Product details

Spot Morphology

NEXTERION® Slide HS produces excellent spot morphologies and consistent spot sizes for microarray applications based on biotinylated molecules over a wide range of probe concentrations.

Superior specificity for biotin ligand

The NEXTERION® Slide HS surface offers a superiorly selective surface for biotin. In addition, the innovative multi-layer structure helps to stabilize biotinylated bio-molecules.



Biotinylated and non-biotinylated proteins were immobilized to NEXTERION® Slide HS and to a competitor slide.

Superior CVs

The innovative multi-component coating chemistry of NEXTERION® Slide HS, combined with SCHOTT's high quality manufacturing process, produces a surface that gives highly reproducible results.

Excellent non-specific binding characteristics

NEXTERION® Slide HS contains a polymeric cross-linked matrix that was designed to inhibit non-specific binding, and to reduce the risk of high background fluorescence in protein assays.

Superior signal-to-background ratios

The high binding capacity of NEXTERION® Slide HS, combined with specific and selective binding, plus exceptionally low non-specific binding delivers consistently superior signal-to-background ratios essential for diagnostic applications.

Packaging and Storage

The streptavidin layer on Slide HS is very sensitive to elevated temperatures. It is therefore necessary to ship the product in a frozen state with dry ice. The product must immediately be put into a freezer upon arrival. Repeated freeze and thaw cycles should be avoided.

NEXTERION® Slide HS is packaged in chemically stable plastic boxes and sealed under an inert atmosphere. To protect the activity of the streptavidin layer, a protective coating is added on top of the reactive coating prior to packaging. This layer must be removed before printing. The slides are stable for 6 months in the sealed packaging when stored at –20°C.

Format

NEXTERION® Slide HS is available in packs of 25 slides with an orientation mark to identify the printing side.

Protocols

Separate NEXTERION® Slide HS handling guidelines are developed and can be provided.

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4. Multi-well formats

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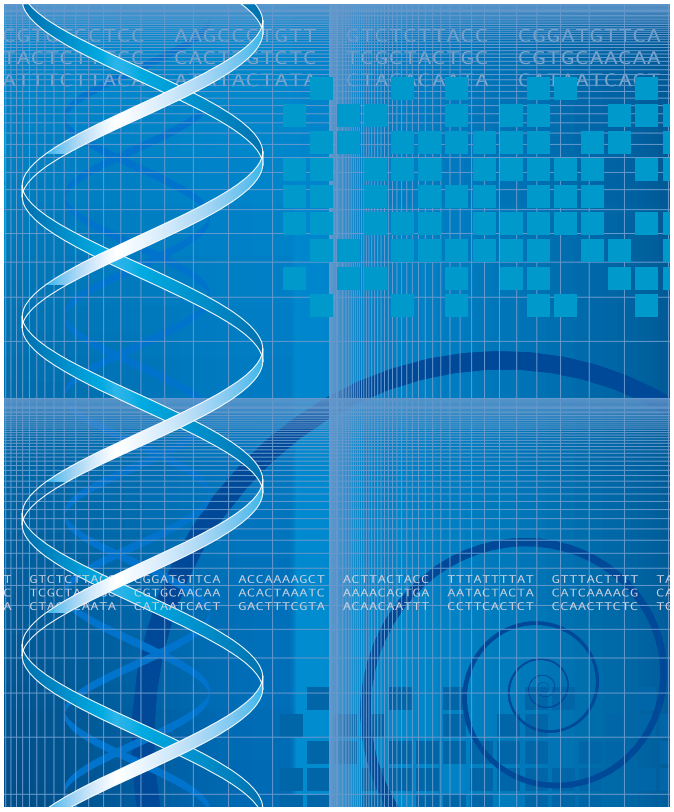
Multi-well formats



Introduction

Multi-well microarray substrates allow the parallel analysis of multiple biological samples against focused subsets of probes. The multi-well format permits a number of versatile assay designs such as multiplexed experiments, side-by-side comparisons, or replicate experiments to be performed. Additional advantages of using multiple well formats include higher array-to-array reproducibility and lower experimental costs when compared to conventional single-array substrates.

SCHOTT can offer multi-well coated substrates in two formats: NEXTERION® Slide MPX-16 on a 75.6 mm x 25.0 mm glass slide, or the NEXTERION® Plate MPX-96 in microplate format. The MPX-16 slide is fully compatible with standard microarray slide printers and scanners, whereas the MPX-96 conforms to the SBS standard format commonly used in clinical diagnostics and drug discovery. In addition 48-wells on slide format as well as 384-wells on plate format or customized well design can be offered on special customer request.

Formats	Immobilization method	Typical applications	
Multi-well slide and SBS microplate format	Various	• Surveillance chips • Virus or bacterial identification	• Molecular diagnostics • Dose response studies

Key product features

- Simultaneous analysis of multiple biological samples in one microarray experiment
- Excellent reproducibility compared to conventional single-array applications
- Optimal use of limited sample material
- Substantial reductions in cost per experiment
- Compatible with standard commercial printing, liquid handling and scanning equipment

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Immobilization chemistry

The multi-well formats are available with functional chemistries and coatings that are identical to the standard NEXTERION® slides, allowing assays to be easily transferred to the high throughput multiwell formats. Please refer to the table in the section “General information coated slides” in order to find the appropriate coating chemistry for your specific application.

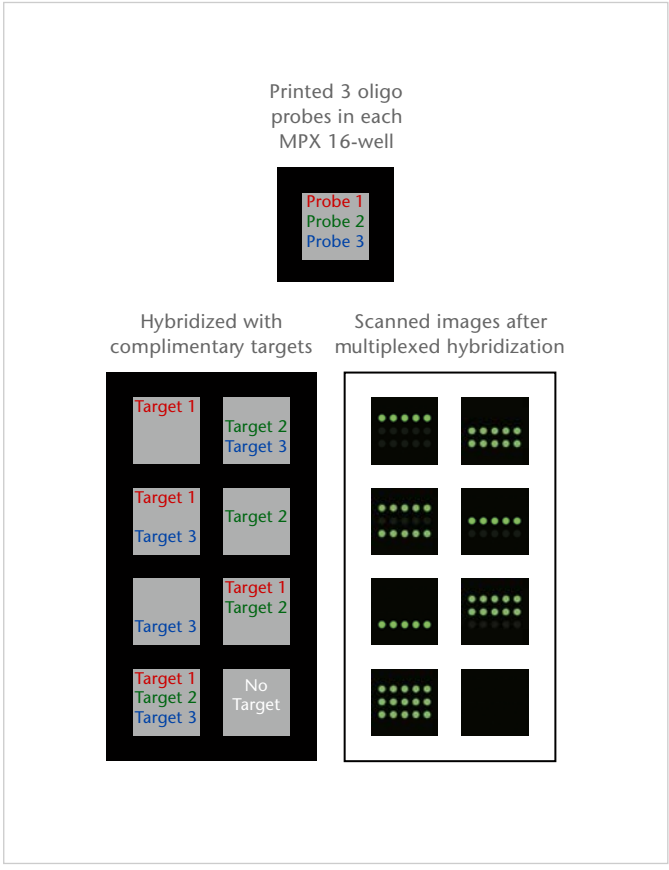
Product details

Hydrophobic multi-well patterning

The microarray quality glass substrates are printed with either a 16- or 96-well hydrophobic patterning, and are available with a number of functional coatings, making both formats suitable for most microarray applications using DNA, proteins, or other bio-molecules as probes. The black patterning material serves several important functions, one of which is to create the individual wells that act as a hydrophobic barrier preventing cross-contamination between the arrays. The well pattern also serves as a registration aid for probe deposition, and a reproducible surface for the adhesion of the silicone superstructure. The absence of well rims makes NEXTERION® multi-well substrates compatible with all microplate arrayers and significantly reduces print times compared to substrates that have recessed wells. The patterned glass substrates have a corner indicator to provide an unambiguous orientation mark. Most modern robotic arrayers are equipped to handle the 96-well microplate formats, and many have pre-programmed definitions for both the NEXTERION® MPX-16 slides and NEXTERION® MTP-96 plates, simplifying the set up process for users. Information on compatible arrayers and detailed instructions for printing into the NEXTERION® multi-well formats are available on request.

Avoidance of cross-contamination

Cross-contamination is avoided during multiplexed hybridization as a result of the 16- or 96-well hydrophobic patterning, and the use of the optional self-adhesive silicone superstructures.

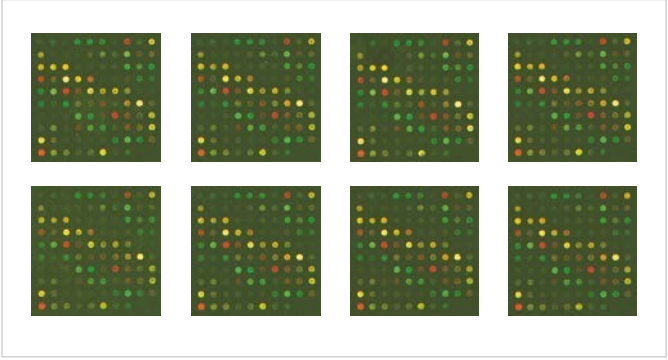


The figure shows a pictorial representation of sub-array wells from NEXTERION® Slide MPX-16 that were first printed with three distinct nucleic acid probes and then hybridized with various combinations of three complementary, fluorescent-labeled targets. No cross-contamination was observed.

Exceptional reproducibility

Intra-slide reproducibility

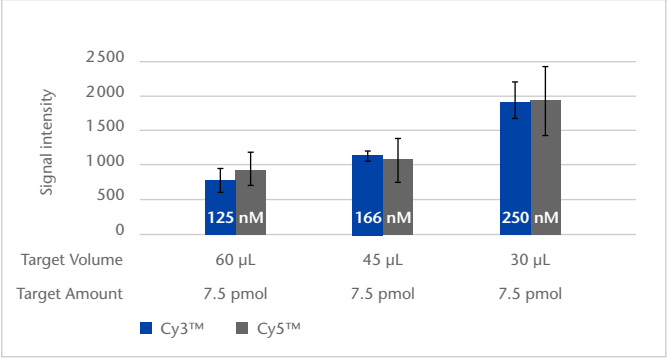
NEXTERION® multi-well coated substrates allow users to obtain microarray data with exceptionally high reproducibility. This was demonstrated by hybridizing multiple 10 x 10 DNA arrays with fluorescent-labeled cDNA targets using NEXTERION® Slide MPX-16. Correlation coefficients were obtained by comparing the normalized signal intensity from spots in different subarray wells. An average correlation coefficient of 0.96 was obtained after pair-wise comparison of all eight-subarray wells.



Virtually identical subarrays in each well of one NEXTERION® Slide MPX-16.

Optimal use of limited target material

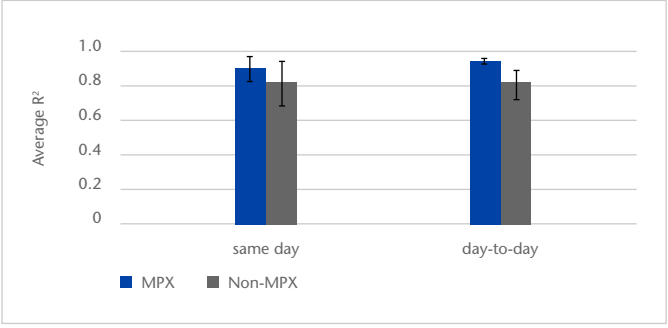
The NEXTERION® multi-well coated substrates allow lower target solution volumes to be used compared to conventional slides. The figure demonstrates that a reduction in target volume results in increased target concentration and thus in improved signal intensities. NEXTERION® Slide MPX also offers cost savings by reducing the amount of target material required without any loss of sensitivity (assuming that the target volume and target amount are reduced equally, keeping the concentration consistent).



Identical probe sets in separate subarray wells of NEXTERION® Slide MPX-16 were hybridized with 7.5 pmol of fluorescent-labeled target (house-keeping gene: GAPDH), which was dissolved in different volumes (60, 45, 30 µL) of hybridization solution.

Inter-slide reproducibility

The excellent inter-slide reproducibility offered by NEXTERION® multi-well coated substrates is attributable to the simultaneous analysis of all subarray assays, and to the improved sample mixing during hybridization within the wells of the superstructure. The figure shows the average correlation coefficient (R2) obtained with NEXTERION® Slide MPX-16 (indicated as MPX) and conventional slides (indicated as Non-MPX). Experiments were conducted as described in the previous figure, but now using multiple slides for same day and day-to-day experiments.



Inter-slide reproducibility

Multi-well slide format

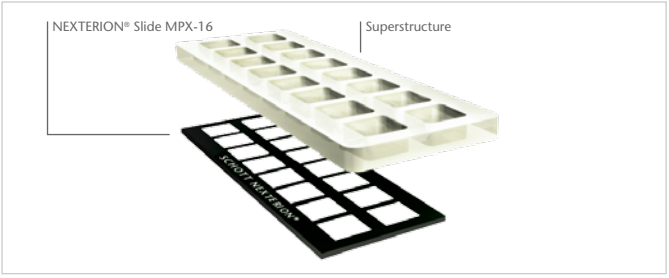
NEXTERION® MPX Slides

Introduction

The special 16-or 48- well architecture of NEXTERION® Slide MPX allows the parallel analysis of multiple biological samples against focused subsets of probes on a single slide. The dimensions of the microarray slide are fully compatible with all microarray printers and scanners, allowing users to run multiple samples on a single slide without any additional hardware.

Product components

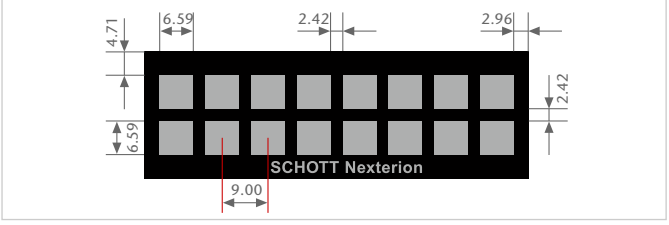
The NEXTERION® 16-well slide system consists of a 16-well patterned glass substrate and a 16-well silicon superstructure. Both components are available separately.



NEXTERION® 16-well slide system

High quality glass substrate

The ultra-flat glass slide is manufactured from low auto-fluorescent borosilicate glass with the dimensions 75.6 mm x 25.0 mm x 1.0 mm. The uniform flatness of the borosilicate glass ensures highly reproducible contact printing and scanning across the wells. The glass slides are partitioned into 16 wells by an ultra-hydrophobic patterning layer. The dimensions and locations of the wells are fully compatible with standard microarray printing parameters.



Dimensions of NEXTERION® Slide MPX-48. All dimensions are given in mm.

16-well silicone superstructure and sealing strip

For NEXTERION® Slide MPX-16 a superstructure is available. It is self-adhesive, and adheres to the 16-well patterning of the glass slide, increasing the well volume to between 30 and 130 µL. Placing the adhesive on the superstructure rather than on the glass slide avoids the risk of adhesive contamination in the wells. The clear self-adhesive sealing strip seals all the individual wells during hybridization, preventing evaporation and cross contamination. If necessary, the superstructure and sealing strip may be removed prior to scanning.

Packaging and storage

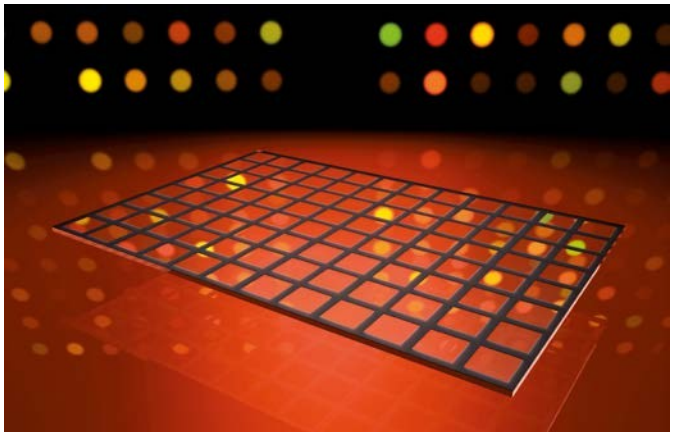
NEXTERION® MPX slides are available as 5-slide packs sealed in stable plastic boxes under an inert atmosphere. The slides are ready-to-use from the box. The exact shelf life of the slides is determined by the coating and is indicated on the external packaging. The 16-well superstructures are not included with the slides and must be ordered separately.

Key product features

- Standard slide format compatible with all standard commercial microarray printing, liquid handling and scanning equipment
- Simultaneous analysis of 16 biological samples on one slide
- Excellent reproducibility compared to conventional single-array applications

Multi-well microplate format

NEXTERION® MPX plates



Key product features

- SBS compilant microplate format
- MPX-96 glass plate easily detaches from the plate holder for spotting and scanning flexibility
- Maximum printable area of 6 mm x 6 mm allows over 1600 features per well
- High optical transmission and low auto fluorescence glass for optimal performance
- Available as a complete microtiter plate, or as individual components with or without well patterning and/or functional chemistry
- Compatible with all contact or non-contact microplate arrayers

Introduction

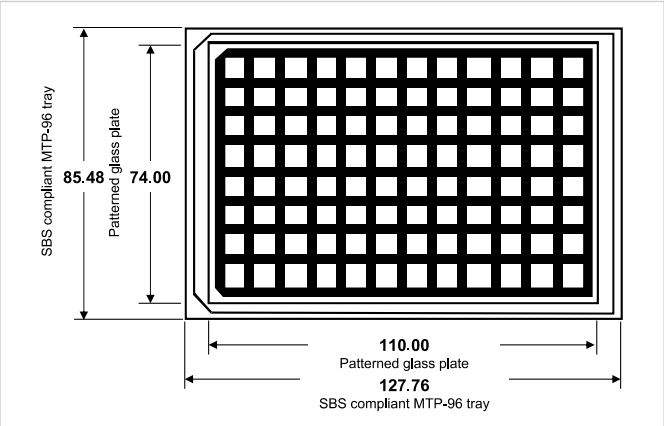
The microtiter plate format is a standard research tool for clinical diagnostics and drug discovery. The advantages associated with this format are obvious and include high sample throughput, cost savings and compatibility with automated handling systems. In recent years, there have been efforts to make the microplate format available for microarraying with the emergence of high-resolution plate scanners and compatible arrayers. However, there are clearly a number of limitations with the conventional 96-well polymeric and glass bottom microtiter plates currently utilized in microarraying, including:

- Microarray print heads cannot access the entire well area because the wells are recessed. This limits the number of features per well and arrayer compatibility.
- The depth of the wells, and the subsequent additional z-axis travel, makes printing time-consuming.
- The intra-well print area may be restricted due to the contamination of the well edges with bonding adhesive. In addition, adhesive out-gassing can affect functional coating performance.
- The round wells have a smaller printable area than the square MTP wells.
- Difficulty associated with applying functional coatings to plastic plates.
- Conventional plastic microplates suffer from poor optical transparency and flatness.

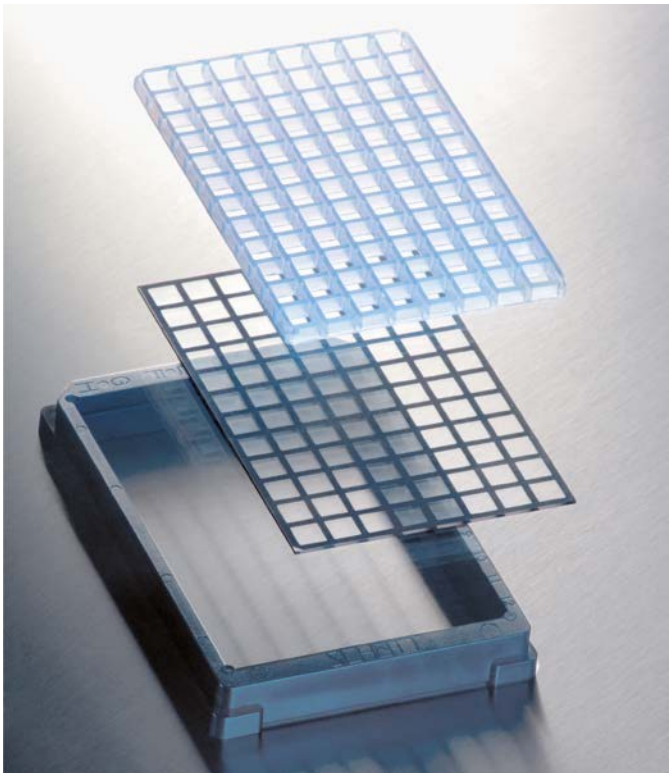
The SCHOTT NEXTERION® MPX microarraying products were specifically developed to overcome these limitations. The system is designed to offer users a high degree of flexibility. The MPX-96 system consists of three main components: a microarray quality 96-well patterned glass substrate, a 96-well silicone superstructure and a microtiter plate holder and lid.

Product components

The three main components comprising the MPX-96 system are available as separate items.



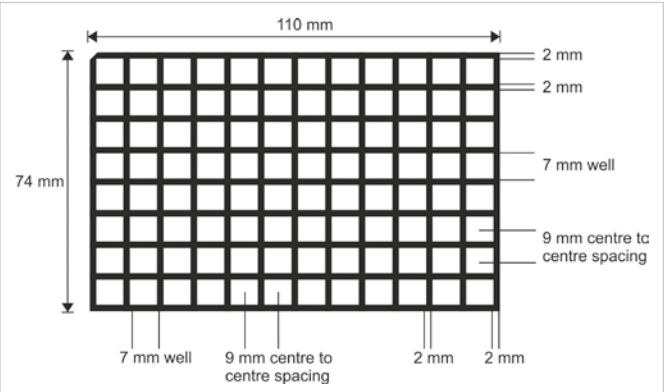
Dimensions of NEXTERION® MTP-96 system



Three components of the MTP-96 system

High quality glass substrate

Microarray plate scanners typically read fluorescence signals from the spots through the bottom of the microplate. The NEXTERION® MPX glass plates have a high transmittance of over 92 % and exceptional optical clarity for wavelengths used in fluorescence-based microarray assays. The plates are manufactured by melting extremely pure raw materials to ensure an excellent internal glass quality with absence of inclusions, bubbles, streaks or other defects. The ultra-flat glass plate is manufactured from low auto-fluorescent boro-silicate glass measuring 74 mm x 110 mm x 1 mm. The uniform flatness of the microplate glass ensures highly reproducible contact printing and scanning across the wells. The microarray quality glass plate is available with or without a 96- or 384-well hydrophobic patterning, and with a number of functional coatings, making it suitable for all microarray applications using DNA, peptide or protein probes. The glass plate may be printed separately or in the microtiter plate tray holder.



Dimensions of NEXTERION® plate MPX-96

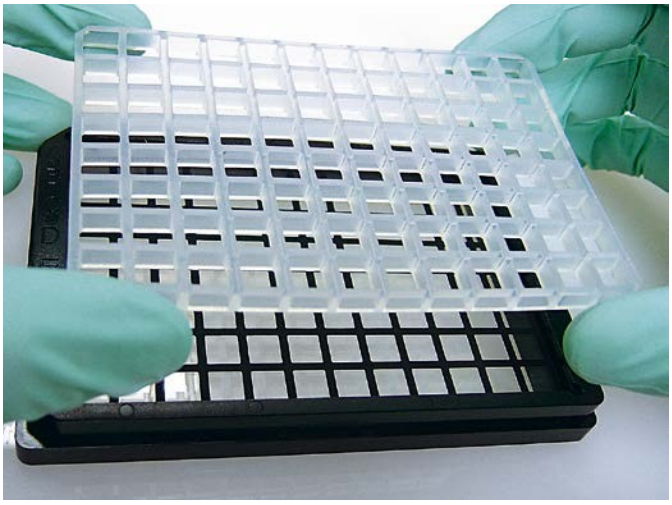
96-well silicone superstructure
The optional superstructure is self-adhesive and adheres to the 96-well patterning on the glass plate, increasing the well volume to between 30 and 130 µL. Placing the adhesive on the superstructure rather than on the glass plate avoids the problem of adhesive contamination in the wells.

Microtiter plate holder with lid
The SBS (Society for Biomolecular Screening) compliant rigid polycarbonate holder supports the glass substrate and superstructure. It also acts as an alignment jig when attaching the superstructure. The holder has molded alpha/numeric well labels for easy identification. The four fixing pins firmly hold the glass plate at the four corners of the microtiter plate holder, ensuring the glass is kept flat. The lid and sealing film limit sample contamination and evaporation during processing.

Instrument compatibility
Information on compatible microplate scanners and detailed instructions for printing into the NEXTERION® plate MPX-96 are available on request.

Technical instructions
Further information about printing and processing the MPX plates are available in the FAQ section of the NEXTERION® web site.

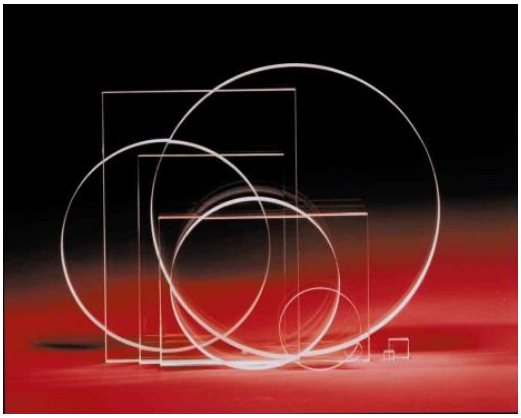
Packaging and storage
NEXTERION® MPX-96 glass plates are available in 5-plate packs sealed in stable plastic boxes under an inert atmosphere. The plates are packaged separately from the plastic MPX-96 components to avoid any changes to the coatings caused by outgassing. The exact shelf life of the plates is determined by the coating and is indicated on the external packaging.



Placing superstructure on MPX 96-well plate

MPX-96 plate holder with glass plate

5. Custom solutions



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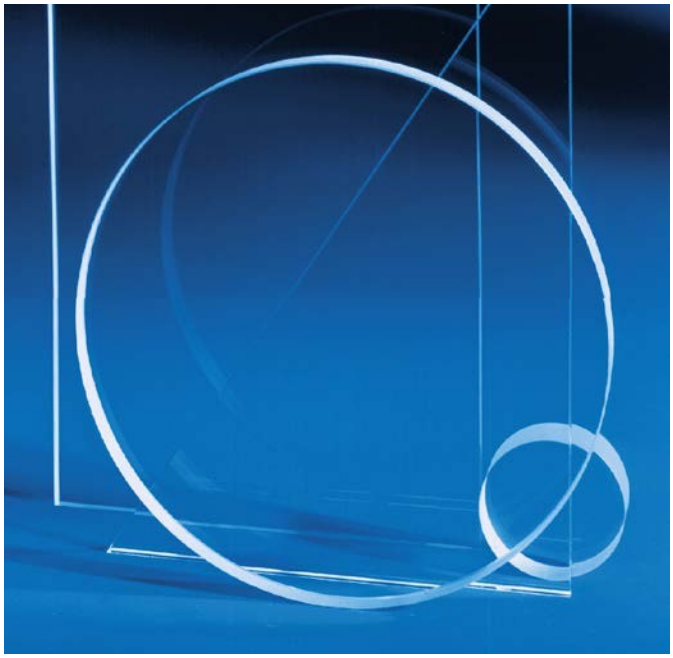
Custom format and coating solutions



Different glass formats can be offered

Introduction

The manufacture of special technical glasses is one of the SCHOTT group's core competencies. SCHOTT has extensive experience in high technology glass processing, and coating technologies. SCHOTT Microarray Solutions can take full advantage of the extensive in-house facilities to offer customers glass substrates in formats tailor-made for specific life science applications.

Customization may range from simply supplying a unique barcode sequence on a standard NEXTERION® slide, to a custom coated substrate for a microfluidics application. The production and quality control systems used for manufacturing custom products conform to the ISO 9001 standard.

Summary of custom services

- Product development of new substrate coatings to meet specific applications
- Scale up and manufacture of substrates using chemistries developed by customers
- Modification of standard NEXTERION® coatings to meet specific applications
- Addition of barcodes, corporate logos, identification and reference marks
- Development and production of alternative glass substrate formats
- Customizable hydrophobic patterning to create multi-well formats
- Coated substrates for diagnostic applications

Typical examples of custom products

- Glass bottomed microplates
- Glass plates for gel electrophoresis cassettes
- Microfluidic chip substrates
- Coated coverslips for DNA analysis, sequencing or gene expression
- Optical coated substrates for label-free detection systems
- Conductive Maldi substrates
- SPR biosensors
- Small microarray substrates for use in microcentrifuge tubes

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Custom coatings

Applying thin-film coatings to glass substrates is another SCHOTT core competence. Production takes place in a class 100 clean room environment at the SCHOTT facility in Jena, Germany. Extremely high quality standards are maintained for surface finish, flatness, parallelism and absence of surface defects.

The coating technologies available include:

- Dip coating
- Chemical vapor deposition (CVD)
- Sputter deposition
- Solvent based reactor method
- Spin coating

Any of the standard NEXTERION® functional coatings can be applied to just about any custom format. The coatings include:

- Aminosilane
- Aldehydesilane
- Epoxysilane
- 3-D thin film
- Inorganic coatings such as metallic coatings

SCHOTT Microarray Solutions is also able to coat glass substrates with coating chemistries developed by clients.

Different patterning, coatings and marks on NEXTERION® substrates

Logos, fudicial marks and barcodes

SCHOTT can offer customers the opportunity to customize their slides and glass substrates with graphics, logos, company names, barcodes, reference marks, or 2-D matrix codes. These markings may be added at any location on, or within the glass surface, and may feature a combination of items, for example a company logo plus a sequential barcode.

Barcodes and logos on NEXTERION® substrates

SCHOTT can offer a number of methods for marking the glass substrates. The markings are robust enough to withstand standard biomedical laboratory procedures.

- Laser-bonded foil method produces robust surface markings in black, or other colours.
- A method of printing with hydrophobic ink can be used to produce graphics, logos, as well as multi-well patterns.
- A laser ablation process produces robust marks on the surface of the glass.
- Laser-induced internal marking introduces markings by the creation of micro-cavities within the glass.

Glass types and formats

The SCHOTT group produces several hundred different types of glass. The range of glass thicknesses available is very wide, ranging from 30 µm up to 254 mm (depending on the glass type). Substrates may be laser cut into the final size, or partially diced to allow the later separation of individual components.

Thickness range of BOROFLOAT® 33

The typical glass types used for life science products include:

- Borofloat® 33 borosilicate glass
- D263T borosilicate glass

Standard life science formats:

- SBS compliant microplate
- Microscope slide
- Coverslip formats in a range of shapes, dimensions, and thicknesses

Custom formats:

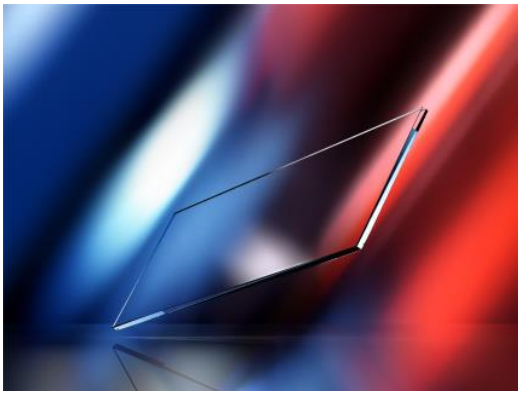
- Rectangular
- Square
- Round

Advanced glass processing

Along with more traditional glass processing methods, such as cutting, grinding, polishing and water jet cutting, SCHOTT has invested heavily in new technologies, such as ultrasonically enhanced drilling for high precision circular holes of 400 µm up to 3 mm. Sand blasting permits the creation of round and rectangular holes, caverns and channels, of 30 µm up to 1.5 mm in glass substrates.

Please contact us to discuss how we might help you to develop your next product.

6. Uncoated substrates



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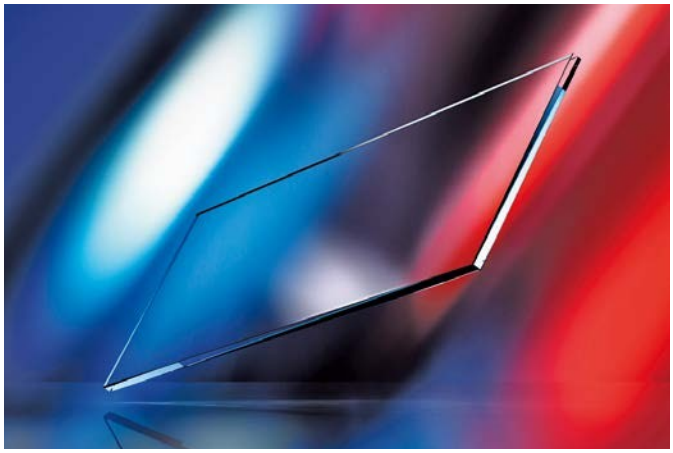
Uncoated slides



Introduction

SCHOTT provides two different types of uncoated glass slides, NEXTERION® Glass B (Borofloat® 33) and D (D263T), for customers looking to apply their own functional coatings. Both glass materials are borosilicate glasses with high chemical resistance, excellent transmission, low fluorescence, and exceptional flatness and were specially selected by SCHOTT Microarray Solutions as the optimal glass types for microarray related applications. The naturally pristine glass surfaces can be used without any additional polishing steps and all the slides are laser-cut to minimize particle contamination.

NEXTERION® Glass B

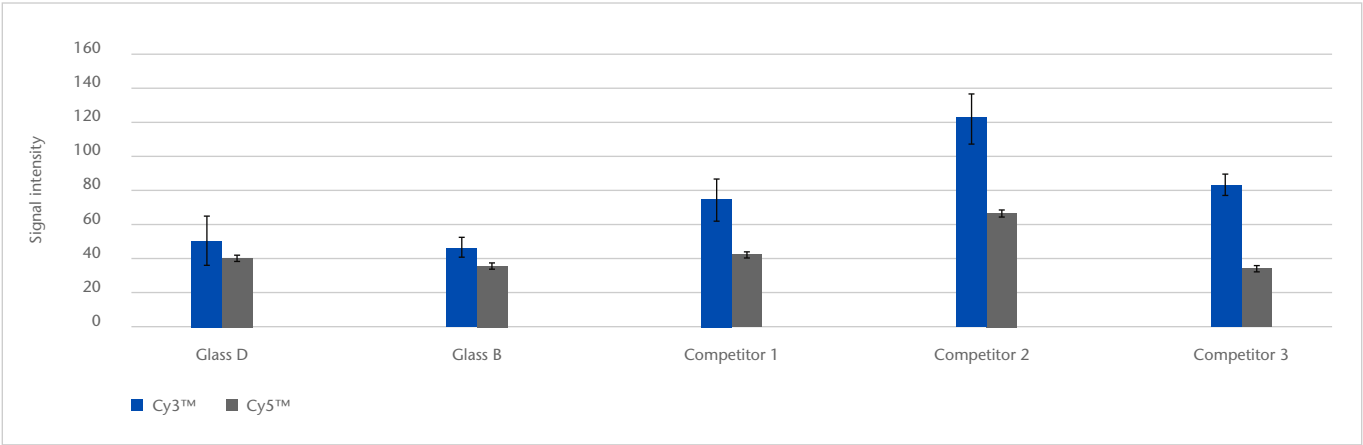
NEXTERION® Glass B is a highly chemically resistant borosilicate glass that is produced by melting the purest raw materials. The microfloat process is used for manufacturing this glass type, resulting in a pristine, fire-polished surface that can be used without any additional polishing.

This process allows the production of glass substrates with tight geometric properties. In addition, the fluorescence is particularly low in the range of Cy3™ and Cy5™ emission wavelengths (570 nm and 670 nm), making NEXTERION® glass slides the perfect substrate solution for microarray applications.

NEXTERION® Glass D

NEXTERION® Glass D is a high quality borosilicate glass produced by melting the purest raw materials. It is manufactured by a special down-draw production process that results in fire-polished surfaces that can be used without any additional processing.

The NEXTERION® Glass D production process allows SCHOTT to offer glass substrates with extremely tight geometric properties. In addition, the fluorescence is particularly low in the range of Cy3™ and Cy5™ emission wavelengths (570 nm and 670 nm).



Autofluorescence of NEXTERION® Glass D and Glass B vs. competitors

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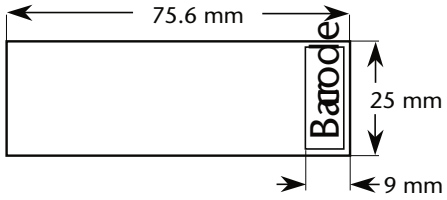
NEXTERION® Glass B and D specification

NEXTERION® uncoated slides are manufactured to the following specifications:

- 25.0 mm x 75.6 mm ± 0.1 mm
- Thickness 1.0 mm ± 0.05 mm
- Plain cut edges, by using the precise laser cutting process

The slides are available with or without a barcode (code 128). Customized features for particular applications are available upon request and include slide orientation marks, non-standard barcodes, customized barcode numbering, company logos, etc. Please enquire for further information.



Dimensions of standard barcoded slides

Three levels of cleanliness

Uncleaned

These slides are cleaned using deionised water and a conventional washing system with brushes.

SCHOTT recommends uncleaned slides if the user intends to subject the slides to a thorough cleaning procedure prior to further processing.

Ultrasonically cleaned

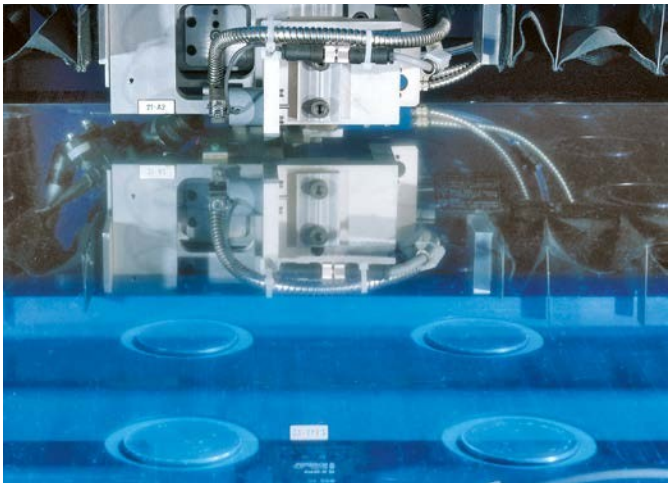
SCHOTT offers uncoated slides that are ultrasonically cleaned. The slides are subjected to a 100% quality control process to validate their dimensional tolerances. To remove all particles, debris, and surface contaminants, the slides are ultrasonically cleaned under alkaline conditions.

SCHOTT recommends ultrasonically cleaned slides if a basic cleaning procedure is used prior to further processing.

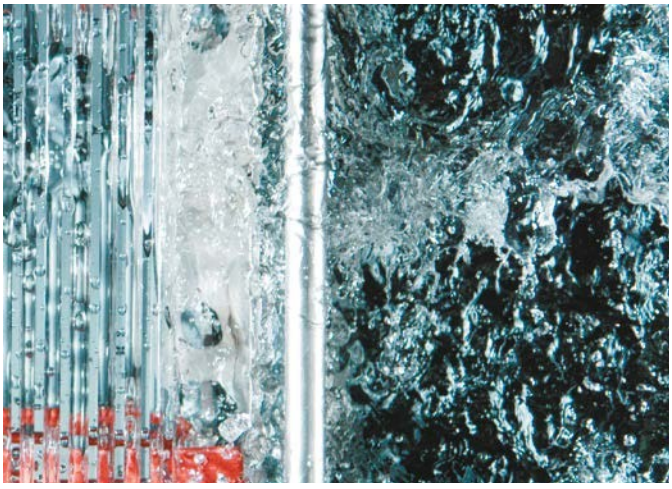
Cleanroom cleaned

SCHOTT's highest grade of uncoated slides are ultrasonically cleaned and quality controlled, as detailed in the ultrasonically cleaned section above. In addition, the slide storage boxes used to transport the slides are sealed in protective foil pouches under an inert atmosphere in a class-100 cleanroom environment. The slides can be used immediately from the sealed boxes without subjecting them to a cleaning process.

Cleanroom cleaned slides are recommended if users intend to coat the slides without carrying out any cleaning steps.



Laser cutting



Automated ultrasonic cleaning of slides

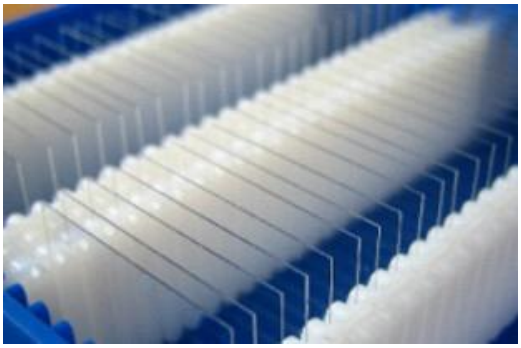
Properties NEXTERION® Glass B and D

Properties	NEXTERION® Glass B (Borofloat® 33)	NEXTERION® Glass D (D263T)
Mechanical		
• Density ρ in g/cm³	2.2	2.51
Optical		
• Refractive indices n_e (λ = 546.1 nm) n_d (λ = 587.6 nm)	 1.47311 1.47140	 1.5255 1.5231
• Dispersion ($n_F - n_C$)	71.9 x 10^{-4}	96.0 x 10^{-4}
• Abbe value (ν_e)	65.41	55
• Luminous transmittance (τ_{vD65}) (Glass thickness 1.1 mm)	92.7 %	91.7 % ± 0.3 %
• Stress optical coefficient C in 1.02 x 10^{-12} m²/N	4.0	3.4
Chemical		
• Hydrolytic resistance (ISO 719/DIN 12 111)	HGB 1	HGB 1
• Acid resistance (ISO 1776/DIN 12 116)	1	2
• Alkali resistance (ISO 695/DIN 52 322)	A 2	A 2
Thermal		
• Linear thermal coefficient of expansion α (20 – 300 °C/68 – 572 °F)	3.25 x 10^{-6}/K	7.2 x 10^{-6}/K
• Transformation temperature T_g	525 °C	557 °C

The properties detailed above were calculated using the very latest standards and measuring methods. SCHOTT reserves the right to change the data in keeping with the latest technical standards. Numerical values stated without tolerances are reference values of an average production quality.

All data is intended to be used as a guideline, unless otherwise stated. Please contact us if you require further information.

7. Coverslips



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NEXTERION® Coverslips

Storage of NEXTERION® coverslips

Introduction

To address the requirements for thin glass substrates for microarraying and the needs of high resolution imaging applications, SCHOTT extended its standard product range by adding coverslips and coverglasses. The coverslips are available in different standard dimensions, with our without ultrasonic cleaning and functional coating.

High quality glass

The thin glass substrates are manufactured from SCHOTT's D 263™ M cover glass. This is a colorless low alkali borosilicate glass with a very low iron content. D 263 M meets the requirements laid down in ISO 8255.

The outstanding features of D 263™ M include:

- High spectral transmission and optically clear
- Excellent internal glass quality with absence of inclusions, striae, bubbles, streaks, etc.
- Excellent flatness and very good surface quality
- Low background fluorescence
- Refractive index of 1.5255 ± 0.0015 optimized for microscope objectives
- Abbe number of 56 ± 2
- Excellent resistance to chemical attack (hydrolytic class ISO 719-HGB 1)
- Non-neurotoxic and non-cytotoxic

Tight Thickness Tolerances

For high resolution imaging applications, coverslips often have to be hand-selected for the required 170 µm thickness to optimize image quality. To avoid this tedious process and to ensure consistent and reproducible image quality, SCHOTT offers high performance NEXTERION® coverslips with a thickness of 170 µm ± 5 µm. These are ISO 8255-compliant Type #1.5H with restricted thickness-related tolerance.

Dimensions and Formats

SCHOTT NEXTERION® coverslips are available in both "High performance" and "Standard" glass thickness tolerances:

"High performance" coverslips #1.5H
Thickness: 170 µm ± 5 µm
18 x 18 mm coverslips
24 x 60 mm coverslips
25 x 65 mm coverslips
25 x 75 mm coverslips
Other dimensions are available to special order

"Standard" coverslips #1.5
Thickness: 175 µm ± 15 µm
22 x 22 mm coverslips
24 x 24 mm coverslips
24 x 60 mm coverslips

Other dimensions and standard coverslip glass thicknesses (#0, #1, #2 etc.) are available on request.

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Cleaning

The NEXTERION® coverslips are offered uncleaned as well as cleanroom cleaned. The cleaning is performed under Class 100 cleanroom conditions using a highly efficient multi-step, ultrasonic cleaning method, which removes glass debris and surface contaminants. This avoids the time-consuming and cost-intensive procedures normally associated with coverslip preparation. NEXTERION® coverslips give you more time to get on with your research work.

Packaging

Standard coverslips are packed surface-to-surface; this often causes scratching of the glass. NEXTERION® cleanromm cleaned coverslips are visually checked and individually packed into custom-made packaging.

Specially-developed packaging manufactured from low outgassing plastic has adjustable holders to separate and protect cleaned and/or coated coverslips. The convenient package also acts as a storage container, preventing particle contamination and damage to the surfaces. The boxes are sealed under an inert atmosphere after cleaning (and coating) to preserve the activated surface.

Uncoated Coverslips

The coverslips can be supplied as uncoated uncleaned glass or as ready to use cleanroom cleaned glass.

Coated Coverslips

Any of the standard NEXTERION® functional coatings can be applied to coverslip glass in just about any size.
The coatings include:

- Aminosilane
- Aldehydesilane
- Epoxysilane
- 3-D thin film

SCHOTT Microarray Solutions is also able to coat glass coverslips with coating chemistries developed by clients. If you cannot find the format or coating you are looking for, please contact us.

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8. Reagents

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Reagents

Introduction

The quality of the results from a microarray experiment depends on many factors: the substrate utilized for printing, the printing buffer, the labeling method employed, and the blocking and hybridization conditions utilized. For this reason, SCHOTT Microarray Solutions provides a range of ready-to-use reagents optimized to get the best performance from the NEXTERION® coated slides.

NEXTERION® Spot (order code: 1066029)

DNA spotting buffer

NEXTERION® Spot is a robust spotting buffer that is suitable for use with most NEXTERION® coated slides. The reagent is a modified phosphate buffer with a pH of 9.0 and is supplied as a 2x concentrated solution. This buffer ensures excellent spot morphology, high signal intensities, and results in medium to small spot diameters. In addition, NEXTERION® Spot offers users the option of "tuning" the size of the printed spot by adding varying volumes of detergents. Specific instructions on how to modify the printing buffer are available on request, or on the SCHOTT Microarray Solutions website. NEXTERION® Spot is available as a 2x concentration in 100 mL packs.

NEXTERION® Block E (order code: 1066071)

Highly effective reagent for deactivating epoxy coating after printing

NEXTERION® Block E is a blocking solution optimized for NEXTERION® Slide E. It reacts rapidly with residual epoxy groups in both the printed and unprinted areas of the slide surface and was developed to ensure high signal intensities with reduced non-specific background, thus increasing overall data reproducibility. SCHOTT Microarray Solutions has demonstrated that NEXTERION® Block E is an extremely important component for producing high quality DNA microarrays with very good signal-to-background ratios. NEXTERION® Block E is available as a 4x concentration in 1000 mL packs.

Spot morphology and signal intensity strongly depend on the following parameters

- Composition of spotting solution
- Compatibility of spotting buffer and slide surface chemistry
- Spot density/pitch
- Nature, concentration, and purity of probe molecule
- Spotting technology
- Environmental conditions
- Immobilization procedures

Examples of packaging of NEXTERION® reagents

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NEXTERION® Hyb (order code: 1066075)

Formamide free hybridization buffer

NEXTERION® Hyb is a hybridization buffer that has been developed for optimal spot morphology, high signal intensities with reduced non-specific background, and high data reproducibility on NEXTERION® slides. NEXTERION® Hyb is compatible with many different surface chemistries and hybridization methods and may be used with cDNA or oligonucleotide arrays. The reagent is supplied as a ready-to-use 1x concentrated solution. By avoiding the laborious preparation of multi-component hybridization buffers, NEXTERION® Hyb can save users time and effort. The components in the buffer help to stabilize the hybridization process during extended runs, and also reduce background fluorescence. NEXTERION® Hyb has a low viscosity, does not contains formamide and is recommended for applications that cannot tolerate formamide, or that require temperatures greater than 60 °C. NEXTERION® Hyb is available as a 1x concentration in 100 mL packs.

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