

# Reflective optical coating

Nexterion® HiSens Slides



## Overview

Type of coating	Ordering information			
	Nexterion® product	Barcode option	Item number	Slides per pack
Reflective optical coating available with most of Nexterion® functional coatings	HiSens uncoated	None	1141518	25
		Label	1141519	25
	HiSens AStar	None	1178045	25
		Label	1178046	25
	HiSens A+	None	1139673	25
		Label	1141515	25
	HiSens AL	None	1139827	25
		Label	1141514	25
	HiSens E	None	1125813	25
		Label	1137332	25
	HiSens H	None	1141517	25
		Label	1139829	25
	HiSens P	None	1178051	25
		Label	1178052	25

## Key product features

- Significantly improved signal to background ratios for identifying low-expressor genes or low-abundant proteins
- Easy implementation with standard slide protocols
- Compatible with all common microarray equipment
- Reduced target concentrations
- Reduced reagents and dye costs
- Preservation of Cy3/5™ ratios – comparable to data from conventional slides
- Chemically stable reflective coating

## Introduction

The majority of microarray users prefer to use fluorescent dyes as labels in their experiments, as these dyes typically offer the most sensitivity and also enable detection of two or more different dyes simultaneously. Unfortunately, microarray scanners do not operate at their maximum efficiency with fluorescent dyes, as the detectors only acquire a small proportion of the total emitted fluorescence.

There are a number of factors that contribute to the inefficient signal capture:

- Only a proportion of the total excitation light is absorbed by the microarray spots, with most passing through the glass slide.
- On standard non-reflective slides, there is weak but “destructive” interference of the excitation light waves, leading to a lower fluorescent emission.
- The light emitted by the fluorescent dyes attached to the target molecule is undirected and lost through the back of the transparent glass.

To address these problems, SCHOTT utilized its extensive optical glass coating expertise to develop the next generation of microarray slides – Nexterion® HiSens (High Sensitivity).

### Immobilization chemistry

Nexterion® HiSens Slides are available with most of the Nexterion® functional coatings.

### Suitable probe types

The functional coating on Nexterion® HiSens Slides is identical to the respective coating on Nexterion® Slides. Please refer to the table in the section “General information coated slides” in order to find the appropriate coating chemistry for your specific application.

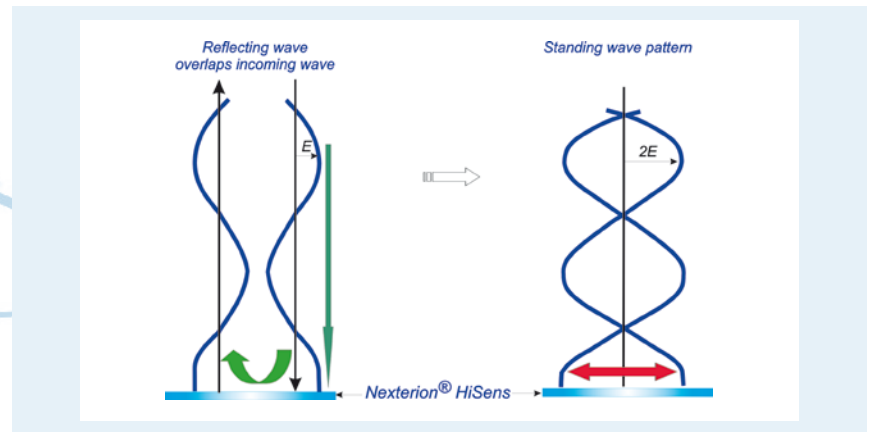
### Product details

The Nexterion® HiSens product is an innovative microarray slide based on an ultraflat, high quality borosilicate glass slide coated with reflective dielectric layers (patent pending). The reflective layers on Nexterion® HiSens significantly enhance sensitivity and signal response. The characteristics of the reflective layers have been optimized for the fluorescent wavelengths most commonly used in microarray experiments, and will simultaneously improve the performance in both the Cy3™ and Cy5™ channels. The slide is produced according to industry standard slide dimensions and is available with SCHOTT’s standard high quality functional coatings for DNA and protein microarraying. This means that the Nexterion® HiSens Slide is fully compatible with all microarray printing technologies and most slide processing protocols, allowing customers a smooth transition from industry-standard transparent microarray slides.

The Nexterion® HiSens coating is able to enhance signal amplification by exploiting several optical effects:

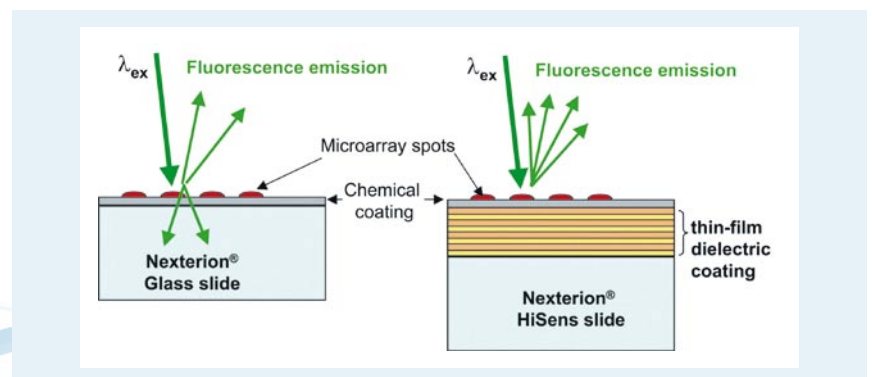
### 1. Fluorescence enhancement and reflection of excitation light

On a standard glass microarray slide, the fluorescently labelled spots absorb only some of the excitation light. By placing a dielectric coating beneath the spots, this “lost” light is reflected back onto the spots. In addition, the multiple layers of the HiSens coating have been specifically designed so that the incoming and reflected excitation light waves overlap and interfere with each other. The interference is constructive at the slide surface, enhancing the excitation by a theoretical factor of up to 6.3 times.



### 2. Reflection of the emission light

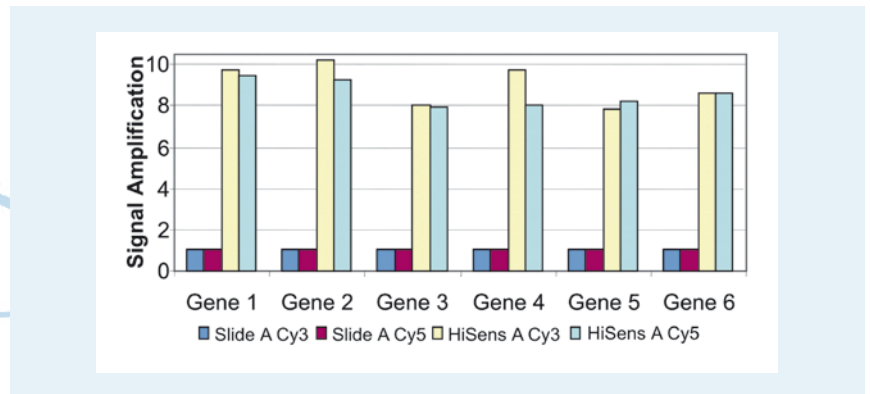
The fluorescence emission in the Cy3™ and Cy5™ channels from the labelled spots is redirected towards the detector rather than being lost by passing through the glass or by scattering. This effectively doubles the detected fluorescence signal.



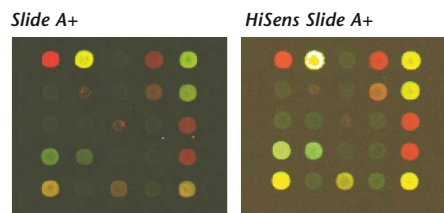
Taken together, these effects can theoretically enhance the fluorescence signal by up to 12.6 times when compared to standard transparent microarray slides.

### Increased sensitivity

Significant increases in fluorescent signal intensities and signal-to-background ratios have been demonstrated with the Nexterion® HiSens E and A+ products, the first two slide surfaces launched by SCHOTT in the HiSens range in 2006 (all slide surfaces are now available). The functional coatings are identical to the standard Nexterion® slides and were processed with standard slide processing protocols. The results clearly exhibit the same impressive spot size and morphology that users typically associate with Nexterion® Slide E and Slide A+, but the signal intensity is significantly enhanced thanks to the HiSens coating.



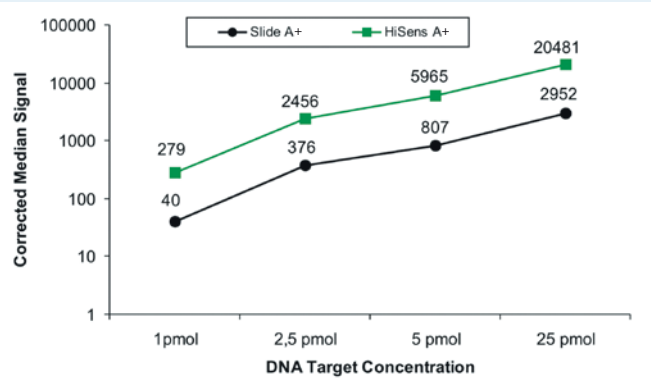
Identical oligonucleotide probes were printed on Nexterion® HiSens A+ and the standard Nexterion® Slide A+. The slides were hybridized and scanned on an Axon 4000B scanner with identical settings. Images of the Nexterion® HiSens reflective coating are compared to standard Slide A+. The Nexterion® HiSens A+ data was normalized against the standard Nexterion® Slide A+. An 8 to 10 fold increase in signal-to-background ratios was obtained with the Nexterion® HiSens reflective coating compared to the standard Nexterion® Slide A+.



## Improved signal response

Nexterion® HiSens is the ultimate microarray slide for microarray applications where the target material is at a low concentration or cannot be reliably amplified, for example with mRNAs or low abundant proteins. The Nexterion® HiSens coating may be used to produce reproducible signals at a much lower target concentration than with conventional slides.

*The graph shows that for a DNA microarray application, between two and ten fold less target was required to produce the same signal intensity with Nexterion® HiSens as with a conventional aminosilane microarray slide, resulting in potentially significant cost savings for users.*



## Preservation of dye ratios

The reflective layers in the Nexterion® HiSens coating have been designed to enhance the performance of both the Cy3™ and Cy5™ channels equally. The Cy3™ to Cy5™ ratios are preserved, allowing use of standard data normalization methods and direct comparison with data previously produced on conventional slides.

### Important information about patents

Using arrays based on SCHOTT Nexterion® products for dual color analysis on a single array in which at least two different samples are labeled with at least two different labels may require a license under one of the following patents: U.S. patent nos. 5,770,358 or 5,800,992 or 6,225,625 and U.S. patent no. 5,830,645. Manufacturing and use of probe arrays may require a license under the following patents: U.S. patent no. 6,040,138 or 5,445,934 or 5,744,305 and under the following patents owned by Oxford Gene Technology Ltd. ("OGT"): European patent no. EP 0,373,203, U.S. patent nos. 5,700,637 and 6,054,270 and Japanese patent nos. 3393528 and 3386391 ("The OGT patents"). Other patents may apply. The purchase of SCHOTT Nexterion® products does not convey any license under any of the OGT patents or any of the other patents referred to. For all applications SCHOTT North America Inc. and SCHOTT Technical Glass Solutions GmbH make no representation or warranty that the practice of its technology and products or any improvement will not infringe or violate any domestic or foreign patent of any third party. Before making or using any oligonucleotide arrays you should contact OGT to discuss a licence. To inquire about licensing under the OGT patents, please contact OGT at [licensing@ogt.co.uk](mailto:licensing@ogt.co.uk).

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