

The background of the slide features a grayscale photograph of three scientists in a laboratory setting. One scientist on the left is wearing safety goggles and looking down. Two other scientists in the center and right are looking towards the camera. The image is partially obscured by a teal rectangular overlay on the left and a white rectangular area on the right.

SURFIX

SURFIX

EPIC Online Technology
Meeting on Biosensors

Luc Scheres
CTO

E info@surfix.nl
T +31 85 488 1285
W www.surfix.nl

Photonic biosensors: it takes more than two to tango!



WHY

To revolutionize diagnostics through photonic based low threshold molecular diagnostics

HOW

Bring the state-of-the-art components together for the purpose

WHAT

Three Dutch companies leading the global field have joined forces for global application of the combined technology

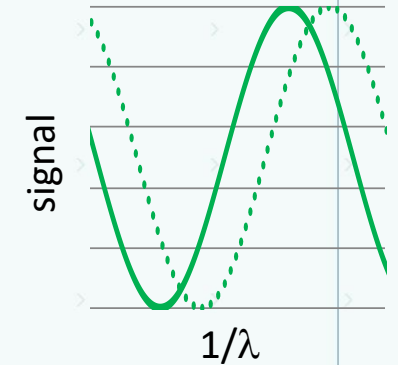


Photonic chip technology



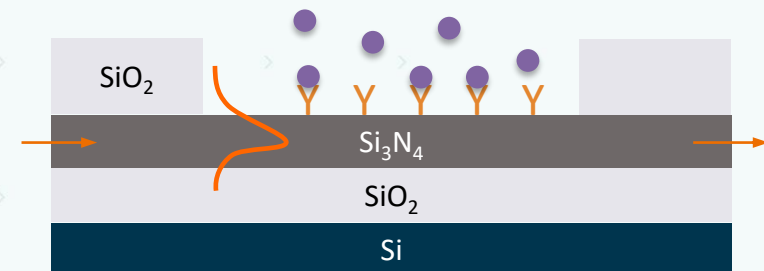
Asymmetric Mach-Zehnder Interferometer (aMZI)

- Robust TriPleX based Si_3N_4 waveguides, having very low propagation loss (down to 0.1 dB/m), embedded in SiO_2
- High sensitivity ($> 2000 \text{ nm/RIU}$)
- Operated at 850 nm



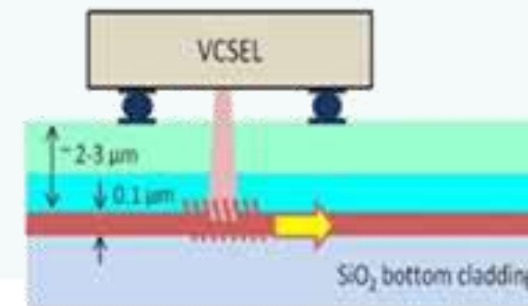
Biosensing

- Evanescent fields extends few 100 nm into solution
- Analyte binding causes phase shift
- Low limit of detection ($< \text{pM}$)
- Multiplexing



Miniaturization

- Potential for low-cost Point of Care applications
- Hybrid integration of VCSEL light source and PD detectors on-chip
- Wafer scale manufacturing of complete biophotonic array



Nanocoating technology

State of the art

- Uniform nanocoating and biofunctionalization
- Analyte binds everywhere, which limits sensor performance

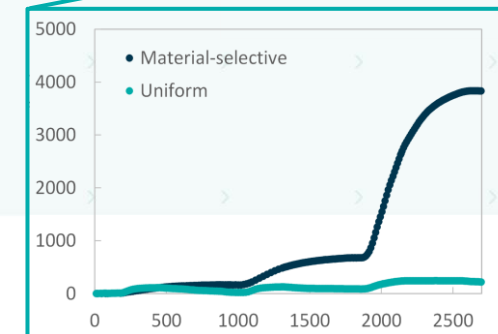
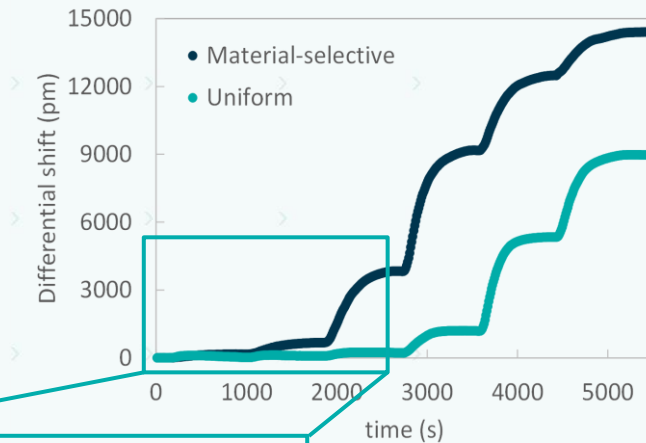
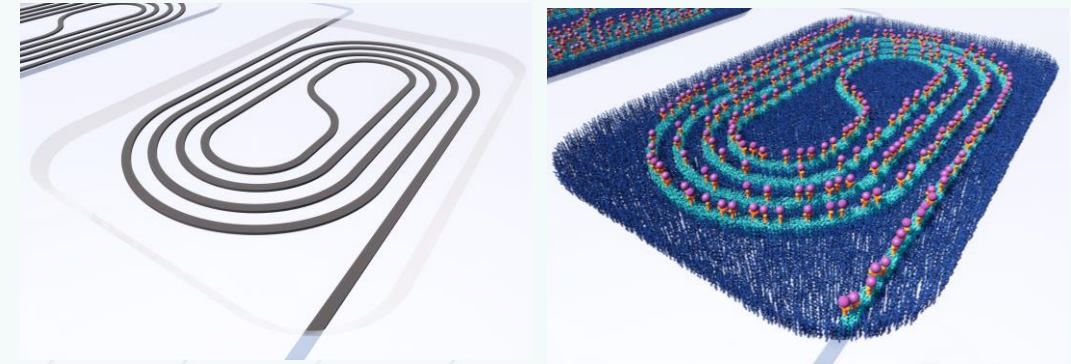
The facts

- Si_3N_4 waveguides are narrow and make up <1% of surface area
- Analyte binding to surrounding SiO_2 remain undetected
- Unstirred liquid layer near the surface (thickness >1 μm)
- Analyte transport in solution is governed by slow diffusion
- Depletion of analyte near the surface, especially at low concentrations

Selective nanocoating

- Concentrating analyte on the Si_3N_4 waveguides
- Higher sensitivity and reproducibility, especially at low analyte concentrations
- Lower LoD

SURFIX



mouse IgG on
coated aMZI
sensor

detection of anti-
mouse IgG

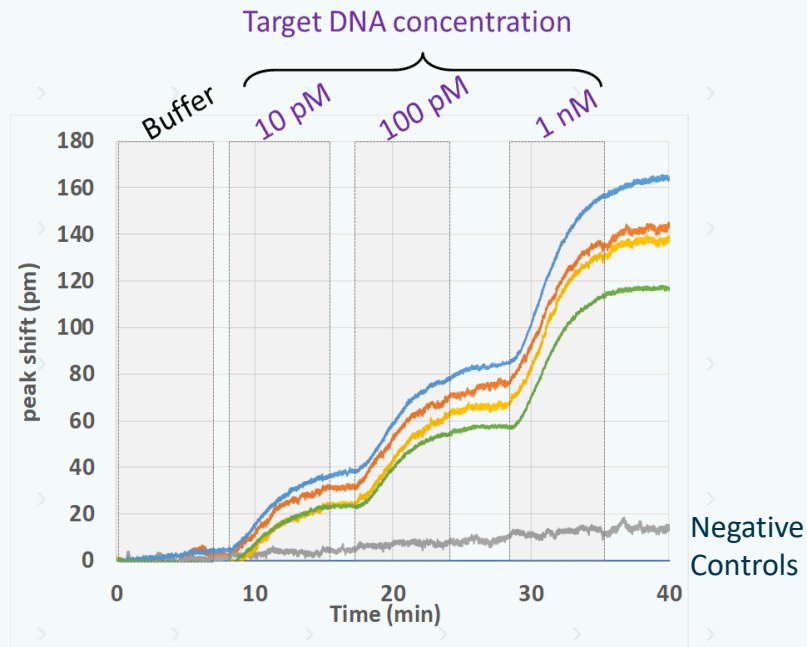
Biomarker technology

SURFIX



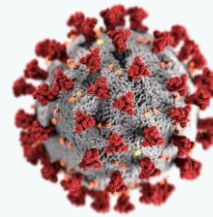
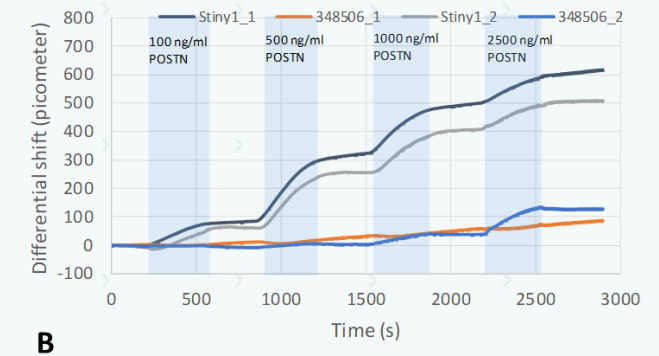
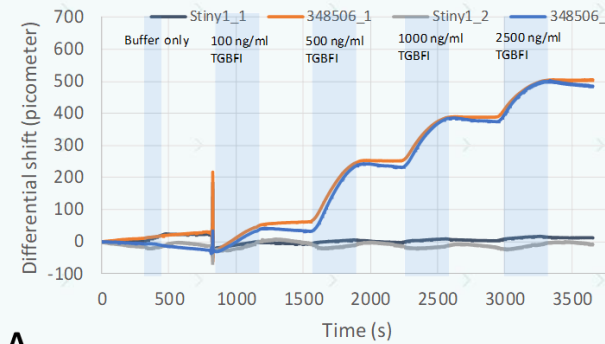
DNA based early cancer detection

- Small fragments of hypermethylated DNA in urine
- Detection of low pM concentrations of small target DNA fragments (5-10 kDa) demonstrated



Protein based cancer detection

- Multiplexed detection of recombinant TGFBI (A) and POSTN (B) demonstrated



COVID-19 testing

Home > News & events > **Leading Dutch biochip companies accelerate development of fast and reliable COVID-19 test**

LEADING DUTCH BIOCHIP COMPANIES ACCELERATE DEVELOPMENT OF FAST AND RELIABLE COVID-19 TEST

24-04-2020

Surfix B.V., together with its shareholders Quirin Diagnostics B.V. and Lionix International B.V., already successfully developing bio-photonics nanochips for cancer detection and other applications, today announce an accelerated development plan to allow mass-scale COVID-19 diagnosis and immunity detection with the financial support and in close collaboration with PhotonDelta.

The desktop testing device will yield reliable test results within 5 minutes and is scheduled to be available for commercial exploitation within 6-9 months. The device will be built around a photonic biochip using Lionix' mature and proven silicon nitride based integrated optics technology (TriPlex™), a key technology within the PhotonDelta ecosystem. The surface functionalization and biochemical assay development are provided by Surfix and Quirin Diagnostics, respectively. The combination of these disciplines enables a successful, fast and accurate virus detection platform. The development will be supported by and in tight collaboration with Photon Delta (a Dutch public private partnership). The PhotonDelta support will be both in co-funding as in further future upscaling and exploitation.

