technology opportunity

Photonic bio-sensors integrated in reaction tubes

Plateau, a consortium of research laboratories of Ghent University, is seeking partners interested in commercializing a new bio-assay platform based on photonic biosensors integrated in reaction tubes and a simple but effective micro-fluidics system.

Introduction

Label-free bio-sensing with silicon photonic ring resonator sensors has proven to be an excellent sensing technique for achieving high-throughput and high sensitivity, comparing favorably with other labeled and label-free sensing techniques. However, as in any bio-sensing platform, silicon photonic ring resonator sensors require a fluidic component which allows the continuous delivery of the sample to the sensor surface. This is the big disadvantage of this platform since this type of micro-fluidic system is very much removed from the daily practice in e.g. hospital labs, which still relies to a large degree on platforms like 96-well micro-titer plates or reaction tubes. To address these issues, we propose the combination of a simple and compatible reaction tube platform with label free silicon-on-insulator (SOI) photonic biosensors, where the fluid moves through the sensor chip as opposed to over the chip as in more conventional approaches. This device allows real time detection and analysis. Its great flexibility and small footprint make it ideal for easy handling in any laboratory.

Technology

Researchers at Ghent University have developed a micro-fluidic system for the new device: a reaction tube with an array of photonics sensors at its bottom. This micro-fluidic system consists of apertures that perforate the chip from the top to the bottom. The analyte solution in the tube will flow through these openings that work as exit channels, creating a flow, which will accelerate the detection process.

Applications

Bio-assays

Advantages

- Low production cost of the sensor, allowing disposable format
- Compatible with the commonly used sample handling systems in hospitals and labs.
- High throughput possible
- Avoids costs and complexity of labels.
- Real-time data. Interactions can be monitored continuously, extracting kinetics and concentration information from the measurements
- High sensitivity and dynamic range

Status of development

The photonic chip with the array of sensors and the embedded micro-fluidic system was fabricated and incorporated at the bottom of “Eppendorf” reaction

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tubes in the Clean Room of Ghent University. As a proof-of-principle to show the capabilities of the combined device, we measured the interaction of biotin and streptavidin on the device.

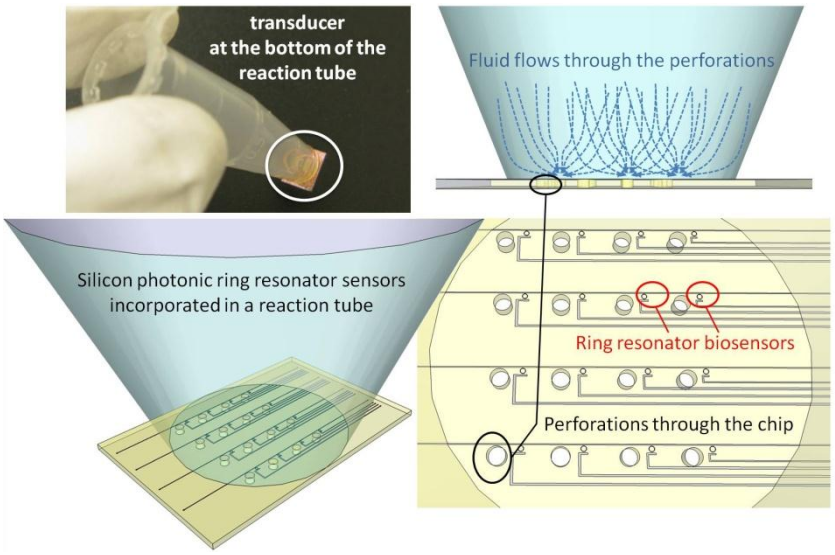
Partnership

Ghent University is looking for a partner who wants to develop a commercial product based on this technology. We are interested to enter into a research collaboration with this partner.

Intellectual property

US provisional patent application US61/757821.

Figure



The silicon-on-insulator chip with the photonic biosensors and the embedded micro-fluidic system is incorporated at the bottom of a reaction tube.

References

[1] De Vos K, Girones Molera J, Claes T, De Koninck Y, Popelka S, Schacht E., Baets R, Bienstman P.," IEEE Phot Journal, 1(4): 225-235 (2009)

Keywords

Silicon nanophotonic sensors, photonic microring resonators, Silicon-on-Insulator (SOI), reaction tubes, biochip, bio-sensor, bio-assay.

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