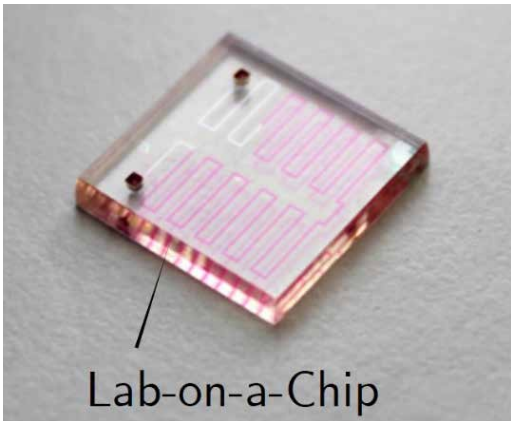
Lab on a Chip for rapid testing applications

Reference No: B79091

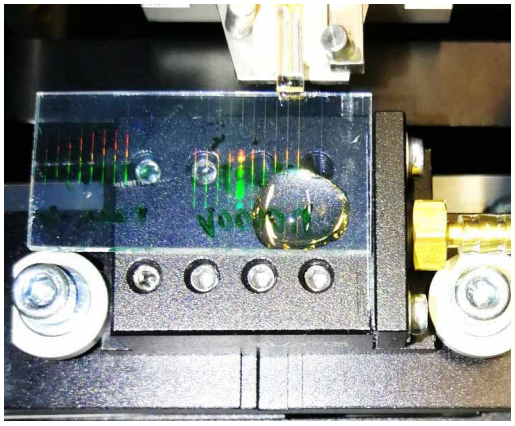
CHALLENGE

The precise measurement of substances – liquid or gaseous – in fluids is extremely complex. It suits various fields of application, such as biomedicine, process engineering or environmental monitoring. Each field requires specifically developed, designed and standardized analysis schemes for different measurement requirements. However, the established substance detection and quantification routines in central laboratories (e.g. ELISA or SPR) are accompanied by several of the following disadvantages:

- time-consuming drawing, storage and transport of significant sample volumes
- preparation, execution and evaluation requires qualified personnel and time
- inflexible specialized measurements with a strictly limited measurement range



Lab-on-a-chip devices filled with liquid



Bragg sensor area appears rainbow-like due to light diffraction effects.

INNOVATION

The novel polymer-based and cost-efficient measurement method uses laser-written, optical waveguide Bragg sensors inside microfluidic channels creating an innovative lab-on-a-chip (LOC) platform. This LOC is suitable for the flexible detection and quantification of a wide variety of (bio-) chemical substances. Due to the microfluidic chip design, each measurement procedure only requires small amounts down to single droplets of the fluid-under-test, while eliminating additional sample preparation. An individual special sensor coating tailored to the respective target analyte enables highly sensitive substance detection. The unique and chemically robust polymer combination allows favorable mass production of these optofluidic chips using conventional photolithographic techniques. The optical monitoring of sensor signals from the produced disposable chips runs via plug-and-play connection of a permanently coupled fiber to a compact self-built optoelectronic Bragg interrogator. The entire lab-on-a-chip system can be used as a portable, universal measurement solution for rapid analytical point-of-interest applications. Refractive index measurements generate instant results. Simultaneous selective substance detection takes less than 20 minutes according to occurring surface binding reactions.

COMMERCIAL OPPORTUNITIES

Due to the proven haemocompatibility of the employed chip materials, the invented LOC suits biomedical rapid testing applications (e.g. biomarkers, toxins or infectious states). The microfluidic layout on the LOC can be easily modified for an extended functionality including filtering, separation or mixing of liquids. Moreover, the flexible sensing capabilities of the presented Bragg grating sensors also allow integrated temperature monitoring of the tested fluids.

DEVELOPMENT STATUS

Functional Prototypes

REFERENCES:

1. Paper: www.osapublishing.org/ol/abstract.cfm?uri=ol-45-19-5510
2. Paper: www.ncbi.nlm.nih.gov/pmc/articles/PMC6806228/
3. Paper: https://www.researchgate.net/publication/282333784_Epoxy_Resin_Based_Optofluidic_Chips_with_Integrated_Bragg_Gratings

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PCT filed in 2020

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