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DEVELOPMENT OF A MULTIPLEX LABEL-FREE IMMUNOASSAY ON PHOTONIC MICRORINGS, FOR SPACE EXPLORATION AND BIOMONITORING

Abstract

The FP7 project Photonic Biosensor for Space Application (PBSA) is focused on the development of photonicbased biosensor technology for biochemical applications into the space domain combining nanophotonics and microfluidics in a common chip. Two main fields of application have been identified: Astrobiology, in the context of planetary exploration, and Biomonitoring human spatial installations, such as space stations or potential planetary human settlements. Basically three main building blocks can be distinguished in the PBSA Biosensor: the photonic transducer, the bimolecular probe, and the microfluidic subsystem.

The use of PIC (Photonic integrated circuit) enables the implementation of highly integrated solutions for the implementation of a Lab-on-a-Chip. Multiple detection can be integrated into a single chip for multiple parallel analyses. This technology has shown to be very sensitive and improves protocol simplicity compared with other techniques. The PIC based solution permits direct measurement of the target analytes leading to savings in the complexity of the detection protocols and reliability. Moreover, this feature is very suitable for remote sensing in space applications where savings in reagents are very valuable.

The aim of PBSA is to develop a multiplex photonic biosensor for different molecular targets. This means that it is necessary to functionalize the photonic chips with different antibodies. It is important to develop procedures for their adequate surface biofuntionalization with antibodies, which ultimately allows

the appropriate features for biotechnological and biomedical applications. We performed the printing procedure by using a MicroGrid II printing robot from DNA and protein microarray industry. We will report the development of different laboratory models as well as the multiplex microring resonator performance for label-free immunological detection.