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Arrays of Resonant Nano Pillars (RNPs) for advanced optical biochemical sensing and first steps in tissue-on-a-chip

In recent works we demonstrated the suitability of using resonant nanopillars (R-NPs) arrays for biochemical sensing and label-free biosensing. The performance comparison with other photonic structures suggest the suitability of this transducers and bio-transducers for many other applications. Moreover, the vertical interrogation of the biochips, simplifies the readout platforms and allows a high degree of multiplexing. The multiplexing results showed a highly reproducibility suggesting the potentially of using R-NPs for multiplexed chemical sensors and biosensors. On the other hand, most of the biosensing systems are based on chemical development or amplification (labeled technologies). This is the case of ELISA tests or lateral flow devices. The challenge for label-free PoC devices is to achieve a competitive LoD avoiding this chemical amplification and working with simple drops of samples in an easy-to-use manner. Thus, being the LoD the main figure of merit to compare PoCs, it is worthy to mention that this figure can be improved mainly by enhancing the transducer sensitivity or by reducing the uncertainty of the PoC readout systems. On one hand, the optical transducers employed is decisive for having high sensitivity, and on the other hand, the optical reader (PoCs) is fundamental for readout the signal with low uncertainty and stability. In, fact the LoD can be estimated by the ratio between the uncertainty and the sensitivity and it can be considered the main figure of merit to compare different



biosensing systems. The application of these technologies (transducers and readers) may play an important role in the development of tissue-on-a-chip approaches. We present in this paper the first steps carried out in our research group in tissue-on-a-chip models.

Speaker Biography

Miguel Holgado received his bachelor's and master's degree in Electrical Engineering from Technical University of Madrid (UPM) (1996), and Doctoral degree (Ph.D.) at the Institute of Material Science (ICMM) belonging to the Spanish National Research Council CSIC (2000). He is Deputy Vice-Rector for Innovation, group leader of the Optics, Photonics and Biophotonics at the Center for Biomedical Technology CTB-UPM, and professor at the Applied Physics and Material Engineering Department of Industrial Engineering School (ETSII-UPM). He worked as: R&D engineer at Laser Section at the Spanish Ministry of Defense and responsible for RAMAN spectroscopy service Lab at ICMM-CSIC. He was process engineer at Lucent Technologies Microelectronics for 4 years, Spanish representative in the 5th and 6th European R&D Framework Programme at the Center for Industrial Technology (CDTI), Sub-director of RTD projects at Nanophotonics Technology Center at Technical University of Valencia and Head of European Communities Unit at CSIC. He has led and participated in 34 research projects: 9 European, 19 National and regional as well as another industrial and R&D initiatives. He is author/co- author of more than 150 scientific publications, which have been cited more than 2200 times and the inventor of 6 patents applications. In addition, he is also founder of Bio Optical Detection; a spin-off company (BIOD S.L.) which develops optical Point-of Care devices and offers IVD screening services.

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