

Functional Materials: Smart Solutions to Generate Useful

Micro-fluidic Devices

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Micro-Total-Analysis Systems (μ TAS) and Lab-on-a-Chip (LOC) are important concepts for the development of personalised health care, point of care diagnostics and miniaturised environmental-control analytical systems.[1] The integration of chemical and/or bio-sensors in the microchannels of the micro-fluidic devices has several technological advantages compared to bench based sensor devices, such as reduction of the volume that is needed to monitor certain analytes, minimisation of cross-contamination from the surrounding environment and continuous flow operation, among others.

Micro-fluidic devices with capabilities that far surpass the current state-of-the-art can be realised, in terms of reliability, flexibility, compactness, ease of use, and low cost, without compromising analytical performance, but only through fundamental advances in materials science.[2]

We present here several approaches on the integration of unconventional materials as sensors and actuators in microchannels for the realisation of fully functional micro-fluidic devices for environmental and health applications.

[1] Materials Science: The Key to Revolutionary Breakthroughs in Micro-fluidic Devices, M. Czugała, B. Ziolkowski, R. Byrne, D. Diamond, F. Benito-Lopez, Proceedings SPIE 8107, 81070C, 2011; doi:10.1117/12.895330.

[2] Materials Science and the Sensor Revolution , R Byrne, F. Benito-Lopez, D. Diamond, Materials Today, 13, 7-8, 2010, 16-23.

Biography

Dr. Fernando Benito López studied chemistry at the Universidad Autonoma de Madrid and completed his master studies in the group of Dr. M.J. Macazaga and Dr. R.M. Medina. He graduated with a thesis entitled “Synthesis and electrochemical study of alkynyl cobalt and osmium complexes” in 2002. He obtained his PhD at the University of Twente, Enschede, The Netherlands, under the supervision of Prof. David N.

Reinhoudt and Dr. Willem Verboom, with a thesis entitled “High-pressure: a challenge for lab-on-a-chip technology” in 2007. He worked as postdoctoral researcher at the Centre for BioAnalytical Sciences at Dublin City University and later joined CLARITY: Centre for Sensor Web Technology at the same university. He was appointed as Team Leader in Polymer Micro-fluidics in 2010 in the group of Prof. Dermot Diamond at the National Centre for Sensor Research. Currently he is Adjunct Faculty Member at Dublin City University and working as a Senior Scientist at CIC MicroGUNE a Microtechnology Cooperative Research Center in the Basque Country, Spain.

His areas of interest are: Smart materials for micro-fluidic applications, micro-fluidic and analytical sciences, wearable micro-fluidics (sports and health), micro-fluidic devices and miniaturised systems for point of care diagnostics, micro-fluidic devices for environmental applications and micro-fluidics for improving chemical and biochemical processes.

Photo

