

Nanodiagnostics: from multidimensional nanomaterials-based biosensing to nanotheranostics

Arben Merkoçi

*Catalan Institute of Nanoscience and Nanotechnology (ICN2), CSIC and The Barcelona Institute of Science and Technology, Campus UAB, Bellaterra, 08193 Barcelona, Spain.
ICREA - Institució Catalana de Recerca i Estudis Avançats, 08010 Barcelona, Spain*

There is a high demand to develop innovative and cost effective devices with interest for health care beside environment diagnostics, safety and security applications. The development of such devices is strongly related to new materials and technologies being nanomaterials and nanotechnology of special role. We study how new nanomaterials such as nanoparticles, graphene, nano/micromotors can be integrated in simple sensors thanks to their advantageous properties. Beside plastic platforms physical, chemical and mechanical properties of cellulose in both micro and nanofiber-based networks combined with their abundance in nature or easy to prepare and control procedures are making these materials of great interest while looking for cost-efficient and green alternatives for device production technologies. Both paper and nanopaper-based biosensors are emerging as a new class of devices with the objective to fulfil the “World Health Organization” requisites to be ASSURED: affordable, sensitive, specific, user-friendly, rapid and robust, equipment free and deliverable to end-users. How to design simple paper-based biosensor architectures? How to tune their analytical performance upon demand? How one can couple nanomaterials such as metallic nanoparticles, quantum dots and even graphene with paper and what is the benefit? How we can make these devices more robust, sensitive and with multiplexing capabilities? Can we bring these low cost and efficient devices to places with low resources, extreme conditions or even at our homes? Which are the perspectives to link these simple platforms and detection technologies with mobile communication? I will try to give responses to these questions through various interesting applications related to protein, DNA and even contaminants detection all of extreme importance for diagnostics, nanotheranostics, environment control, safety and security.



Arben Merkoçi is currently ICREA Professor and director of the Nanobioelectronics & Biosensors Group at *Institut Català de Nanociència i Nanotecnologia* (ICN2), part of Barcelona Institute of Science and Technology (BIST). After his PhD (1991) at Tirana University (Albania), in the topic of Ion-Selective-Electrodes (ISEs) Dr. Merkoçi worked as postdoc and senior researcher/invited professor in the field of nanobiosensors and lab-on-a-chip technologies in Italy, Spain, USA and since 2006 at ICN2. Prof. Merkoçi research is focused on the design and application of cutting edge nanotechnology and nanoscience based cost/efficient biosensors. The paper/plastic-based nanobiosensors involve

integration of biological molecules (DNA, antibodies, cells and enzymes) and other (bio)receptors with micro- and nanostructures/motors and applied in diagnostics, environmental monitoring or safety and security. He has published around 300 peer review research papers (H index: 61 WOS; 75 GS), supervised 30 PhD students and has been invited to give plenary lectures and keynote speeches in around 200 occasions in various countries. Prof. Merkoçi is Co-Editor In Chief of Biosensors and Bioelectronics and member of Editorial Board of other journals. He is co-founder of two spin-off companies, PaperDrop dedicated to nanodiagnostics and GraphenicaLab to electronic printing. See more details on his CV at: https://www.icrea.cat/security/files/researchers/files-maintenance/full_cv_amerkoçi_0.pdf