

7 - 11 JULY 2024



15th International Conference on Surfaces,
Coatings and Nanostructured Materials
www.nanosmat2024.com

ABSTRACT:

Real time characterization of cells and tissues based on bio-impedance methods within microdevices

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A biological environment is a medium which, from a dielectric point of view, is highly polarisable. By applying a variable electric field to it, the response obtained can be used to obtain indicators of its physiological state and composition. This analysis technique can be associated to imaging. Bio-impedance measurement is therefore a complementary means of improving medical diagnosis or carrying out cellular analysis.

In developing this measurement technique, we have set up integrated micro-devices on a chip, combining microfluidics with the use of electrodes for electrical impedance spectroscopy to analyse biological environments. The challenge is to extract indicators to assess a pathology, monitor a biological environment or detect an anomaly. This has enabled us, for example, to study the impact of blue light on the retinal pigment epithelium using a microelectrode array (MEA) [1], to use a microfluidic chip to detect the presence of sickle cell cells in a blood flow [2] and also to analyse the dielectric signature of different cell types. This set of examples exploits a wide frequency range from Hz to Ghz, can be applied from tissue to cellular scale and takes advantage of the complex dielectric properties of biological cells. The resulting applications are numerous and constantly offer new ways of analyzing a biological environment.

References:

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