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International Journal on Smart Sensing and Intelligent Systems
ISSN 1178-5608

AN ELECTRICAL MODEL OPTIMIZATION FOR SINGLE CELL FLOW IMPEDANCE SPECTROSCOPY

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Submitted: Mar. 3, 2016 ***Accepted: Apr. 9, 2016*** ***Published: June 1, 2016***

Abstract- This paper presents an optimization of a single cell electrical model, based on Maxwell's mixture Theory, applied to flow cytometry coupled to impedance spectroscopy. It is based on the discretization of the measurement area into a square reference volume, centered between micro-electrodes, and fixed impedance areas. The first one represents the sensing area, the one impacted by cell presence during measurement, and the second one, all other areas that contribute to global measured impedance. By removing these last impedances, it is possible to compare and model the electrical response of different electrodes geometries. Simulations, performed for 6 different electrodes geometries using Finite Element Method (FEM), were performed to check our assumptions. Results attest the validity of our model for cells with sizes comprised between 30 and 70% of the channel weigh. Finally, measurements performed with our microfluidic sensor show the same impedance variation distribution during the passage of calibrated beads with an error lower than 5%.

Index terms*: *biosensor, microfluidic, modeling, impedance spectroscopy, single cell.