Simulation of Electric Fields for the Development of Biochip for the Purpose of Manipulating Biological Cells

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***Abstract*—Researchers nowadays prefer biochip technology platform as a medium for conducting the analysis of biological cells where appropriate manipulation techniques like trapping, screening and sorting in a few seconds are required to perform biological cells analysis. Non-uniform AC electric field is required for dielectrophoresis force (DEP) to implement manipulation technique, where the non-uniform AC is generated by microelectrodes designed. The current design has a limitation in term of electric field distribution pattern generated. Thus, ring microarray microelectrode pattern was designed and simulated using COMSOL Multiphysics 4.4 software for implementing one of the main objectives of this study, which is to investigate the electric field distribution resulting from the microelectrodes designed. To optimize the generated DEP force for manipulating biological cells, electric field simulation is very important. The electric field simulation performed by altering some microelectrode geometric design parameters such as the microelectrodes length and the distance between the microelectrodes and the microcavity. The simulation has been shown in this paper. This is intended to simulate the effect of an electric field that results when there are any changes to the geometric design of microelectrodes. Based on the simulation that has been done, the results show the distance between the microelectrodes and microcavity provide more impact in electric field distribution strength compared to the change of the microelectrodes size.**

***Index Terms*—biochip, dielectrophoresis (DEP), and microelectrode design.**

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