APPLICATOR PROTOTYPE FOR DIELECTROPHORESIS-ENHANCED ELECTROTRANSFER OF MOLECULES INTO BIOLOGICAL CELLS

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Various carriers are used to locally increase the membrane permeability for drugs and/or other molecules [1]. However, pulsed electric field induced electroporation phenomenon is an alternative physical method to increase membrane permeability [2]. At the same time, alternating pulsed electric fields can be also used to manipulate the motion of the biological cells using dielectrophoresis [3], which is based on polarization of cells in non-homogeneous fields. In this work, we present a cuvette prototype and a concept for dielectrophoresis-enhanced electroporation. The finite element method model of the pulse applicator and the generated pulsed electric field is presented. It is shown that the gradient of electric field is sufficient to trigger controllable dielectrophoresis accompanied by cell permeabilization, which indicates opportunity to significantly improve/manipulate the electrotransfer rate. The influence of needle type electrode density and shape is also investigated and further recommendations are provided.

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