# Biochip development using Nanoimprint Lithography (NIL) and metallic thermal evaporation techniques for biological cells manipulation using DEP

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**ABSTRACT**

A Biochip is a platform of miniaturized microarrays arranged on a solid substrate that permits many tests to be performed at the same time in order to achieve higher throughput and speed. Single-cell identification, imaging and analysis in situ using Atomic Force Microscopy (AFM) faced a lot of difficulties as immobilizing the cells for direct cellular analysis is still a major challenge. One approach to overcome this problem was the use of organized arrangements like microarrays to trap the cells and placed them in a controlled manner. This can be achieved by fabricating these microarrays on a special platform such as Biochip. To manipulate the cells' movements, an electrokinetic phenomenon known as dielectrophoresis (DEP) was used for that purpose. Non-uniform AC electric fields generated by the interdigitated microelectrode arrays provide an ideal method for manipulating and controlling particles. The cells were captured using positive and negative DEP forces in cavities placed at different locations within the electrode arrays. As some cells have no tendency to spread over substrates during culturing, the contact area between the cell and substrate is very small, often leading to cell detachment by the scanning tip. Thus by employing the cavity trapping method, not only the cells were perfectly anchored to the surface but also their heights were lowered to within a set-scan level of the AFM, enabling faster time-to-analysis. This paper reports the development of a new layout for the Biochip electrodes intended for DEP cell manipulations.

**KEYWORDS:**

AFM; biochip; photolithography; thermal evaporation; fabrication

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