

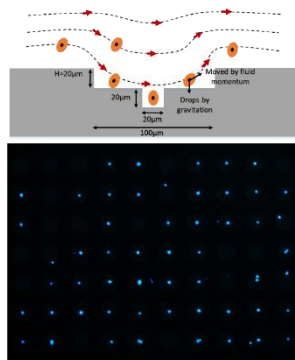
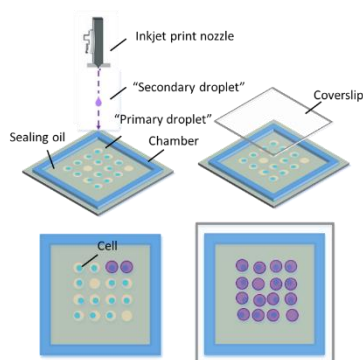
Single Cell Array Construction and Nucleic Acid Analysis Based on Chips

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Cellular heterogeneity represents a fundamental principle of cell biology for which a readily available single-cell research tool is urgently required. Here, our group present two kinds of single-cell analysis tools, open-pattern droplet-in-oil planar array system (ODOAS) and dual-well array chip, both of them can capture single-cell in large isolated reaction microenvironment. The ODOAS, as a multi-functional analysis platform, combining cell-sized well arrays with sequential inkjet printing allows the ability to simultaneously accommodate the high occupancy rate of single cells (74.5%) and sequential addition of reagents (multi-component) while retaining an open structure.



The dual-well array chip, as a low-cost and rapid analysis device, integrating reaction-well and capture-well together enabling highly efficient single cell trapping (75.8%) with only 11.3% multi-cells while requiring neither complicated infrastructure nor high expenditure. Our group

applied these two single-cell analysis tool to successfully intracellular enzyme kinetics measurement, quantity glucose molecule quantity, nucleic acid detection and mass spectrometric analysis. We believe that the feasibility and flexibility of our methods will enhance their use as universal single-cell research tools as well as accelerate the study of cellular heterogeneity.

In the meantime, our group start to design and fabricate a very large scale ion sensitive field effect transistor (ISFET) array for DNA sequencing. ISFET array is 640×640 , the pixel size is $7.4 \mu\text{m} \times 7.4 \mu\text{m}$ and pH sensitivity of the device has been measured.