

MICROWELL PREPARATION FOR BIOMEDICAL EXPERIMENTS

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Miniaturization and multiplexing of cell culture on biochip is attracting a growing interest with the development of cell-based biosensors and actuators [1]. Consider the rapid methods for microwell preparation and controlled dispensing of different cell lines within these fabricated microwells.

Immobilization of bacteria is an important step in the development of cell-based biochips. The **sciFLEXARRAYER** [2] has been used to spot bacteria in nanoliter volumes. The activities of the bacteria have been tested.

Bacteria were grown in minimal medium with 0.5 M and 1 mM ecotine. The bacteria were centrifuged and suspended with various osmoprotectants. 500 nl (1000 drops) of bacteria were spotted into the wells of a 384-well microtiter plate using the **sciFLEXARRAYER**. Measurements were performed before, after spotting and after incubation for 24 hours at 4°C in the dry state. In most cases the bacteria maintained their activities after 24 hours. This indicates that they also survived the spotting process when comparing the activities before and after spotting.

Loading of biosensors means a real challenge for dispensing devices – small volumes have to be placed onto the targets with very high precision. Non-contact **sciFLEXARRAYERS** with user-friendly software tools for detection of microstructures allow loading of intricate patterns on biosensors with an unsurpassed high absolute accuracy.

A variety of biological substances have been dispensed onto different biosensors using a **sciFLEXARRAYER** with special hard- and software features offering distinct advantages for highly accurate loading of biosensors.

While in many microarray applications highly precise intra-array positioning of the substances is sufficient, the production of biosensors requires an extremely high absolute accuracy. Furthermore, the surface of biochip substrates is often highly reflecting, sometimes with only minor differences between different structures on the sensor and the carrier material. This makes imaging of the biosensors for target recognition and quality control especially difficult.

Precise localization of positions to dispense on and the use of fiducially marks allow highly accurate positioning of substances, even when the biosensors are not entirely uniform and are not perfectly well arrayed on the target holder. The software modules can be customized for individual applications.

All **sciFLEXARRAYERS** offer non-contact printing with high accuracy ($< \pm 20 \mu\text{m}$) and precision ($< \pm 5 \mu\text{m}$). The user-friendly integration of dedicated hard- and software tools offers reproducibly high production quality and reliable in-process quality control:

- Dispensing defined quantities of substances is facilitated by software.
- Rapid microstructure scanning is followed by quick dispensing with highly accurate positioning of substances. The high sensitivity of the camera enables detection of dried spots with only slight differences in reflectivity.

[1] Dadunashvili S. A. Sensors based on nanomaterial of biological origin – “IEEE-NANO 2002”, Washington, 2002.

[2] Enabling life science – SCEENION AG, Berlin, 2012.