sciFLEXARRAYER Application Note
No. 08006

Quick and highly precise loading of biosensors

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

Materials and methods

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:
• sciDROPVOLUME software module for precise online meas-urement of droplet volumes
• Microscope with CCD camera in combination with software modules for pre-spotting detection & analysis of microstruc-tures and post-spotting quality control

Results and discussion

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 localisation of positions to dispense on (Fig. 1a) and the use of fiducial marks (Fig. 1b) 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.
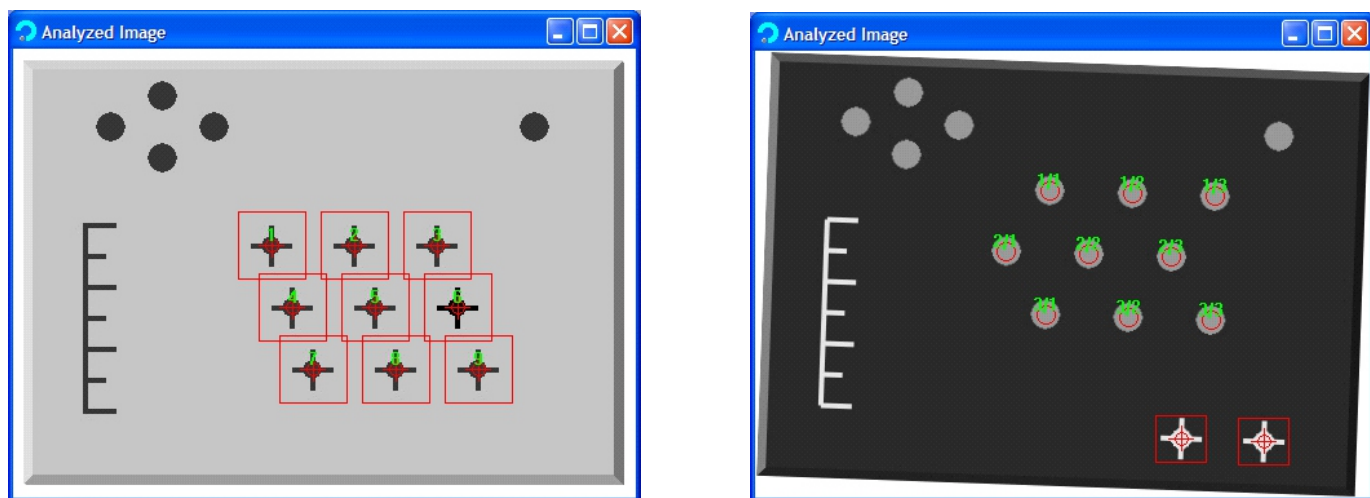
Fig. 1 Schematic illustration of the automated recognition of 1a less reflective, 1b highly reflective structures on biosensors. 1a All structures that match the template image (red box) are recognized. The corresponding positions to dispense on are marked (red cross) and ordered (green numbers). 1b The recognition of the template image as fiducial marks not only defines the coordinate reference, but also allows for an angular correction. Positions to dispense on (red circles) can be defined freely and without the need of unique structures at their locations.

All sciFLEXARRAYERS offer non-contact printing with high accuracy (< ± 20 μm) and precision (< ± 5 μm). For R&D with the sciFLEXARRAYER S3 to large-scale production using the sciFLEXARRAYER S100 (Fig. 2), 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 sciDROPVOLUME 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.
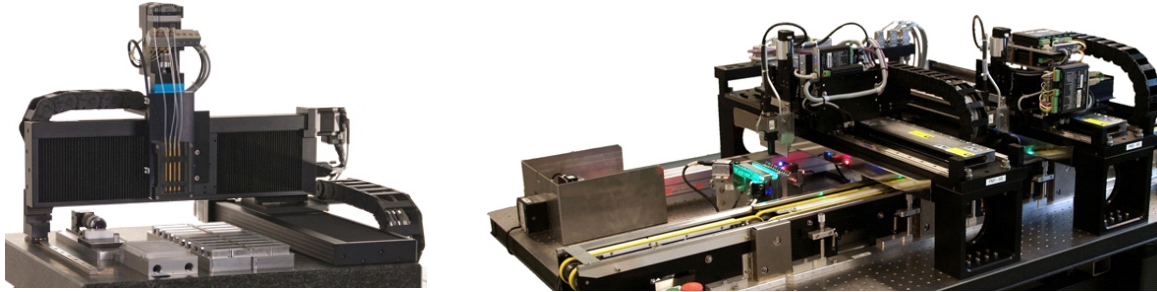
Fig. 2 sciFLEXARRAYER S3 for small-scale and sciFLEXARRAYER S100 for large-scale manufacturing

Feb 2008