Sampling device for high-throughput light-sheet-based microscopy

Project Status

A prototype of the invention has been designed and tested.

Customer Benefits

- Increased throughput for 3D imaging
- Suitable for component screenings, e.g. multicellular spheroids
- Excitation and detection below the sample
- Novel cuvette design minimizes spheric aberration

Patents

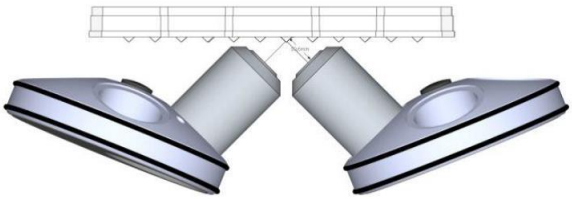
- DE 10 2013 110 093 B3
- EP 3 044 567 A1

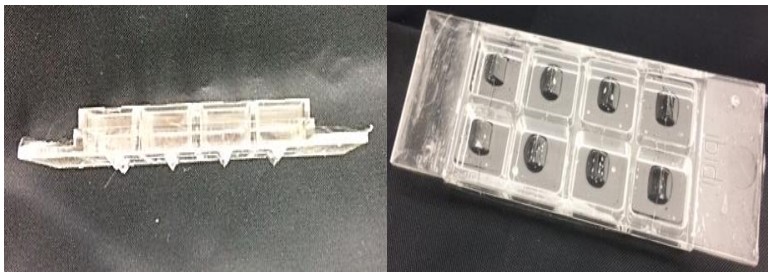
The technologies can be licensed or assigned. Moreover, collaborations regarding further development are welcome.

INNOVECTIS
Gesellschaft für Innovations-dienstleistungen mbH
Altenhöferallee 3
D – 60438 Frankfurt am Main
Phone +49 69 25 61 632-0
Fax +49 69 25 61 632-29
eMail info@innovectis.de

Abstract

Light-sheet-based fluorescence microscopy (LSFM) is a powerful method to analyze 3D living or fixed biological samples - such as organoids, spheroids, embryos, or tissues - with high temporal resolution and low photo-toxicity. The novel sampling device allows high-throughput LSFM measurements without loss of imaging quality.





Invention

LSFM is especially suited for imaging of sensitive specimen, living tissue, or living plants over long periods of time. In addition, the method provides a high imaging speed and an exceptional resolution of fixed and optically cleared probes. However, similarly to inverted microscopy, most LSFM setups require a non-planar positioning of the sample. Hence most commercially available LSFM setups are limited in their application for cell-based high-throughput screenings.

The novel sampling device, which may be combined with standard multi-well plates, was developed to facilitate high-throughput screenings of biological probes such as multicellular spheroid cultures or organoids. This is achieved by positioning the light source and the detection device below the sample and at an angle of 45° with respect to the sample. Because of the customized zigzag shape of the microtiter plate (see figure) the lens distance is minimized, facilitating a selection of matching lenses. In addition, a novel holder has been developed mounting both lenses, which can be tilted and rotated around its axis. Hence, lenses with smaller working distances and larger diameters can be employed. Moreover, due to the rotation different perspectives can be obtained. By employing identical lenses for excitation and detection their function is interchangeable just by rotating the mirrors, which further accelerates the imaging process. Concluding, the novel setup allows for an accelerated - thus both time- and cost-efficient - throughput compared to standard LSFM measurements.