

Experimental Device for Fluorescence Measurement by Optical Fiber Combined with Dielectrophoretic Sorting in Microfluidic Chips

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Abstract : We present a device that combines fluorescence spectroscopy with fiber optics and dielectrophoretic micromanipulation in PDMS (poly-(dimethylsiloxane)) microfluidic chips. The device allows high speed detection (in the order of kHz) of the fluorescence signal, which is coming from the sample by an inserted optical fiber, e.g. from a micro-droplet flow in a microfluidic chip, or even from the liquid flowing in the transparent capillary, etc. The device uses a laser diode at a wavelength suitable for excitation of fluorescence, excitation and emission filters, optics for focusing the laser radiation into the optical fiber, and a highly sensitive fast photodiode for detection of fluorescence. The device is combined with dielectrophoretic sorting on a chip for sorting of micro-droplets according to their fluorescence intensity. The electrodes are created by lift-off technology on a glass substrate, or by using channels filled with a soft metal alloy or an electrolyte. This device found its use in screening of enzymatic reactions and sorting of individual fluorescently labelled microorganisms. The authors acknowledge the support from the Grant Agency of the Czech Republic (GA16-07965S) and Ministry of Education, Youth and Sports of the Czech Republic (LO1212) together with the European Commission (ALISI No. CZ.1.05/2.1.00/01.0017).

Keywords : dielectrophoretic sorting, fiber optics, laser, microfluidic chips, microdroplets, spectroscopy

Conference Title : ICM 2017 : International Conference on Microfluidics

Conference Location : Sydney, Australia

Conference Dates : December 04-05, 2017