Microfluidic devices: fabrication and applications with enzymes and biomolecules

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The field of microfluidics is a rapidly growing area and already found its way to commercial products. I will present a new class of commercial microfluidic devices and applications thereof for enzyme studies. The new class of microfluidic flowcells is made in such a way that the device provides easy access to the inner surface areas as the device can be closed and reopened without limitations. This was exploited to modify the inner surfaces of the microfluidic flowcell with surface immobilized glucose oxidase and with optical oxygen sensor layers, enabling monitoring of the enzyme performance on-line. Furthermore, I will present custom-made research devices that were exploited for studies of new migration mechanism as well as separation of biomolecules.

- M. Viefhues, S. Sun, D. Valikhani, B. Nidetzky, E. Vrouwe, T. Mayr, J. Bolivar. *Tailor-made resealable micro(bio)reactors providing easy integration of in-situ sensor,* submitted.
- M. Viefhues, J. Regtmeier, and D. Anselmetti. *Fast and Continuous-flow detection and separation of DNA complexes and DNA in nanofluidic chip format*, in Microchip *capillary electrophoresis protocols*, Edited by A. Van Schepdael, Series: **Methods in molecular Biology**, Vol. 1274, 2015.
- M. Viefhues, S. Wegener, A. Rischmüller, M. Schleef, and D. Anselmetti. *Dielectrophoresis based continuous-flow nano sorter: fast quality control of gene vaccines*, **Lab Chip**, 13 (15), 3111-3118, 2013.
- J. Regtmeier, R. Eichhorn, M. Viefhues, L. Bogunovic, and D. Anselmetti. *Electrodeless Dielectrophoresis for Bioanalysis: Theory, Devices and Applications*, **Electrophoresis**, 32 (17), 2253-2273, 2011.
- M. Viefhues, S. Marchanda, T.-C. Chao, D. Anselmetti, J. Regtmeier, and A. Ros. *Physisorbed Surface Coatings for Poly(dimethylsiloxane) and Quartz Microfluidic Devices*, **Analytical and Bioanalytical Chemistry**, 401, 2113-2122, 2011.
- J. Regtmeier, J. Käsewieter, M. Everwand, and D. Anselmetti. Continuous-flow separation of nanoparticles by electrostatic sieving at a micro-nanofluidic interface, **J. Sep. Sci.,** 34, 1180–1183, 2011.