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Das Institut für Analytische Chemie, Chemo- und Biosensorik

lädt ein zum Vortrag von

Prof. Dr. Adam T. Woolley, PhD

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und

Prof. Dr. Wei Wang, PhD

State Key Lab of Analytical Chemistry for Life Science, Nanjing University, Jiangsu, China

für Montag, 13. Mai um 16.00 s.t., H46
(*im Zuge der Vortragsreihe der GDCH*)

Prof. Dr. Wei Wang, Phd

Prof. Dr. Adam T. Woolley, Phd

Prof. Dr. Adam T. Woolley, PhD:

3D Printed Microfluidic Systems for Disease-Related Biomarker Analysis

Abstract

3D printing has enabled important advances for miniaturized analysis of medically relevant molecules. We are developing novel 3D printers with applications in making sophisticated bioanalytical microfluidic systems with separation columns, valves and pumps. In these devices we can carry out affinity extraction [1-2], solid-phase extraction with fluorescent labeling [3], and microchip electrophoresis [4-5]. We have applied 3D printed microsystems in analyzing maternal serum biomarkers connected with preterm birth risk [1,3-5]. We have also quantified mosquito-borne virus RNA using affinity extraction and fluorescence labeling in 3D prints [2]. Moreover, with 3D printed valves and pumps, complex sample handling processes such as serial dilution [6] are readily accomplished. Furthermore, we recently integrated solid-phase extraction, fluorescence labeling and microchip electrophoresis of preterm birth biomarkers in a 3D printed microfluidic device [7]. Combining multiple processes in 3D printed systems can decrease sample and reagent volumes, simplify analysis, lower detection limits, and generally improve chemical analyses. These advances further illustrate the promising possibilities for broad application of 3D printing in advancing diagnostic bioassays.

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References:

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[3] A.V. Bickham et al. 3D Printed Microfluidic Devices for Solid-Phase Extraction and On-Chip Fluorescent Labeling of Preterm Birth Risk Biomarkers. Anal. Chem. 2020, 92, 12322.

[4] J.E. Esene et al., 3D Printed Microfluidic Device for Automated, Pressure-driven, Valve-injected Microchip Electrophoresis of Preterm Birth Biomarkers. Microchim. Acta. 2022, 189, 204.

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[6] J.L. Sanchez Noriega et al. Spatially and optically tailored 3D printing for highly miniaturized and integrated microfluidics. Nat. Comm. 2021, 12, 5509.

[7] J.E. Esene et al. 3D Printed Microfluidic Devices for Integrated Solid-Phase Extraction and Microchip

Electrophoresis of Preterm Birth Biomarkers. Anal. Chim. Acta 2024, 1296, 342338.

Prof. Dr. Wei Wang, PhD:

Extracellular recording on the intracellular pH dynamics of single living bacteria

Abstract

Intracellular pH (pHi) plays essential roles in maintaining and regulating the physiological functions of cells and microorganisms. Staining cells with pH-sensitive fluoresecent dyes represents one of the most popular techniques to study the pHi dynamics of single cells. However, such approach faces two major challenges. First, the fluorescence labelling inevitably brings chemical and photochemical interferences to the function and behaviors of cells. Second, the strong buffering capacity of cytoplasma places additional obstacles on the sensitivity for pHi determination. In this talk, we will introduce a microwell-based methodolgy that we recently developed to report the pHi dynamics of single living cells with extracellular fluorescence recording. Because it has overcome the limitations of conventional assays, significantly improved sensitivity allowed for the discovery on several unprecedented dynamics features of pHi at single living bacteria level.