

学科进展系列报告

Monitoring of metabolic parameters of cell cultures in microfluidic devices using integrated optical chemical sensors



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邀请人: 王旭东 研究员

报告内容:

Measurement of the metabolic parameters of living cells and cell cultures has become an important tool in basic research of medical and biological sciences, pharmaceutical research and toxicity tests. Herein, optical chemical sensors are established because they are easy to integrate, non-invasive and do not need any reference element. Basically, they comprise of a luminescent indicator dye embedded into a host polymer. Since they are cheap and can be read-out contactless from outside the reaction chamber, they are good alternatives to electrochemical sensors to be applied in microfluidics. We present microfluidic devices with integrated sensors for oxygen, pH and glucose. Our sensors can be excited with red-light and emit light in the near infra-red range (<700 nm). This suppresses background fluorescence or scattering from biological material. Sensor layers or spots are deposited with inkjet-based microdispensing with good adherence on glass or polymeric materials. A modified miniaturized phase-fluorimeter enables the read-out of sensor spot sizes below 100 micrometers. In addition, luminescent nanobeads are demonstrated as an attractive alternative to integrated sensor layers since they can be easily injected to the flow, do not interfere with the sample and have fast response times. We want to show the practical use of different pH and oxygen sensitive beads produced via staining of nanoparticles or nano precipitation. We will demonstrate the potential of optical sensors applied in micro reactors for online monitoring and control of chemical reactions, catalytic conversions or cell cultures. We will give examples of cell respiration measurements with oxygen sensors in a liver-on-chip model and pH sensors in various cell cultures. In future, these microsystems can be used for medium and high throughput toxicity testing of drug candidates or nanomaterials.

报告人简介:

Torsten Mayr received his PhD in chemistry from the University of Regensburg (Germany) in 2004. In 2002–2004 he was a post-doctoral fellow at the Karolinska Institute in Stockholm (Sweden). Since 2004 he is Assistant Professor at the Institute of Analytical Chemistry and Food Chemistry at the Graz University of Technology. Since 2014 he is Associate Professor at the same institute. His research is dedicated to optical chemical sensors and their application in biotechnology and environmental analyses. Further research activities include functionalized micro- and nanoparticles, luminescent materials and the integration of sensors in microfluidic systems. Since 2017 he is member of the editorial advisory board of the Journal “Analytical Chemistry” of the ACS.

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