Chinese Academy of Sciences

Key Lab for Biomedical Effects of Nanomaterials and Nanosafety

中科院纳米生物效应与安全性重点实验室

Nanosafety Lab. CAS

学术报告通知

CAS NS Forum (NO. 288)

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

时　间: 2018年4月16日 (Monday)　9:00 am

地　点: 国家纳米科学中心，南楼二层会议室

主持人：陈春英

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 sensor 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.

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