Development of a System for Affinity Analysis

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Creoptix GmbH, a young, innovative company in the Wädenswil founder organisation grow, in cooperation with the Center for Biochemistry at the ICBC, has developed a system for label-free affinity analysis with highest sensitivity, and has successfully provided proof of principle. A major application of this instrument is to determine the binding affinity of ligand-analyte interactions in research and development projects, such as in the development of «small molecule drugs» or high affinity antibodies as active pharmaceutical ingredients.

The Measurement Principle

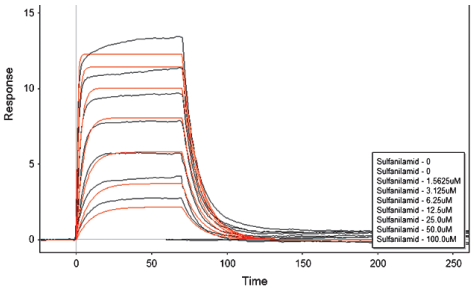
The label-free technology developed by Creoptix to determine affinity between ligand and analyte is based on an interferometric principle and is characterized by high sensitivity and low complexity of the components. Figure 1 shows the configuration and measurement principle of Creoptix's grating-coupled interferometer (GCI). A ligand is immobilized on a sensor chip surface consisting of an optical tantalum pentoxide wave guide. The affinity of the analyte to the immobilized ligand is determined during the continuous flow of the analyte over the chip. The binding of the analyte to the ligand can be detected in real time by means of two laser beams interfering in the wave guide.

The Market for Label-Free Affinity Measurement Devices

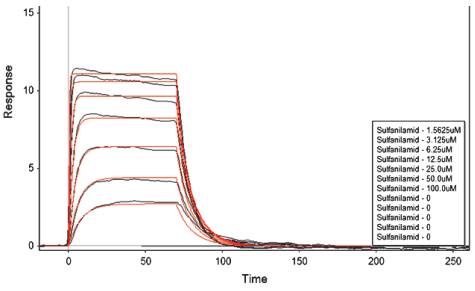
The advantages of wave guide sensors based on interferometry over conventional sensors based on surface plasmon resonance (SPR) are that they are more sensitive and less vulnerable to matrix effects. So far, however, they have not penetrated the market due to their complexity and the associated costs. Thanks to GCI technology, a sensor is now available for the first time in which the known advantages of the wave guide interferometer are achieved with a lower component complexity. Through innovative integration of the microfluidics into the sensor chip in a disposable cartridge, the high data quality achieved with the GCI technology can be combined with a high degree of usability.

Project Objectives and Results

As part of a CTI project, the partners ZHAW, FHNW and CSEM in partnership with Creoptix set themselves the goal of developing an instrument based on the GCI technology. At ZHAW fluidic variants were tested, various surface coatings examined for suitability, and feasibility studies conducted with various model systems. Comparative measurements were made using the currently most sensitive device on the market, the SPR-based Biacore T200. Reference values were determined with the GCI prototype Creoptix QUBE CX-3 (Figure 2). The higher sensitivity of the QUBE CX-3 was demonstrated by an approximately 4-fold higher signal-to-noise ratio. The proof of the suitability of the device for applications in the life sciences has laid the foundation for the planned launch of the device on the market.

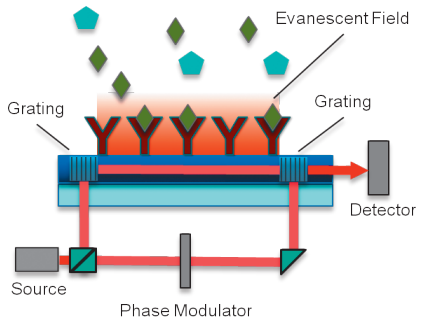


Creoptix QUBE CX-3



Biacore T200

Fig. 2: Binding of sulfanilamide (172 Da) to carboanhydrase II. Comparison of measurement on the GCI-based Creoptix QUBE CX-3 and on the SPR-based Biacore T200



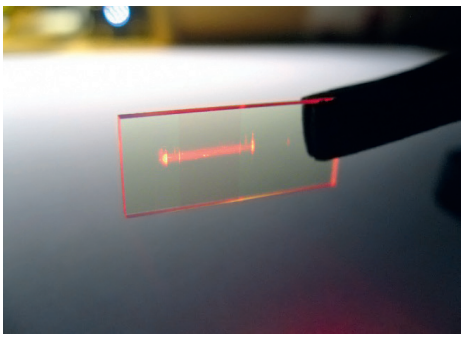


Fig. 1: Structure of the grating-coupled interferometer (l) and sensor with integrated tantalum pentoxide wave guide (r)

Research project

Development and Market Introduction of a System for Label-Free Affinity Analysis with Highest-In-Class Sensitivity

Leadership ZHAW:	Prof. Dr. Christiane Zaborosch
Project duration:	1.5 years
Partners:	CSEM Alpnach, Dr. Helmut Knapp; FHNW, Prof. Dr. Daniel Gygax
Funding:	Commission for Technology and Innovation CTI, Bern
Project volume:	CHF 1.75 Mio.