Abstract
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Thesis title: ***Lokalisierte Funktionalisierung von SPR-Sensoren***
(localized functionalization of SPR sensors)

In the field of biochemical research, including medical and pharmaceutical questions, there is still a need for non-invasive analytical methods. Established analytics often rely on markers and labels to identify and track molecules of interest, e.g. protein-tags or fluorescent dyes. Thus, a "foreign body" is brought into the system that may in_uence the matter being studied, resulting in interference with or even destruction of parts of the system as well as complex sample preparation. Analytical methods without this need are, therefore, desirable. One emerging tool that fulfills these goals is optical sensing based on surface plasmon resonance (SPR). Here, excitation of the plasmon occurs in a thin metal layer in contact to a dielectric sample bulk, e.g. a solution containing target analytes. Processes in the sample bulk result in alteration of the plasmon resonance conditions as long as they occur inside the evanescent field of the plasmon that is in the vicinity of the sensor interface. Thus, SPR sensors need no direct interaction with the sample, making them almost non-invasive. SPR-sensing has been established in the last 20 years leading to several SPR based systems commercially available. These systems have been developed for so called biomolecular interaction analysis (BIA) mainly but SPR sensing is also exploited for other applications like the detection of gases.

A remaining challenge is simultanious sensing of multiple analytes within one sample. A current workaround are sensor arrays, where a single sensing platform shows spacial response to particular analytes. For reasons of miniaturisation,comparability and time-saving it is advantageous to have a single multi-channel sensing device instead of an array composed of several devices. This means localized manipulation of the sensor interface. This thesis focuses on the development of such multi-channel-sensors. Therein, the sensor surface is adjusted to respective requirements by localized functionalization. With imaging SPR-spectroscopy (iSPR) the channels are visualized, identified, selected and observed. Microcontact printing, a simple and low cost soft lithography process, is used to create the channels. Free definable elastomeric stamps allow to realize customized patterns of different molecular sensing structures, thus leading to separated and selective channels. A build-in CCD-camera delivers a contrast image of the sensor surface and the channel pattern. Multiple areas of interest then can be placed on the sensor, thus splitting the surface in separably detected signals.

The first part of this work describes the fabrication of the channels using microcontact printing. Gold-covered glass substrates provide the sensor base. Different thiols are used as molecular sensing structures, forming self assembled monolayers (SAMs) on the gold. SAMs are known to form stable and homogenious layers and are well used in surface engineering. In the second part of this work the sensors are tested in model reactions to prove the general functionality and performance of the developed sensors. Several chemical addition- reactions are tested, thus resulting in a distinct and stable signal. Finally, a model system based on click-chemistry is established and, in varying the system, the performance of the sensors is explored.