Abstract

In this work, functionalized chemical sensors are under investigation, which are subdivided in the major chapters of passive and active devices. Therefore, the properties of four different types of sensor devices - a surface plasmon resonance senor (SPR), a waveguide sensor (WG), a microcavity sensor (µC) and a resonant mirror sensor (RM)- are simulated with the help of the refractive index n and the extinction coefficient k. These optical properties are obtained by variable angle spectroscopic ellipsometry (VASE) of the different materials, applied to fabricate the sensors. The superordinated goal is to develop a toolbox of sensors, which are separately useful for different requirements in chemical synthesis.

Besides the simulations, the passive devices, SPR and WG sensor, are implemented. They are applied in a screening of the influence of the reagent concentrations in the Huisgen 1,3-cycloaddition between an azide and an alkyne. Additionally, the influence of different solvents and a phase transfer catalyst are under investigation.

In the second part, active sensor devices are introduced, which include a photo-switchable layer, consisting of a photochromic dye in a siloxane matrix. With these devices it is possible to influence the refractive index of the active layer structure, which itself provides the opportunity to manipulate the sensors signal. Thus, the sensors are enabled to react on the different demands, which arise from the large variety of possible chemical reactions.