Development of glucose biosensor based on mussel inspired chemistry triggered

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Functional materials are predicted to have an enormous impact on many aspects of society, including next generation health care and energy-related technologies. For example, enzyme-based electrodes represent an important class of biosensors where byproducts of the enzymatic reaction with the analyte are detected electrochemically.[1, 2] Bottom-up approaches, using self-assembly principles, are increasingly considered to be the most appropriate routes for the development of enzymatic biosensors.[3, 4] Recently, we developed the concept of morphogenic self-construction of films, whose buildups are triggered by the presence of ions, the morphogens, generated electrochemically at the substrate. In this project, we propose to apply the morphogenic approach through a mussel inspired coupling reaction using catechol moities (Figure 1). Our aim is to immobilize covalently an enzyme, Glucose Oxidase (GOX), for the development of glucose biosensor.

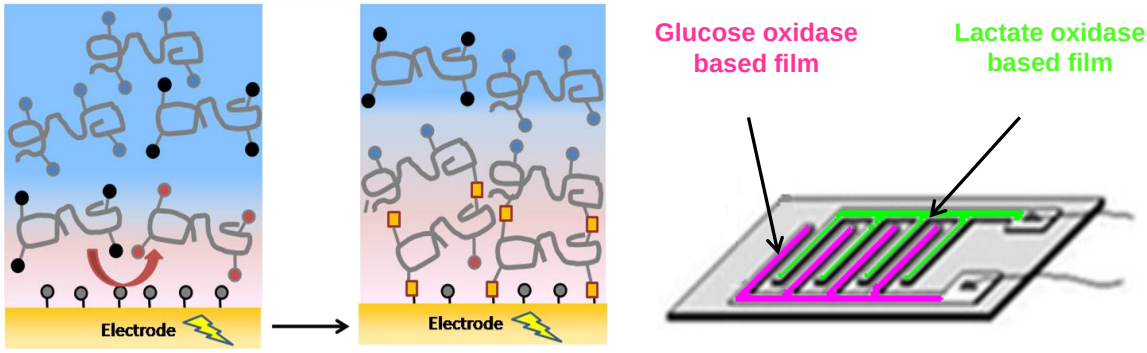

Figure 1: *Schematic representation of the PhD subject based on (left) the morphogenic self-construction of polymeric films based the activation of one polymer through a morphogen gradient (pink gradient). (right) Functionalization of microelectrodes by two enzymes of interest.*

GOX in combination with catechol modified polymer will be used to develop an enzyme based electrode that will be able to generate a measurable current allowing the determination of glucose concentration. Different physico-chemical parameters will be studied to optimise the buildup of the enzymatic film using electrochemically coupled Quartz crystal microbalance (EC-QCM) and atomic force microscopy (AFM). The enzymatic activity of the film in contact with glucose will be determined using amperometry. Microelectrodes will be used to obtain micro-biosensors.

We are looking for a motivated experimentalist (polymer or material science background) who is interested to study the physical-chemistry of enzymatic films on a conductive surface using electrochemistry. Chemical synthesis can be performed by the candidate if he or she is interested in. No knowledge in electrochemistry is needed.

References

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