

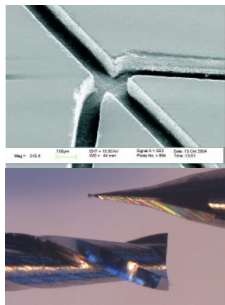


1. Introduction

- Polymers are interesting for the microtechnology due to the inexpensive mass production, the easy adjustable surface and bulk properties and the multisided surface structuring techniques such as micro-milling, laser-ablation or hot embossing. More and more easy handling polymerfabrication displaces expensive silicontechnology in fields such as micro electronics and (bio)sensorics.
- Furthermore electrochemical methods are increasingly used in the (bio)sensorics. These techniques allow a sensitive, selective and fast detection of electro active species and a quick analysis of surface and solution properties without any expensive readout techniques.
- In the course of these trends conductive polymers such as Polypyrrole (PP) and Poly(3,4-ethylenedioxythiophene) (PEDT) become important for production of inexpensive, mass producible and fast sensor systems without any noble or heavy metals.
- We combine conductive polymers (electrode) and biological molecules (recognition element) such as enzymes to build up a high specific, mass producible and noble metal-free detection electrode.

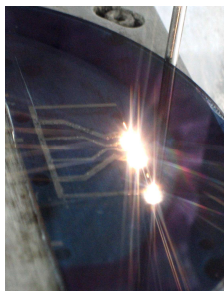
2. Possibilities of surface and electrode structuring

• Micro-milling:



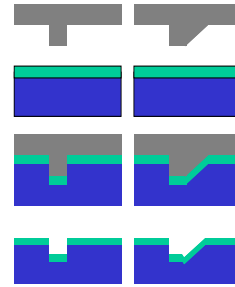
- Fast process to produce micro channels and cavities.
- Using of tools down to 10 μm are possible. We realise 25 μm .

• Laser-ablation



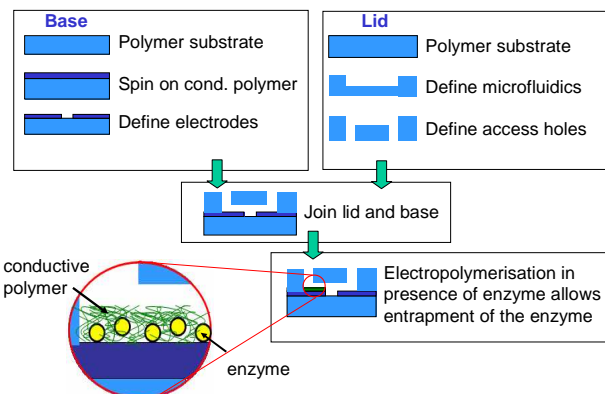
- Material absorbs the energy of the laser flux, heats up, evaporates and leaving voids which disconnect the electrodes or for fluidic systems.

• Hotembossing (HE):

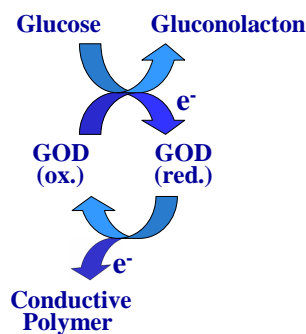


- Heated tool (stamp; grey) will be pressed into an electrically conductive polymer (green) placed on a carrier substrate (blue).
- Soft polymer gives way to the tool.
- After cooling the conducting polymer and the carrier are structured.

3. Fabrication of electrochemical biosensor

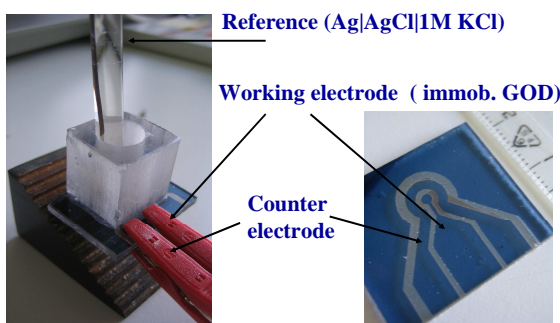


4. Reaction scheme of an amperometric glucose sensor



- Glucose in solution acts as substrate for glucose oxidase immobilised at the electrode
- Glucose oxidase recognises, binds and oxidises glucose to gluconolacton
- Reduced glucose oxidase can be oxidised at a conductive polymer electrode
- Resulting current is proportional to the glucose concentration

5. Polymer prototype of glucose sensor



6. Results / Outlook:

- Successful structuring of electrodes (base) and microfluidic system (lid) by micro-milling and CO₂-Laser-ablation. Application of HE (mass production) will be realised in a later stage.
- Mounting of base and lid was realised by gluing to produce a prototype. To achieve a higher bonding quality, laser bonding will be tested next.
- First tests of conductive polymer (PEDT) as electrode were successful (shown in the workgroup)