**COSMIC: Coupling Smart Molecules Into Chips**

**Screen printing**

1. substrate
2. ink
3. screen printing
4. printing step 1
5. screen printer
6. plastics

**Synthesis of the Ni-NTA chelator on gold arm without spacer**

- Ni-NTA
- Glutaldehyde
- Tebio
- NTA
- NiSO4

**Fluorescence of His-tagged PSI immobilized on plastic gold electrode**

- Residual activity [%]
- L.0.d. = 0.1 ppb
- absorbing at 200 nm

**Immunosensors based on natural molecules are currently available, but very soon biosensors to be largely on the market especially with disposable devices.** Here we report the results obtained with two His-tagged proteins: an engineered phycobilis pigment (PSII-6xHis) and a commercial product (commercial protein A as a control). The immobilization of the proteins was performed by a preconcentration step on the sensor surface or to change the protein with another one with different sensing properties. Here the original procedure for introducing Ni-NTA chelator onto plastic printed surfaces was presented as previously presented at Tebio conference. A silanising agent (APTES) and glutaraldehyde and an amino-derivatization of the chelator was used to build the chelator. The immobilisation on the plastic sheets with Ni-NTA was achieved by washing the sample with imidazole. Good reproducibility and quite high signal were obtained. Typical fluorescence curve of PSII with maximum at about 685 nm with a rather wide shoulder was obtained. Again decrease of fluorescence intensity of almost 60% was observed when imidazole was used as feeding solution together with the substrate. Preconcentration, starting from the pure crude unpurified extracts, skipping long, denaturing and expensive purification procedures...

**Table:**

<table>
<thead>
<tr>
<th>Residual activity [%]</th>
<th>L.0.d. = 0.1 ppb</th>
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<tbody>
<tr>
<td>20</td>
<td>0.1</td>
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<tr>
<td>40</td>
<td>0.1</td>
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<tr>
<td>60</td>
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**Figure:**

- Optical image of a 3D-printed biosensor chip showing the principle: the proteins of interest and their functions are immobilised on the plastic sheet.

**Conclusion:**

- The immobilised PSII had lost activity. Fluorescence spectra (obtained by illumination of the plastic or glass samples with a blue light (400-530 nm) and washing the sample with imidazole) showed a significant decrease of fluorescence intensity of almost 60% was observed when imidazole was used as feeding solution together with the substrate. Preconcentration, starting from the crude unpurified extracts, skipping long, denaturing and expensive purification procedures...

**Further reading:**

- Immobilisation of natural and engineered molecules on electrodes and optical surfaces.

**References:**

1. Department of Biology, University of J.E. Purkinje, Nitra, Slovakia, and R. Pilloton.
2. M. Host, of Microbiology, Academy of Sciences, Bratislava, Slovakia.