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MODELLING THE FUTURE

UTAustin Portugal

Development of a Bio-FET System for Continuous Monitoring of Urinary Biomarkers

NANOTECHNOLOGIES

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Motivation and Objective

Continuous monitoring of multiple biomolecules in urine → Potential of diagnosis at early stages of the disease → More efficient treatment → Better patient outcomes

A solution for such monitoring is still missing.

OBJECTIVE: to develop a **NANO-BIOSENSOR SYSTEM** capable of detecting multiple urine metabolites in continuum.

→ Microfabricated Au electrode [1] + Readout circuit system

PADDY Biochip

Microfabrication Process – PADDY Biochip

PADDY microfabrication follows the process **described** below:

Glass sample cleaning → 1st lithography step → Cr/Au deposition → Au pads lift-off → 2nd lithography step → Ti/Pt deposition → Ref pads lift-off → 3rd lithography step → Si_3N_4 deposition → Final Dicing

Au Test Pads Definition

Pt Ref Pads Definition

Passivation – Vias Definition

pH Tests

Two group of tests were performed to study:

1. the ΔI_{DS} after the addition of an acid and a base to a neutral solution.
2. the I_{DS} when 6 different pH solutions were tested.

Results:

- $\uparrow pH \Longrightarrow \uparrow I_{DS}$ (linear relationship)
- pH sensitivity of $2.20\ \mu A/pH$

Fig 1. Experimental

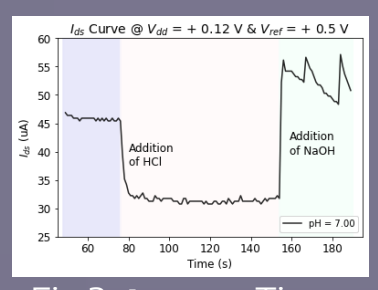

Fig 2. I_{DS} over Time

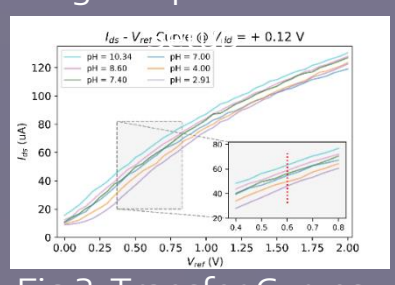

Fig 3. Transfer Curves

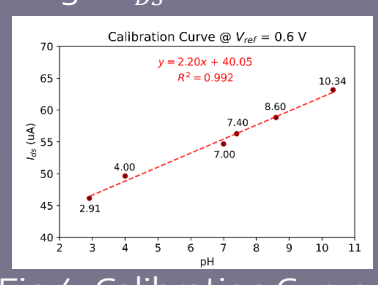

Fig 4. Calibration Curve

Future Work

- Identify the urinary biomarkers for the target diseases.*
- Functionalization process. *
- Test with urinary protein biomarkers.

***ongoing tasks**

Reference

[1] Baldacchini, C., et al. "A reliable biofet immunosensor for detection of p53 tumour suppressor in physiological-like environment." *Sensors*, 2020

Partners & Funding

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Ciências ULisboa

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