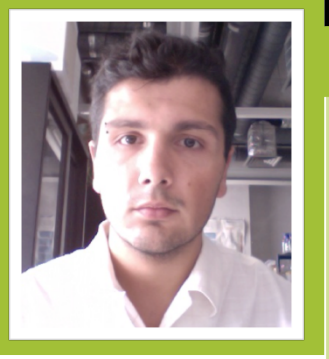
SCIENCESPRINGDAY

FACULDADE DE CIÊNCIAS E TECNOLOGIA
UNIVERSIDADE NOVA DE LISBOA

Life Sciences Department– CIGMH
Centro de Investigação de Materiais- I3N

Development of field-effect sensors for gene expression analysis
Application to cancer diagnostics.

Nanotheranostics- CIGMH / Biosensors - CENIMAT



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Bachelor´s degree :
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Master´s degree:
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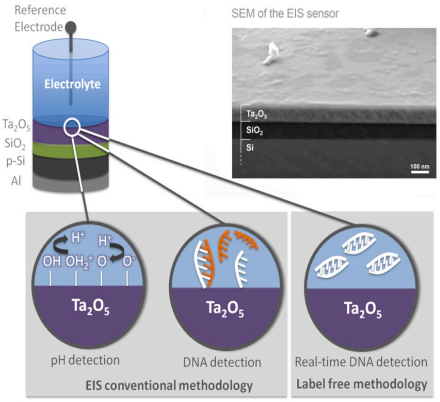
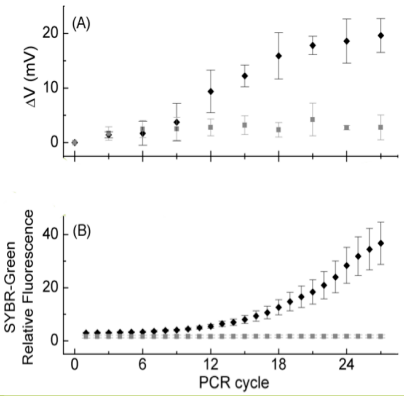
Objectives

This project aims at developing an amorphous metal oxide ion sensitive thin film transistor biosensor, optimized for real-time detection and quantification of DNA/RNA amplification. A Ta_2O_5 based sensor will be fabricated, characterized and optimized for label-free, real-time detection and quantification of gene expression (Fig1). As proof-of-concept, genes over-expressed in biological pathways of relevance for human cancer that can be used as disease biomarkers will be used and compared to current standard laboratory techniques. Assessment of fabrication via ink-jet deposition of sensing layers onto flexible low-cost supports will be pursued towards development of low-cost point-of-need platform for cancer diagnostics.



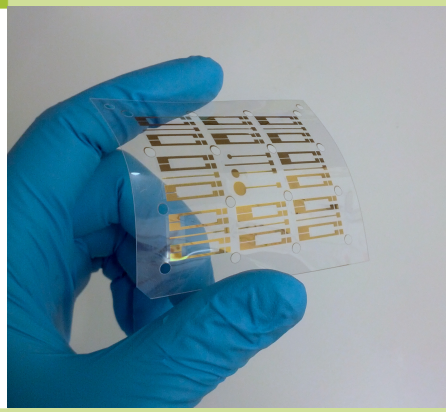
Methodology

Based on the *In silico* sequence analysis, we will development specific DNA/RNA qRT-amplification methodologies for each relevant locus, allowing the detection and gene expression analysis. Optimisation of these reactions will be followed for specific allele discrimination allowing the analysis of gene mutation and genome stability.
Charge variations in the electrolyte-insulator interface associated with DNA amplification influence the oxide's surface potential, thus modulating the EIS sensor response (Fig2). Oxide based devices will be fabricated using the conventional technologies, and ink-jet printing, on crystalline silicon, glass and flexible substrates at room temperature (Fig3).



Expected Results

- We aim to develop a label-free real-time quantitative nucleic acid amplification based on ISTFTs suitable for gene expression analysis - Comparison between A) corrected Ta_2O_5 EIS sensor amplification curve and B) standard RT-PCR: •) c-MYC gene sequence amplification, ■) RT-PCR negative control (Fig2).
- Develop a methodology for real-time quantitative DNA/RNA amplification using the fabricated device.
- Assess the best methodology that integrates ISTFTs and Gold nanoparticles for optimal sensitivity and specificity.
- Validation of developed platform for molecular diagnostics using biological/clinical samples of cancer patients.



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