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FACULDADE DE CIÊNCIAS E TECNOLOGIA
UNIVERSIDADE NOVA DE LISBOA

Materials Science Department – CENIMAT|I3N

Electronics and optoelectronics

CENIMAT|I3N / Microelectronics and Optoelectronics

FCT Fundação para a Ciência e a Tecnologia
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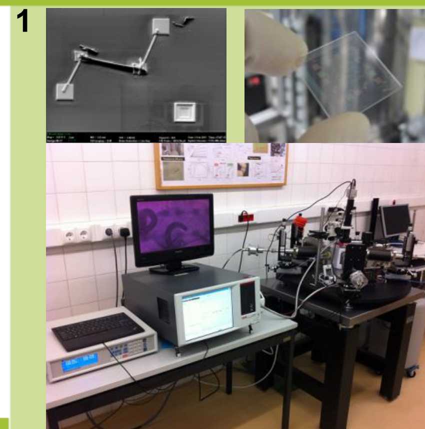
Objectives

- Investigate of the electrical properties of a promising class of n- and p-type TFT materials, amorphous oxide semiconductors, nano-transistors and memristors (1) .
- In order to get insights into charge transport models, several electrical experiment setup can be operated, namely basic TFT electrical properties measurement and advanced analysis of devices (source/drain series resistances, gate voltage dependent S/D series resistance), capacitance measurements, photo field effect analysis, stability and durability experiments of TFT (evolution of threshold voltage, mobility, contact resistance, bias and current stress measurements with and without illumination) and exploring temperature dependent electrical characteristics (2,3,4).

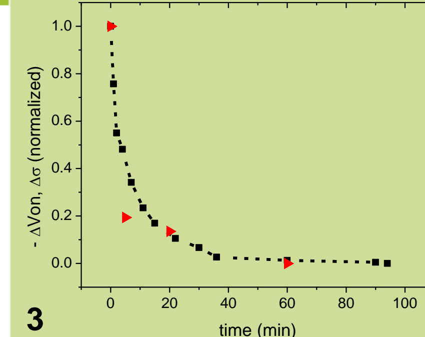
1



Methodology

- The characterization work is making full use of an advanced configuration of a Keithley 4200-SCS semiconductor parameter analyzer, including DC, CV and pulsed-IV modules, connected to a Janis ST-500 cryogenic probe station able to measure fA current levels under vacuum or different gas atmospheres, with UV-Vis-NIR illumination and at temperatures ranging between 80 K to 650 K.
- For nanotransistors, there is also the possibility of performing in-situ measurements inside a SEM-FIB cross beam system (Zeiss Auriga).

2



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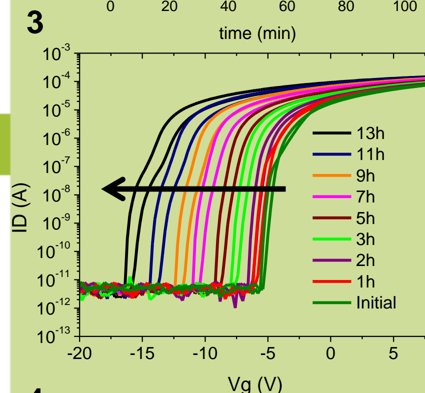
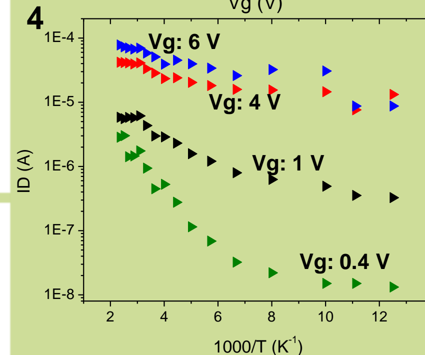


Expected Results

- Dynamic characterization, using C-V measurements at different frequencies is a crucial step for the characterization of the dielectric/semiconductor interface, which dominates field-effect devices behavior and stability.
- In order to accurately model the TFT electrical properties, the light wavelength and intensity dependent photo-responses (photo field-effect) in oxide TFTs, between UV and NIR is investigated to extract a density-of-states (DOS) model.
- Temperature dependent measurements can provide various types of information concerning the dominant physical mechanisms of parasitic resistance and the distribution of the density of states in a sub-band gap region.

4



Funding: