

Materials Science Department – CENIMAT|I3N

Transparent Electronics: Fabrication/Simulation

CENIMAT|I3N / Materials for Electronics, Optoelectronics and Nanotechnologies Group



UNINOVA



Jorge Martins

Researcher, PhD Student

PhD Student in Nanotechnologies and Nanosciences at FCT/UNL

2012 – MSc in Physics Engineering at FCT/UNL

jorge.souto.martins@gmail.com

Objectives

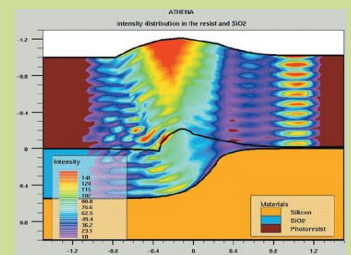
- Implement process and device simulation tools suitable for oxide TFT technology.
- Improve the electrical properties of low-cost oxide semiconductor thin films (e.g. Indium-free such as ZTO) at lower process/annealing temperatures, using physical and solution processing routes.
- Understand/reduce gate bias stress effect on oxide TFTs.
- Integrate n and p-type oxide TFTs in transparent CMOS circuits.

Methodology

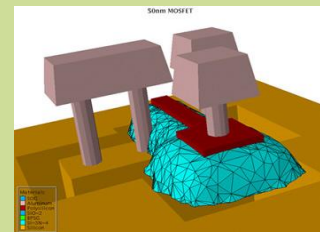
- Device fabrication:
 - RF magnetron sputtering or solution-processing deposition methods of amorphous transparent oxides (e.g. ZTO, IGZO, GAZO, SiO+TaO). Low temperatures (<175°C) used in fabrication.
- Physical simulation of processes, structures and devices:
 - Optical-lithography simulation (1)
 - Mask/processes simulation of structures (2)
 - Simulation of structures' physical parameters
 - Device simulation (3)
- Optimization of processes and devices using the simulation outputs.

Expected Results

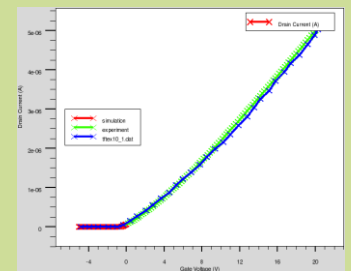
- Indium-free oxide semiconductor thin films deposited by sputtering requiring low process/annealing temperature ($\mu > 15 \text{ cm}^2/\text{Vs}$ with $T < 175^\circ\text{C}$).
- Low-temperature ($T < 250^\circ\text{C}$) solution-based processes for amorphous oxides deposition.
- Articulation of process and device simulation for prediction of device/circuit behaviour with process modifications.
- Good performance of fully-transparent and flexible (4) oxide CMOS circuits. e.g. CMOS Inverters (5 and 6).



1



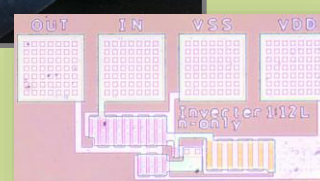
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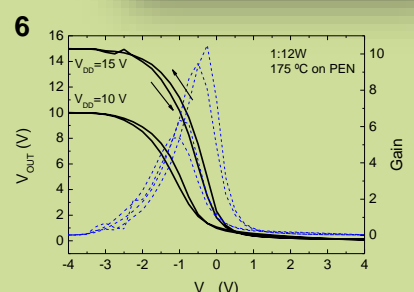
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6



ORAMA



i-FLEXIS