SCIENCESPRINGDAY

FACULDADE DE CIÊNCIAS E TECNOLOGIA
UNIVERSIDADE NOVA DE LISBOA

Materials Science Department – CENIMAT|I3N

Transparent Electronics and Nanofabrication

CENIMAT|I3N / Microelectronics and Optoelectronics Group

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2012 – Assistant professor on the Materials Science Department, FCT-UNL

2010 – Ph.D. in Nanotechnologies and Nanosciences, FCT-UNL

Objectives

- Design and fabrication of nanosctructured oxides for application in low-temperature transparent electronics, involving conductive, semiconductive and insulating materials.
- Integration of n- and p-type oxide TFTs in transparent electronic circuits (1).
- Fabrication of transparent active matrix backplanes (2) and integration with frontplane technologies (LCD, OLED, e-ink).
- Low-temperature deposition processes compatible with device fabrication with and on paper (3).
- Modification of neural electrodes at nanoscale level.
- Fabrication of nanoscale devices using SEM-FIB-GIS platform (4 and 5).

Methodology

- Multicomponent amorphous oxides (e.g. Ga-In-Zn oxide, GIZO) fabricated by sputtering, which is currently the method implemented in display industry.
- Indium-free materials are being investigated for cost reduction and improved electrical and optical performance at low temperatures.
- Low-temperature fabrication (<200 °C) is always a requirement, for cost reduction and compatibility with flexible substrates (PET, paper...).
- Migration from optical to e-beam lithographic techniques in order to study transistors with sub-µm channel lengths.
- Usage of the extensive possibilities of the Zeiss Auriga SEM-FIB installed at CENIMAT for analysis, deposition, milling and modification of materials and devices at nanoscale level, using the combined action of electrons and ions.

Expected Results

- Oxide TFTs with processing temperatures <200 °C with good electrical performance (μ_{FE}>10 and 1 cm^2/Vs for n- and p-type TFTs, respectively) and stable operation under electrical and optical stress.
- Oxide CMOS circuits and OLED displays with oxide TFT backplanes on flexible substrates.
- Usage of results from sputtering processes as a benchmark for material selection using solution-processing routes (ultimately, ink-jet printing, for simultaneous deposition&patterning of device layers).
- Neural electrodes modified by FIB with improved SNR.
- Nano-FETs for exploration of new concepts for future IC technologies.

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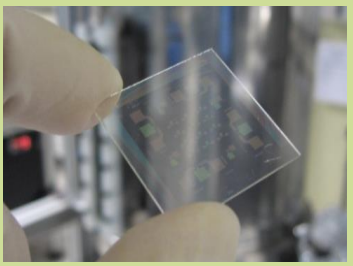

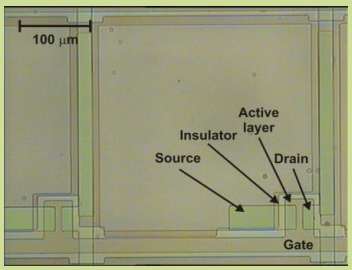

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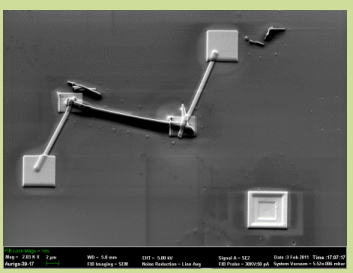

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Funding:

SEVENTH FRAMEWORK PROGRAMME

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