Project CuFT PTA

In the group semiconducting compounds, cuprous oxide (Cu_2O) presents promising electrical and manufacturing features that establish it as a suitable candidate for p-type transparent semiconductors. During last year in LMGP we achieved the incorporation of magnesium in cuprous oxide thin films grown by aerosol-assisted metal-organic chemical vapor deposition. The fabricated doped thin films reached up to 17% of magnesium, resulting in morphology changes. Electrical resistivity was reduced down to values as low as 6.6 Ω.cm, due to the increase of charge-carrier density up to $8x10^{17}$ cm^{-3}, 100 times higher than Cu_2O. On the mobility, we obtained diminished values (1 $cm^2.V^{-1}.s^{-1}$) when compared to intrinsic Cu_2O (5 $cm^2.V^{-1}.s^{-1}$). However, the assessment of the impact of the doping on the optical transparency was inconclusive since the bandgap (2.35eV) and the total transparency (51%) only improved slightly when comparable with intrinsic Cu_2O.

As a consequence of these results, we would like to prepare a Thin Film Transistor TFT in PTA with a following structure:

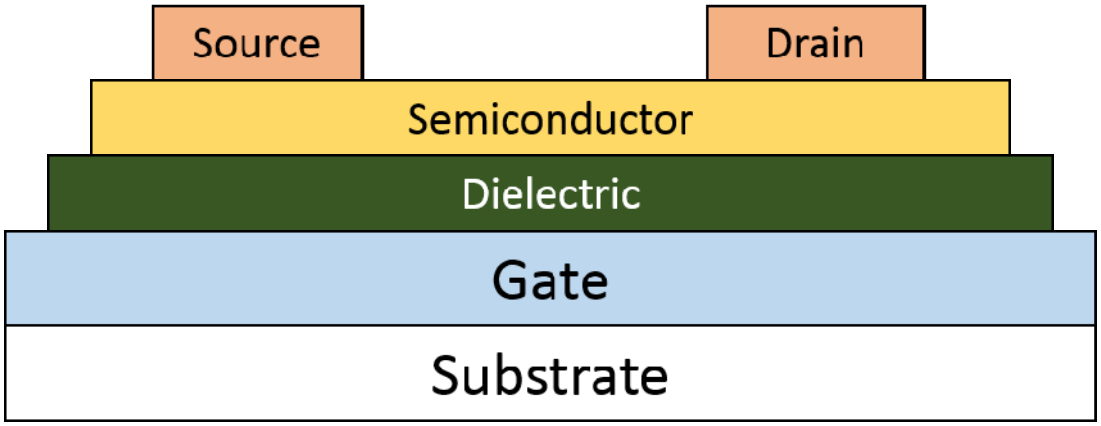

Figure 1 - Structure of the TFT

Substrate – Corning Glass 1737

Gate – 200nm of indium tin oxide (ITO) thin film (commercial)

Dielectric - 200 nm of Al_2O_3 and TiO_2 (ATO) superlattice, 200 nm Al_2O_3, or 200 nm of SiO_2 (deposited in PTA with mask)

Semiconductor - 50nm of intrinsic Cu_2O and Mg doped Cu_2O (deposited in LMGP).

Channel width and length - W/L = 500 µm/20 µm litho and chemical etching (PTA)

Source and drain - 200nm Au or 200nm ITO (deposited in PTA with litho and lift off)