

EFFECT OF UV/OZONE TREATMENT TIME ON PENTACENE THIN-FILM TRANSISTORS

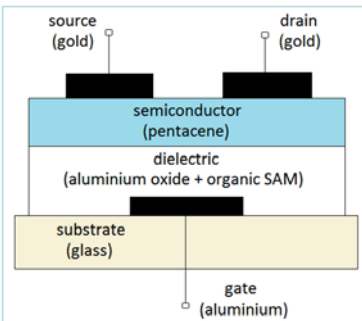
INTRODUCTION

Organic materials due to their low process temperature and compatibility with flexible plastic substrates are becoming the cost efficient substitutes to inorganic materials. Their ability to be applied over large areas makes them attractive for large-area electronics. Their applications range from flexible displays to solar cells, sensors and RFID tags.

OBJECTIVE

To develop low-temperature process for low-voltage p-channel transistors, amenable to plastic foil substrates.

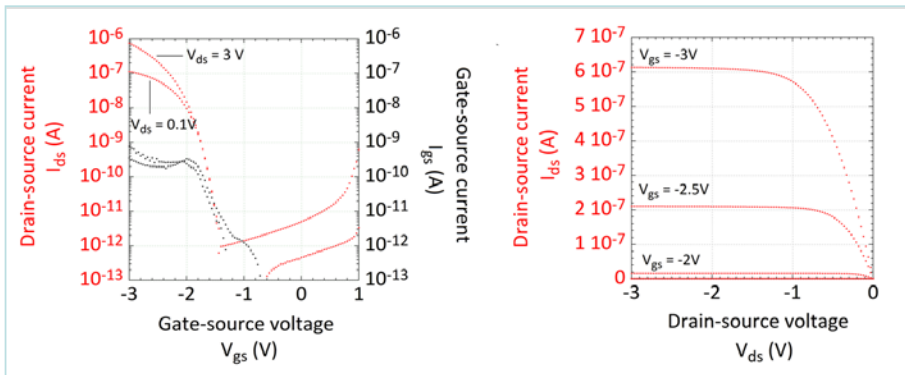
TRANSISTOR STRUCTURE



EXPERIMENT

- AlO_x prepared by UV/ozone exposure of aluminium gate
- Varied UV/ozone exposure time between samples
- All other transistor layers are identical
- Transistor dimensions:
channel width W = 1000 μm
channel length L = 30, 50, 70, 90 μm

TRANSISTOR TRANSFER AND OUTPUT CHARACTERISTICS



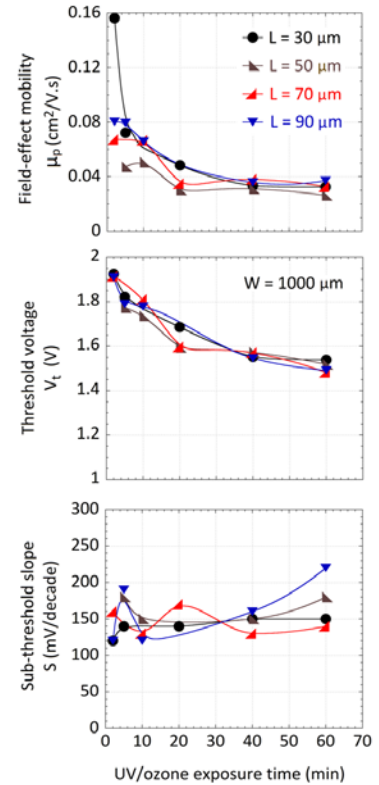
TRANSISTOR PERFORMANCE

Field-effect mobility $\mu_p = 0.04 \rightarrow 0.16 \text{ cm}^2/\text{Vs}$
 Threshold voltage $V_t = -1.5 \rightarrow -1.9 \text{ V}$

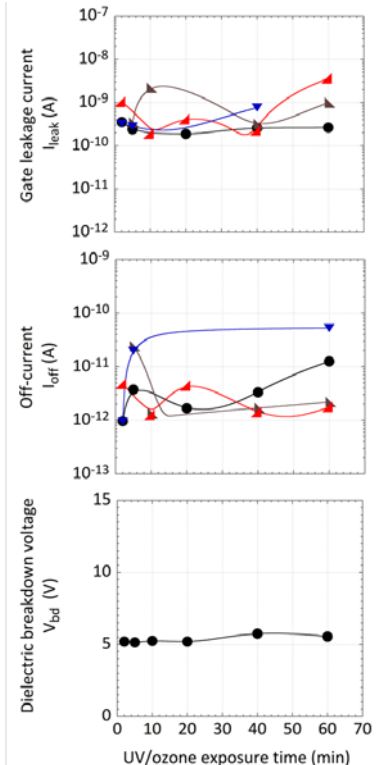
On-off current ratio $I_{on}/I_{off} \sim 10^6$
 Sub-threshold slope $S \sim 150 \text{ mV/decade}$

CONCLUSIONS

- Field-effect mobility and the threshold voltage decrease with increasing UV/ozone time
- UV/ozone time has little effect on the off-current, gate leakage current, sub-threshold slope, and the gate dielectric breakdown voltage.



RESULTS



Krishna Chinnam is recipient of a PhD scholarship funded by Glasgow Research Partnership in Engineering (GRPE). He acknowledges help from the School of Engineering, University of Glasgow.