ORGANIC ELECTRONICS

Operation of OFET devices

Ambipolar behavior of OFET device

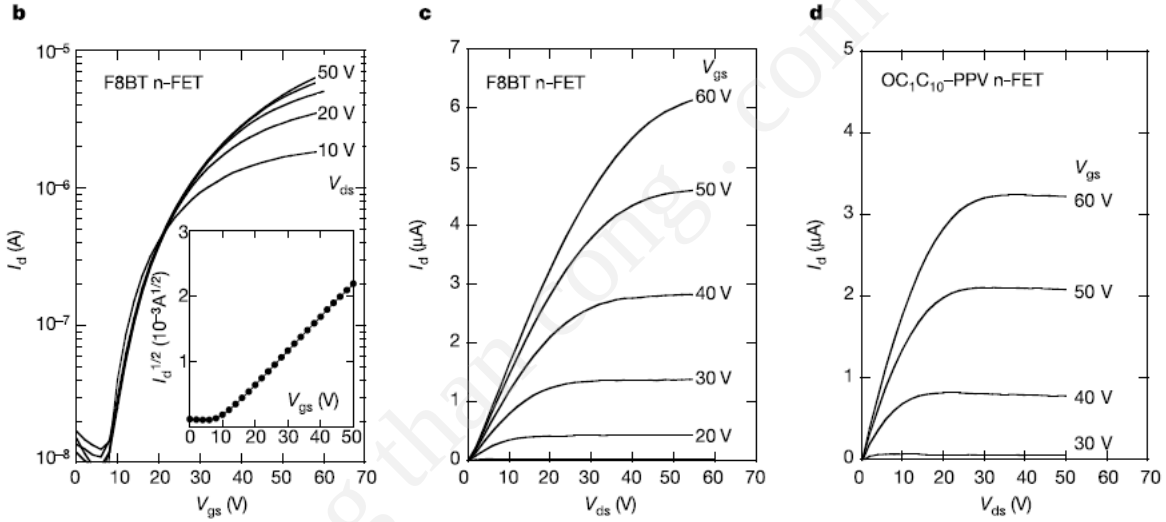


Figure 1 F8BT and OC_1C_{10}–PPV n-channel FETs with BCB/SiO_2 dielectric and Ca source-drain electrodes. **a**, Diagram of the n-FET and the chemical structure of the crosslinked BCB dielectric. s-d, source-drain. **b**, Transfer characteristics of an F8BT n-FET: channel length $L = 25\,\mu m$, channel width $w = 2.5$ mm and gate capacitance $C_i = 13\,nF\,cm^{-2}$ (SiO_2 thickness, 200 nm; BCB thickness, 50 nm). Inset shows a well-behaved linear plot of $I_d^{1/2}$ versus V_{gs}. Values of $\mu_{e,FET}$ extracted from the linear and the saturation regimes are $7 \times 10^{-3}\,cm^2\,V^{-1}\,s^{-1}$ and $5 \times 10^{-3}\,cm^2\,V^{-1}\,s^{-1}$, respectively. **c**, Output characteristics show well-defined saturation behaviour. **d**, Output characteristics of an OC_1C_{10}–PPV n-FET: $L = 200\,\mu m$, $w = 10$ cm and $C_i = 9\,nF\,cm^{-2}$.

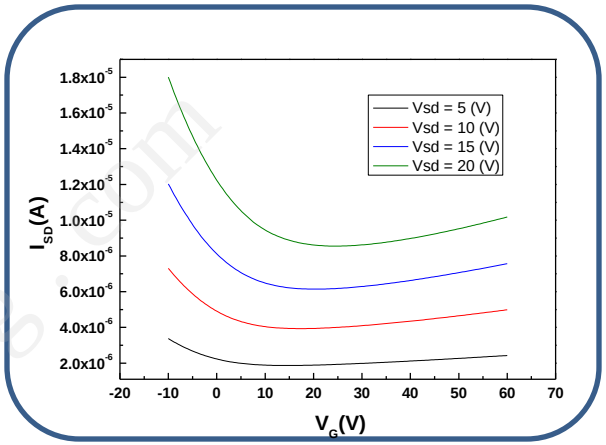
- Organic semiconductor have both carriers types.
- SiO_2 gate have Si-OH groups that trapped electrons, not holes

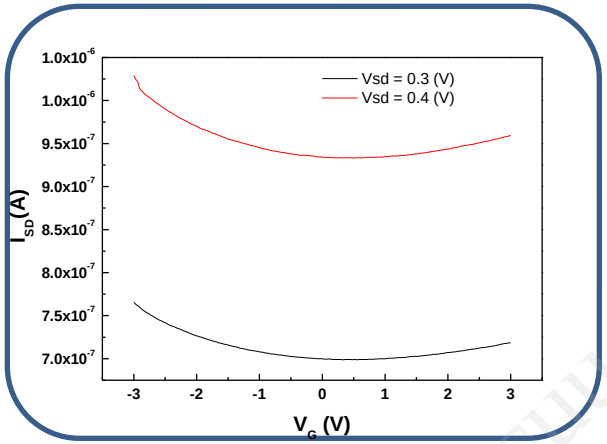
Ref. R. H. Friend, Nature, 434, 2005, 194

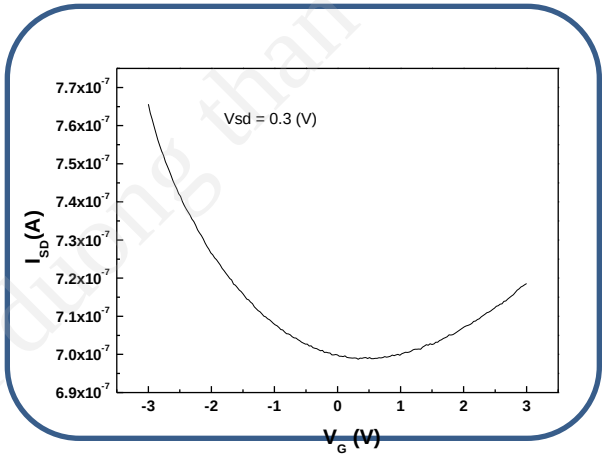
Stability improvement by encapsulation

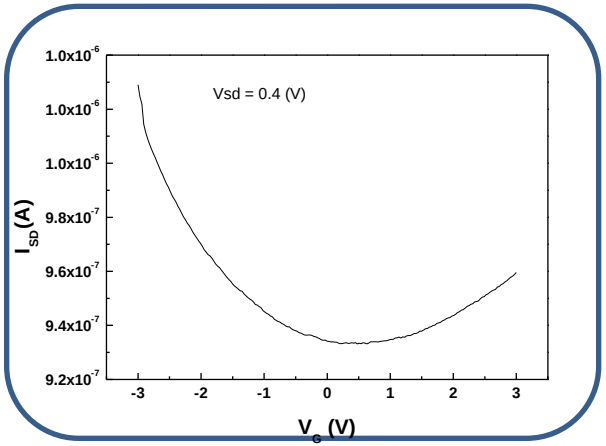
rGO – FET without encapsulation:

Dirac point (DP) at high Gate bias-voltage, and DP depends on applied Vsd due to high trapping of electrons.







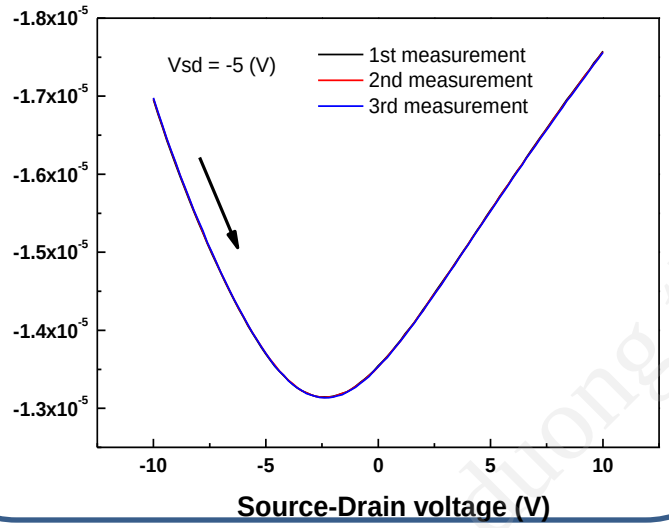


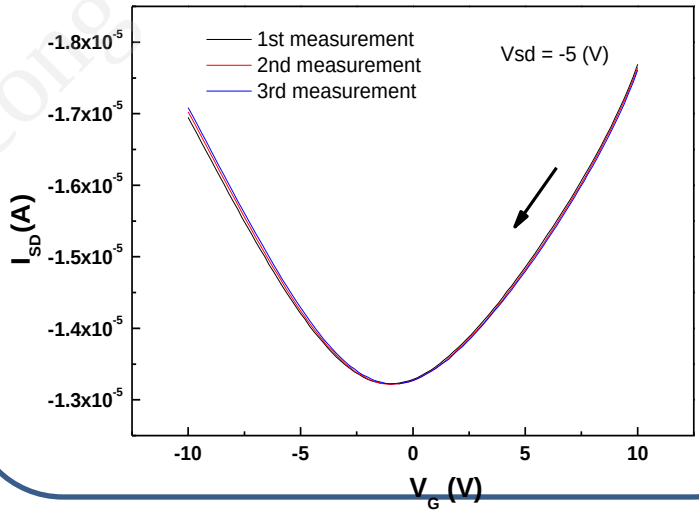
rGO – FET with encapsulation:

DP was observed at lower gate bias-voltage, and DP does not depend on applied Vsd, which indicate reduced charge trapping effects.

Stability improvement by encapsulation

Stability measurement





TTC deposition condition:

-> **Annealed for 4 hours at 140 ℃ in vaccum vapor or oxygen**

-> **Deposition of TTC (300 nm) at 50 ℃**