

# Transistors organiques ambipolaires

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- ***Transistors Mémoires***
  
- ***Transistors ambipolaires***

# Organic Field Effect Transistors

- Low temperature processing
- Compatibility with plastic substrates

Applications :

Active matrix displays

Low cost logic circuits

Smart cards

## FET Type FeRAM

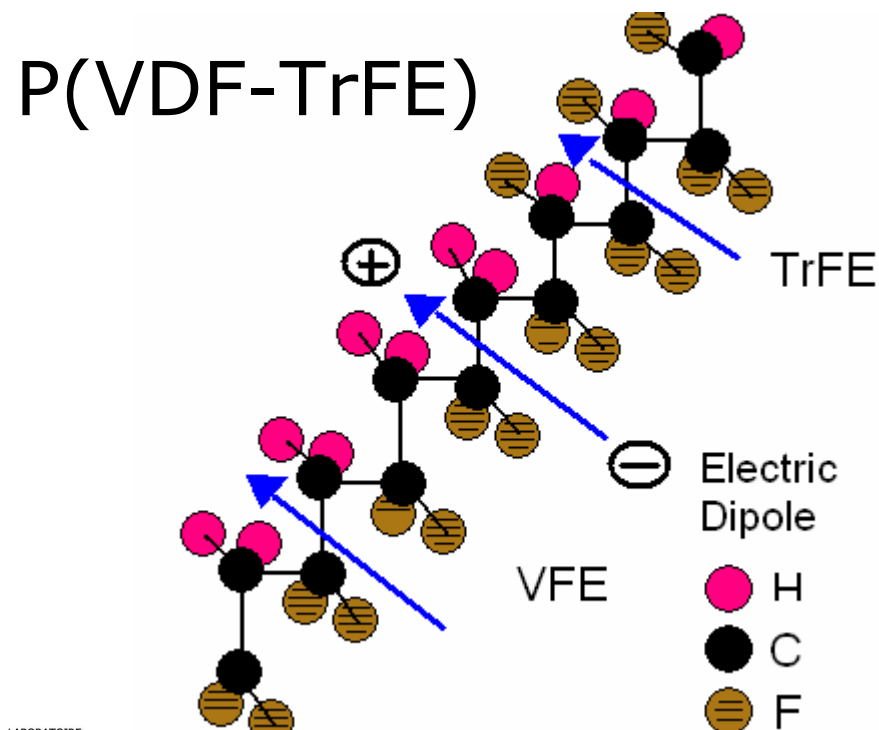
- **Nonvolatile Data Storage**
- **Nondestructive data readout**
- **Single Transistor type memory cell**

## Structure

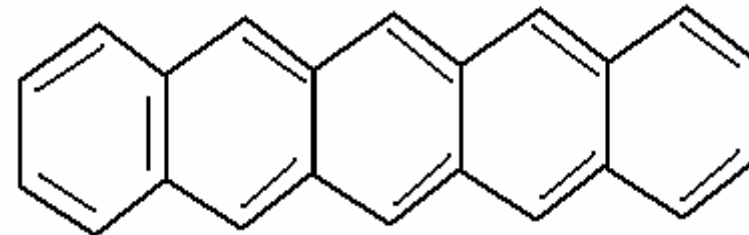
**Pentacene / active material**

**Polyvinylidene fluoride-Trifluoroethylene / gate insulator**

**Gold & ITO / contacts**

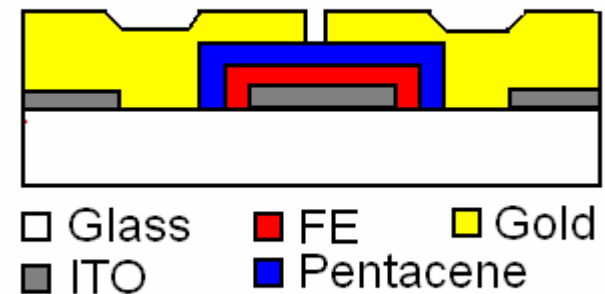


Pentacene

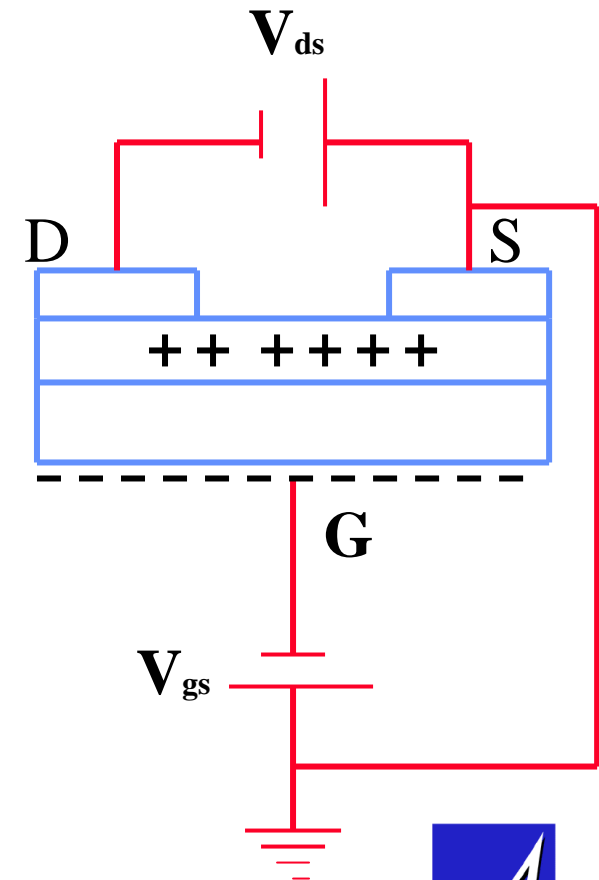
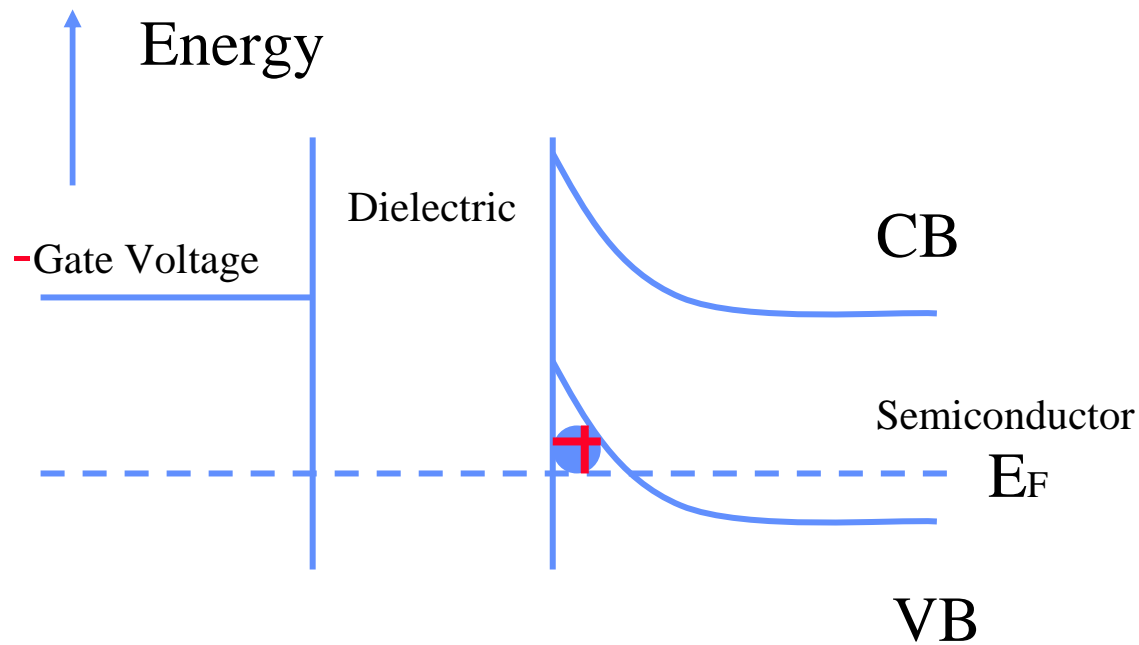


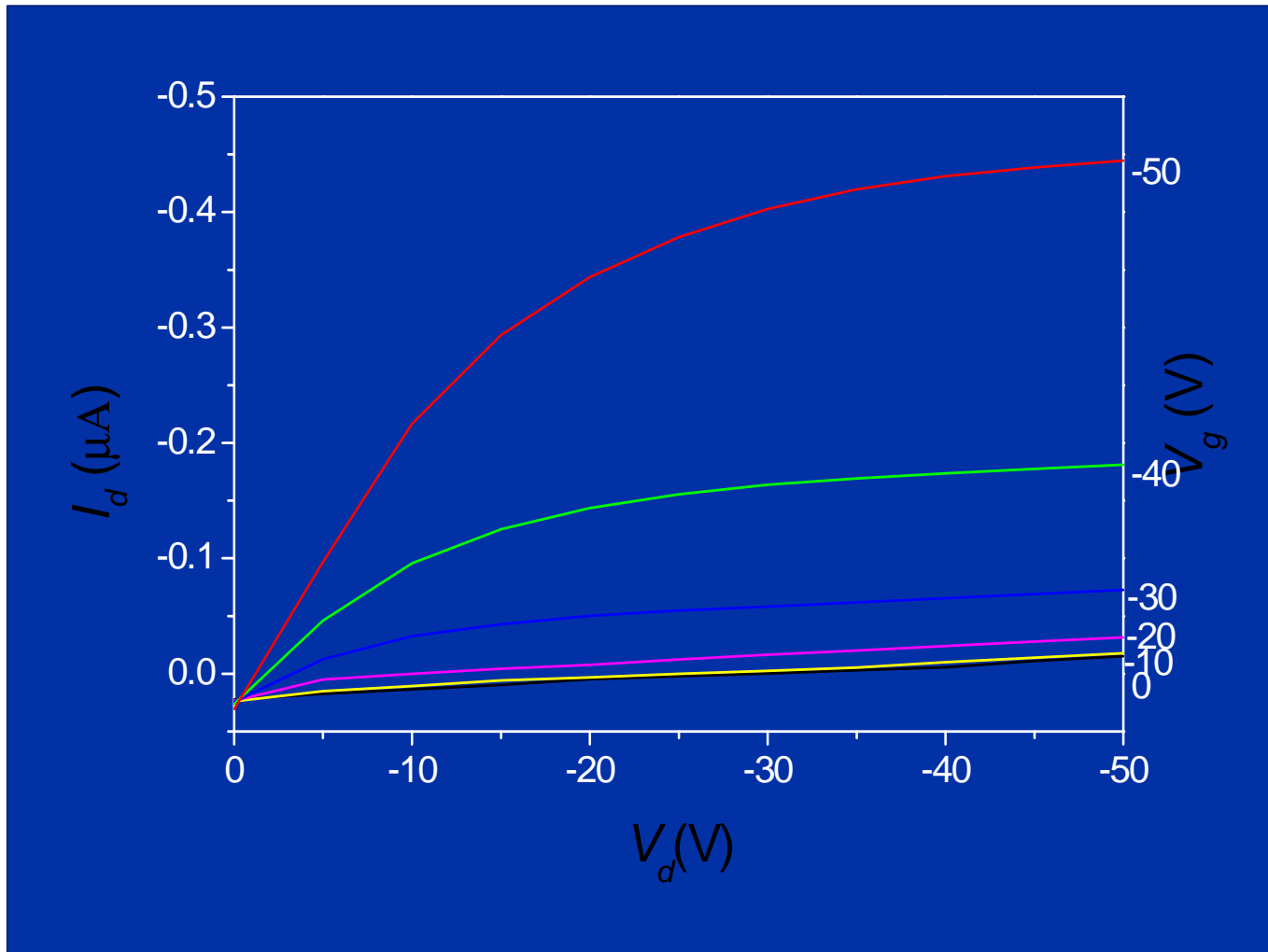
## Experimental Details

- ITO coated glass slides as substrates
- P(VDF-TrFE) spin coated
- Pentacene evaporated
- Gold source & drain electrodes
- Channel length  $120\mu\text{m}$
- Channel width  $0.5\text{mm}$

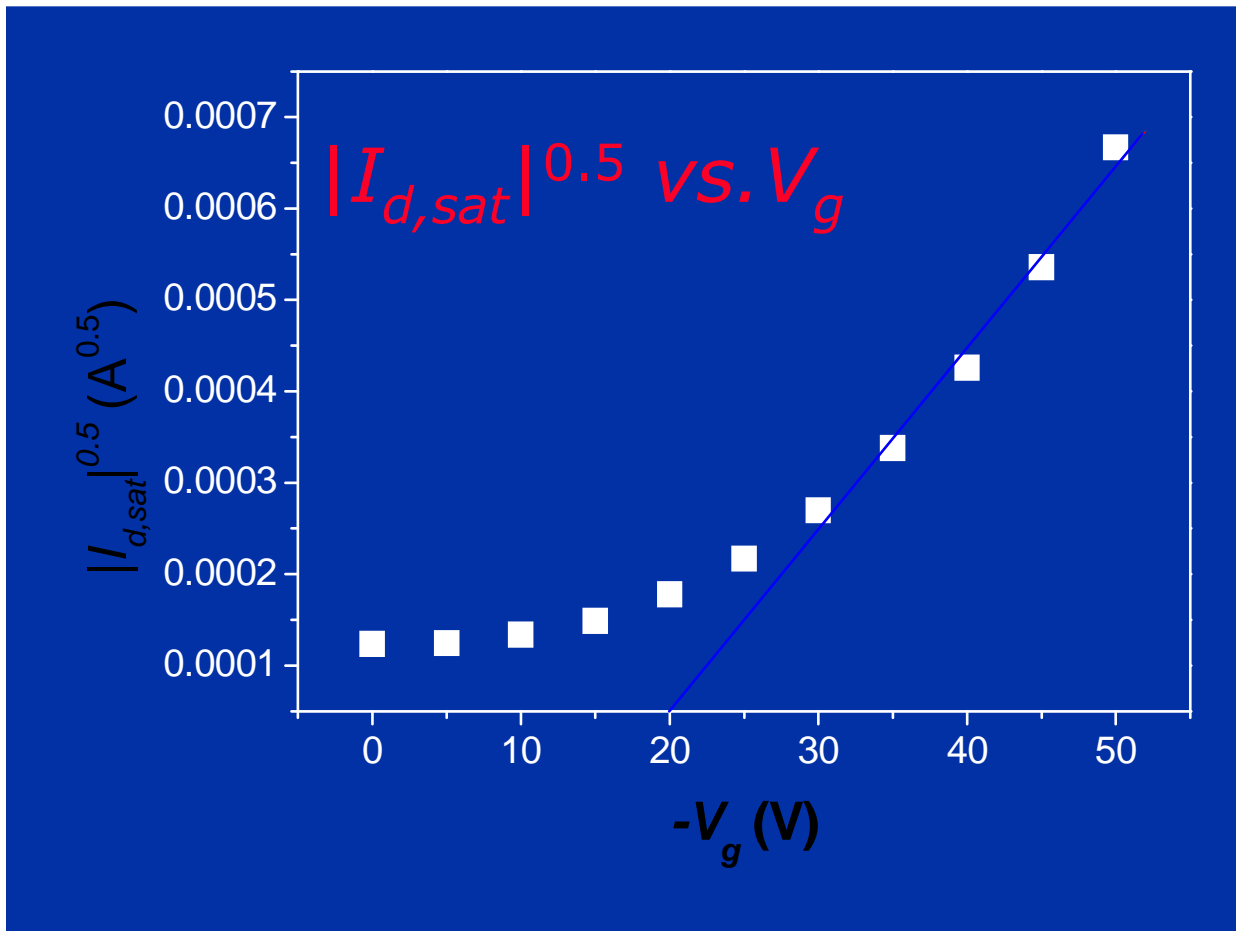


# How does a MISFET works ?





Transistor characteristics of a pentacene FET with P(VDF-TrFE) as gate insulator

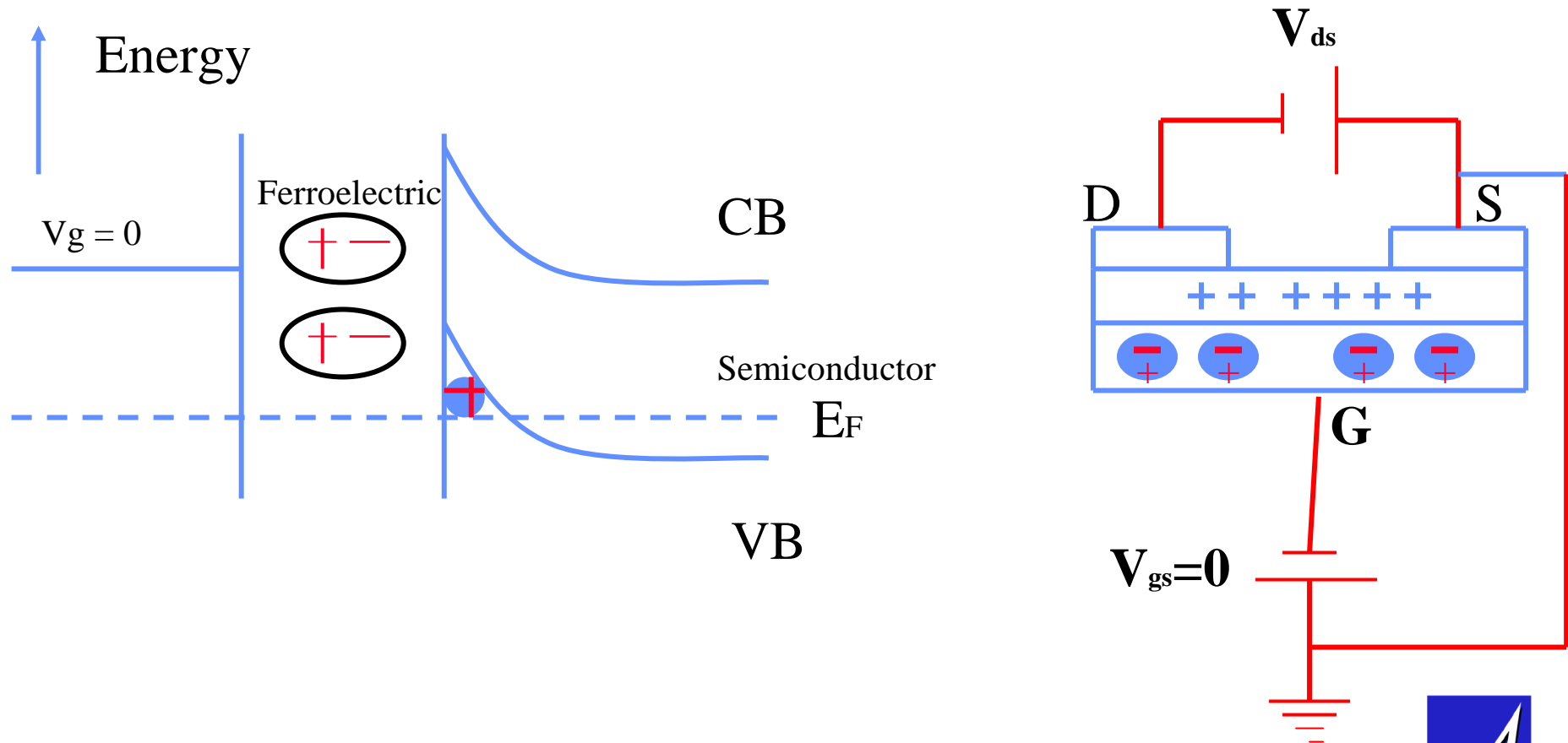


$$I_{d,sat} = \frac{W}{2L} C_i \mu_{FE} (V_g - V_t)^2$$

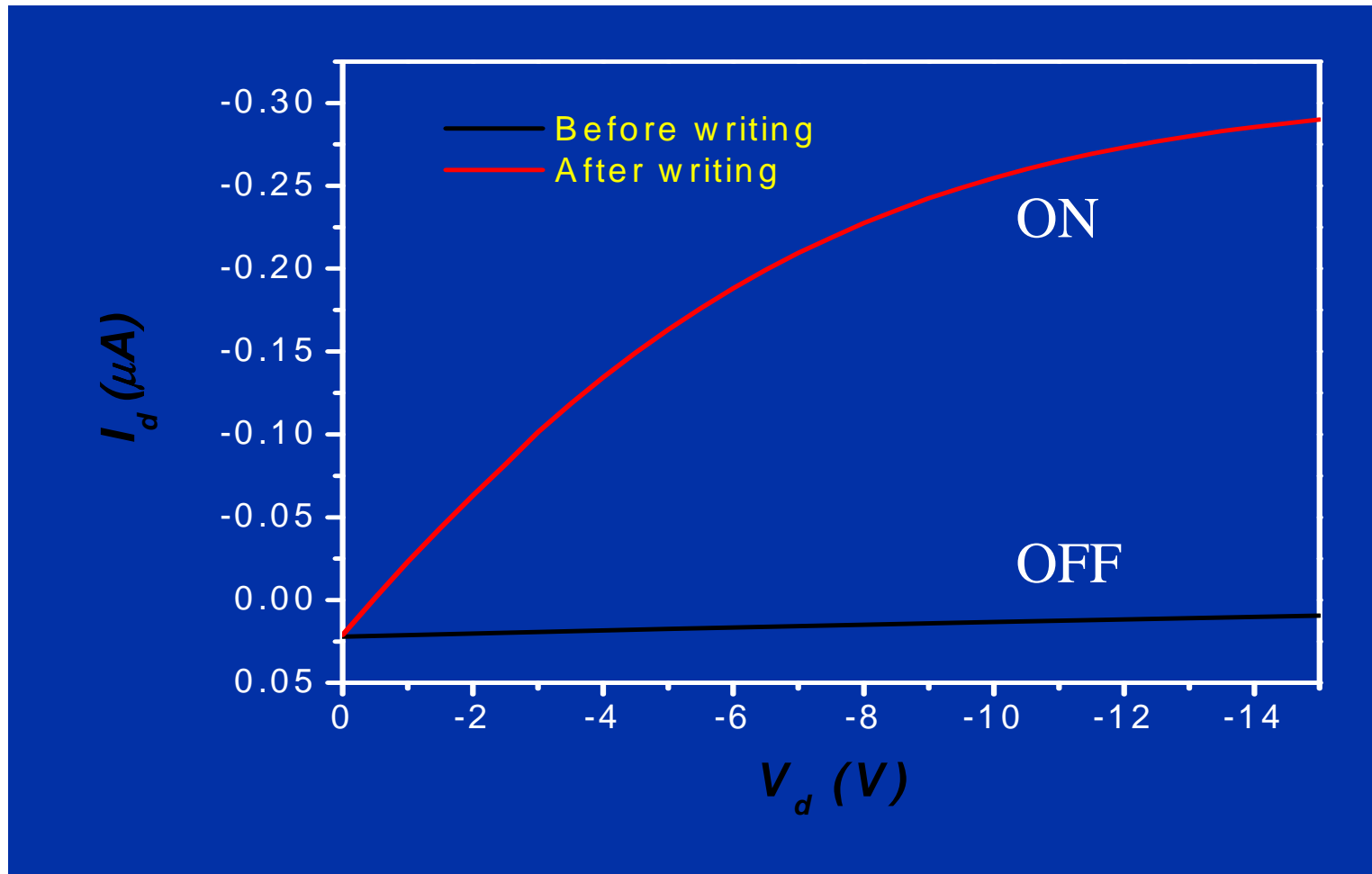
$$\mu_{FET} = 2.6 \times 10^{-3} \text{ cm}^2\text{s}^{-1}\text{V}^{-1}$$

$$\text{Threshold voltage} = -17.4 \text{ V}$$

# How does a MFS-FET works ?

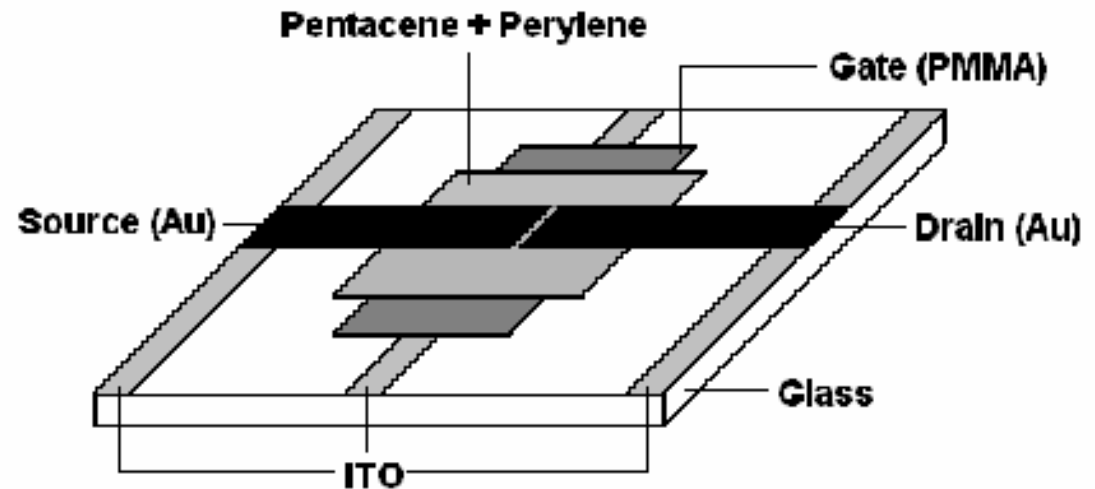
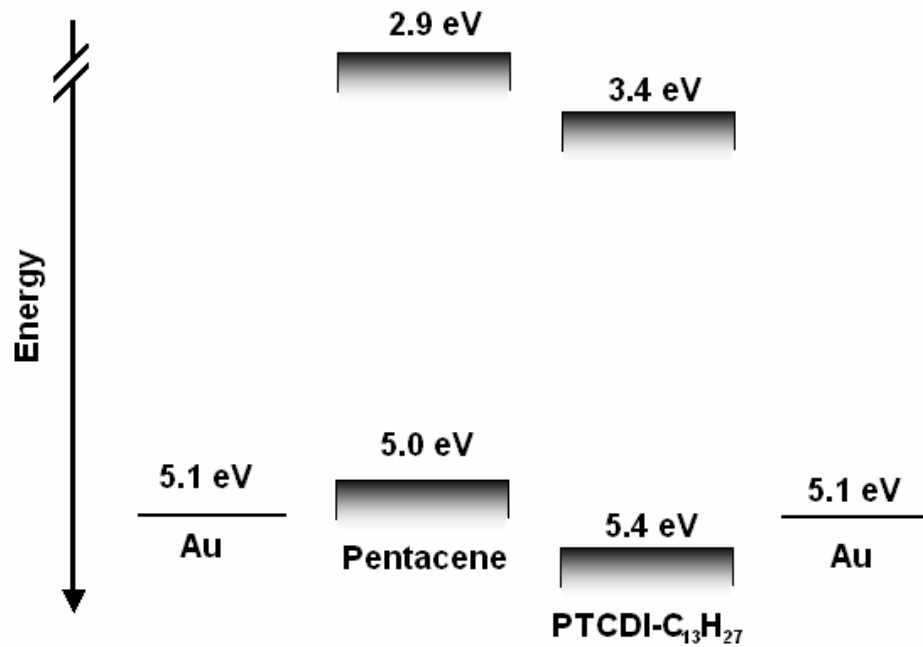


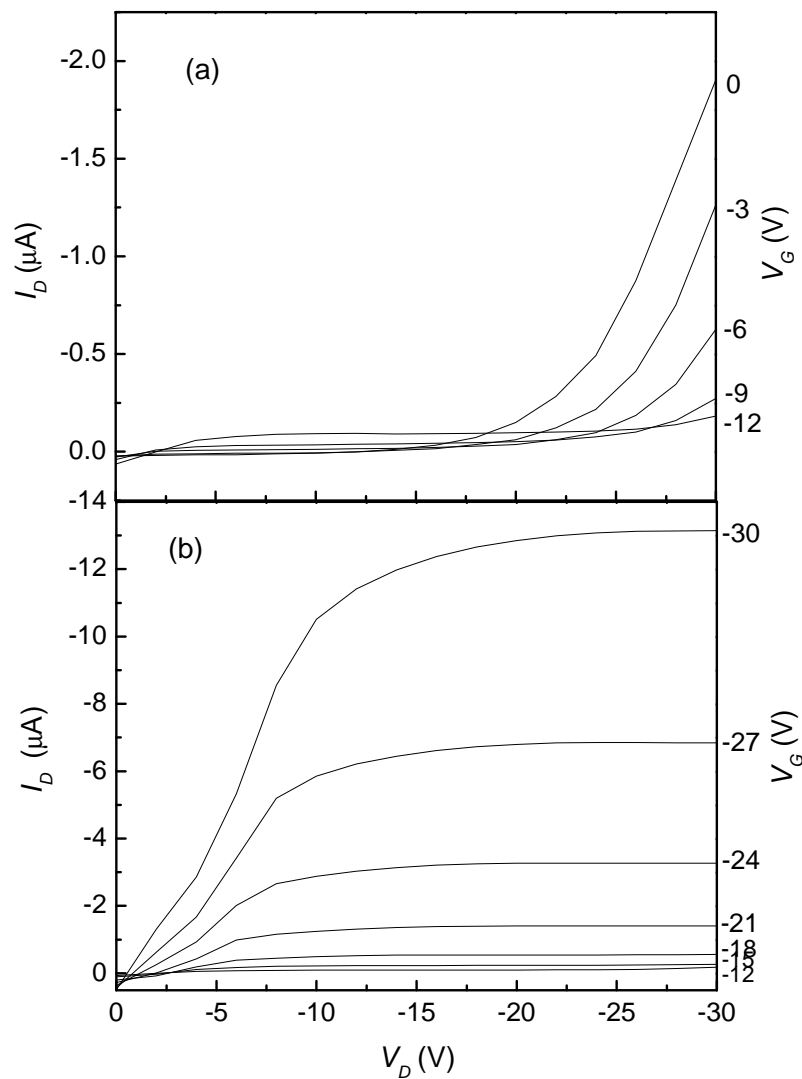




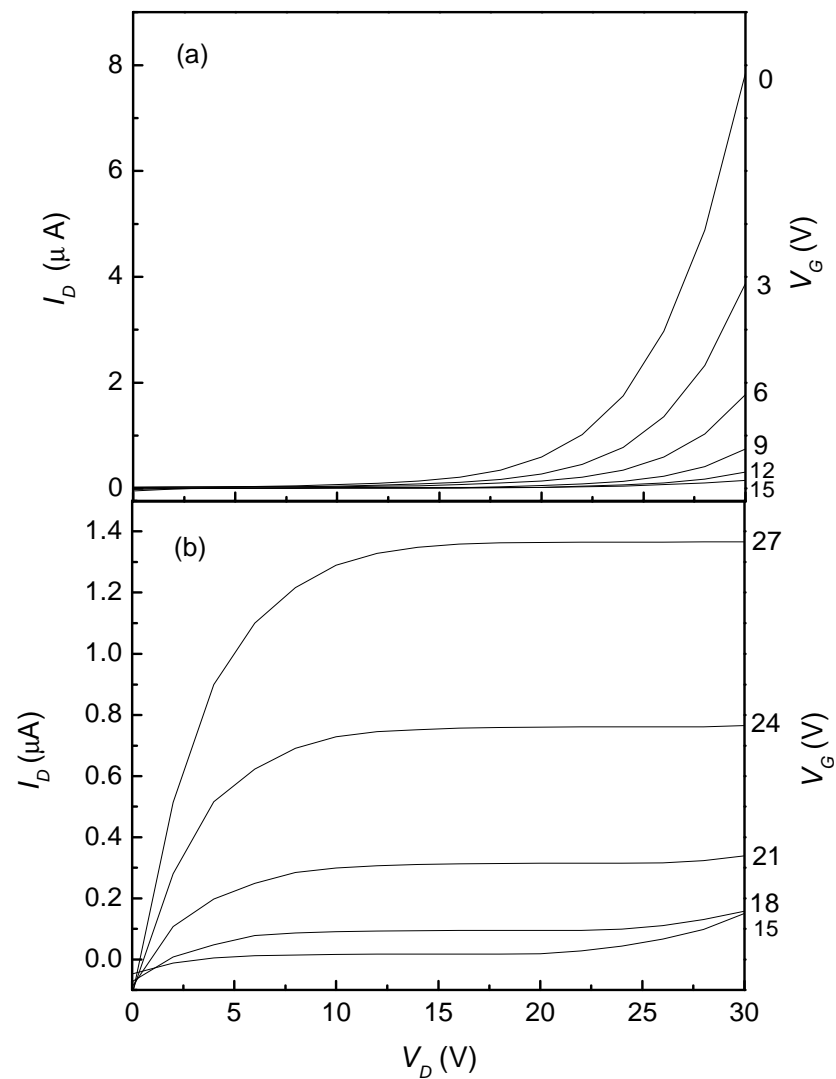
Comparison of drain currents at  $V_g = 0$ , before and after writing with  $-50$  V

# FET ambipolaire



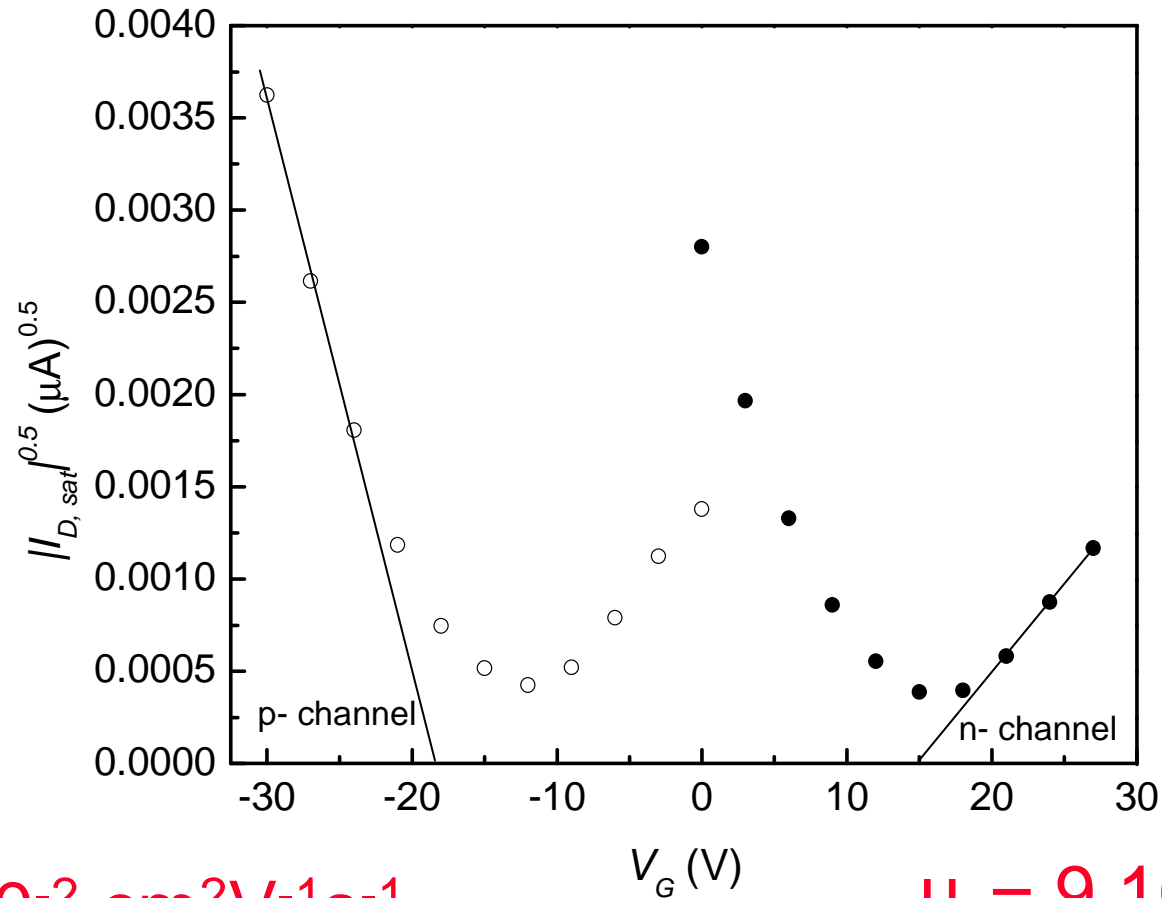


**Fct. Canal P**



**Fct. Canal N**

# Caractéristiques ON/OFF

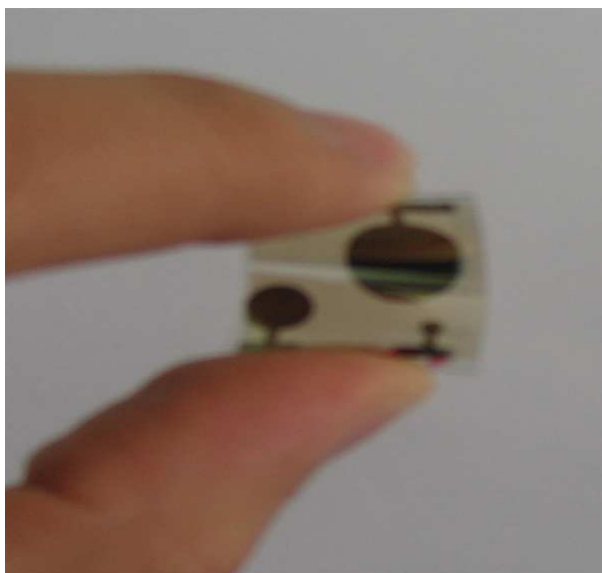


$$\mu_e = 10^{-2} \text{ cm}^2\text{V}^{-1}\text{s}^{-1}$$

$$\mu_h = 9 \cdot 10^{-2} \text{ cm}^2\text{V}^{-1}\text{s}^{-1}$$

( $1,2 \cdot 10^{-2}$  / pure)

## Composants plastiques souples, stables et reproductibles



***Cellules PV souples 2-3% (APL 2006)***

# TITK, Rudostadt

