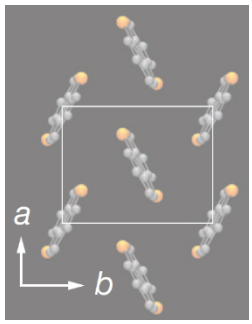
School of Engineering
Institute of Materials
Laboratory of Macromolecular
and Organic Materials

# Organic Electronic Materials 2025 Exercise 8 (submit on 01.06.2025)

1. What is the function of a transistor and in which applications can thin film transistors (TFTs) be found? Draw a schematic illustration of a bottom gate, top contact OTFT. Name all the parts and give examples of possible constituent materials.

2. Describe the working principle of an organic thin film transistor. Illustrate your answer with both the charges evolution on OFET drawings and the output characteristics at the different working regimes, in the case of a p-type top gate, bottom contact OFET.

3. A typical value for the number of accumulated charge carriers in an OTFT in the on-state is $10^{13}$ $cm^{-2}$. What is the percentage of charged molecules in an OTFT based on a single layer of $C_8$-BTBT, with herringbone packing (image on the right) and crystal lattice parameters of a=5.9 Å and b=7.9 Å?




4. Draw a transfer curve for a typical n-type TFT. Which parameters can be extracted from (i) the transfer curve and (ii) from the $\sqrt{I_D}$ vs $V_G$ curve?

5. The working principles of OVP and OLED are opposite. Explain this affirmation with the help of schemes of charges evolution on energy diagrams, in the simple case of devices with a mono active layer between the two electrodes.

6. Explain why bulk heterojunction OPVs are more efficient than single layer or bilayer OPVs. Make a qualitative drawing of each structure. What is the exciton diffusion length and why is it important for the device efficiency?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