PÔSTER - RESUMO - DISPOSITIVOS ELETRÔNICOS, ELETROQUÍMICOS, SUPERCAPACITORES E BATERIAS

# MAPPING THE CHARGE DISTRIBUTION IN ORGANIC TRANSISTORS BY NONLINEAR OPTICAL MICROSCOPY


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Organic Field-Effect Transistors (OFETs) are the basis of organic electronics, just as inorganic transistors are fundamental building blocks to current (inorganic-based) electronics. Among their main advantages are low cost, simple fabrication, and versatility, made possible by the chemical design of the organic semiconductor properties. An OFET is a three-terminal device (drain, source, and gate), with the gate isolated from the semiconductor film by a dielectric. The electrical conductivity within the semiconducting channel (between drain and source electrodes) is controlled by charge accumulation at the semiconductor-dielectric interface, induced by the applied gate voltage. Although the basic working principle of an OFET is well understood [1], testing current OFET models against experimental data is scarce in the literature [2], especially regarding the charge density distribution within the channel of operating OFETs. A few methods have been used to probe the charge (or electric-field) distribution within OFET channels, such as photoluminescence microscopy [3], microwave near-field conductivity microscopy [4], second-harmonic microscopy [5] and charge-modulation microscopy [6], among others. However, a comparison of the obtained distributions with OFET models has not been explored. Here we will show our recent extension of sum-frequency generation (SFG) vibrational spectroscopy [7] to SFG microscopy for probing the spatial distribution of the electric-field within the dielectric layer, which is proportional to the accumulated charge density at the semiconductor-dielectric interface, along the OFET channel. This technique has the unique feature of potentially being sensitive to the sign of the electric field. This opens the possibility of probing for the first time the charge inversion that should occur near the drain electrode after the pinch-off, in the saturation conditions. This perspective will be discussed, together with the expected comparison with OFET models.

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Palavras-chave: organic field-effect transistors; charge distribution; sum-frequency vibrational spectroscopy; charge-induced absorption spectroscopy; optical microscopy.