**ΤΙΤΛΟΣ :**

**"Fabrication and Characterization of Organic Field Effect Transistors (OFETs) based on the Sprayed Blends of Semiconducting Small Molecules and Insulating Polymers"**

## Αγγλική Περίληψη

Spraying technology is emerging as one of the most promising solution processing methods in the field of organic electronics, due to its simplicity, compatibility with R2R processes, as well as its capability to deposit functional organic semiconducting thin films on both plastic and rigid substrates towards the realization of a variety of organic electronic devices and applications (OLEDs, OSCs, OFETs, inverters, sensors…). Recently, several spraying approaches, such as airbrush spraying, ultrasonic spraying, electrostatic spray deposition, have been developed for the realization of high performance OFET devices. Small soluble acenes have attracted the interest of the scientific groups due to their solubility in common organic solvents, their good solution processability, as well as their good electrical performance and stability. However the crystalline anisotropy of the organic semiconducting small molecules and the incomplete coverage of the resulting films may result in large variations in electrical performance of the produced OFETs. As has been proposed to the literature, a viable way to address these issues is the use of small molecule/insulating polymer blends. In such cases, the good film-forming properties of the polymers can be efficiently combined with the high charge carrier mobility values of the crystalline organic semiconductors and thus provide good wet film formation over a large area, better device performance consistency as well as enhanced mobility values. In this study, airbrush spraying technology was used for the deposition for the deposition of blended solutions of triisopropylsilylethynyl-pentacene (TIPS-PEN) and an insulating polymer such as polystyrene (PS) or polymethylmethacrylate (PMMA). The utilization of such blended solutions not only resulted in an improved wet film formation but also enabled the control of the crystallization behavior of TIPS-PEN. Particularly, we performed a detailed study on the effect of the drying process on the crystalline morphology of both TIPS-PEN/PS as well as TIPS-PEN/PMMA blend films. Furthermore, TIPS-PEN and PS or PMMA were mixed in different composition weight ratios (0.8:0.2, 0.5:0.5, 0.2:0.8), in order to investigate the blending effect on the morphological and structural characteristics of TIPS-PEN/PS and TIPS-PEN/PMMA blends. The fabricated air-brush sprayed OFETs showed excellent current-voltage electrical characteristics with a maximum recorded mobility value up to 1.12 $cm^2/Vs$, negligible hysteresis, ON/OFF current ratios greater than $10^4$ and near-zero turn-on voltages Von ≈ 0V. These electrical performances represent a remarkable improvement compared to those obtained in previously reported sprayed OFETs with a similar device geometry. Additionally, the sprayed OFETs revealed long-term environmental stability with a little degradation in electrical performances. These results indicate the applicability and potentiality of the air-brush spraying technology for large-area processing for the fabrication of high performance and stable OFET devices.