Symposium: **N** - Controlling and characterising the structure of organic semiconductor films

Title: **Growth and performance of polycrystalline α-Sexi-thiophene thin films deposited by Supersonic Molecular Beam Deposition**

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Conjugated small molecules are very interesting both as a model to study the growth model of crystalline organic films and as a very good performance organic material. Vacuum deposition is the most suitable technique to obtain high purity and order films. Nevertheless, the high anisotropy of organics makes easy the formation of different polymorphs or/and orientations that strongly limit the quality of the films. The innovative supersonic molecular beam deposition (SuMBD) technique, developed at the IFN-Lab, allows a wider control on the growth. The kinetic energy ($E_K$) of the

impinging molecules is the key factor that affects the growth modifying the assembling processes of molecules and their surface mobility.

We report on the α-sexithiophene sub-monolayer growth, investigating the influence of energetic state of the impinging molecules, surface energy and substrate temperature. Each growth parameter affects the morphology of the molecular film in terms of coverage and fractality of the sub-monolayer islands. Optimizing the different parameters, we obtain larger and smoother islands and low density of grain-boundaries.

The best conditions, including high kinetic energy of the beam, give rise to organic thin film transistors (OFETs) with a field effect mobility value of $1.5 \cdot 10^{-1}$ V·cm$^{-1}$·s$^{-1}$, twice higher than the best values in literature.