STUDY OF TCM-TTF SUPRAMOLECULAR ORGANIZATION BY AFM

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In the field of molecular electronics it is essential to understand the nature of the non-covalent interactions which exist between molecules since they are responsible for the resulting electrical properties. Tetrathiafulvalenes (TTF) have provided many good conductors and superconductors, the 1,3-dithiole ring of TTF contains two sulphur atoms, and potentially realizes large intermolecular S-S contacts.[1] As an example, TTF derivatives have recently been shown to be promising materials for the preparation of organic field-effect transistors (OFETs). The driving force in the crystallization of the TTF is the π-π stacking, which permits, together with the S···S interactions, an intermolecular electronic transfer responsible for their transport properties. [2]

Here we report on the study of the self-assembly in solution of the TTF derivative, tetracarbometoxy-tetrathiafulvalene (TCM-TTF, Fig.1) by Atomic Force Microscopy (AFM).

We demonstrate that different polymorphs of TCM-TTF can be obtained depending on the nature of the solvent used for crystallizing it. This result shows the influence of the solvent-molecule interactions on the 3D organization of this molecule (Fig. 2).

The two dimensional self-assembly of TCM-TTF was studied by AFM. The samples were prepared by drop-casting a solution of the compound on different substrates. Deposition of TCM-TTF from THF and toluene diluted solutions on graphite resulted in the formation of aggregates, but nanofibers structures were observed on mica and silica (Fig.3). From a solution of TCM-TTF in CH_2Cl_2 the formation of layers was observed. Finally using methanol aggregates were formed in both substrates.

In summary, it has been shown that it is possible to induce different organizations of TCM-TTF controlling the interactions solvent-molecule-surface.

References:

[1] M. Katsuhara et al, Synthetic Metals, 149, 219 (2005)
[2] M. Mas-Torrent et al, *J. Am. Chem. Soc*. 126, 984 (2004)

Figures:

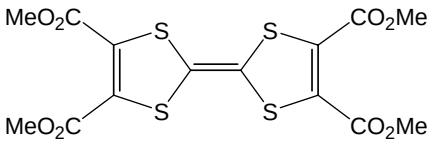

Fig. 1 *Molecular structure of tetracarbometoxy-tetrathiafulvalene (TCM-TTF).*

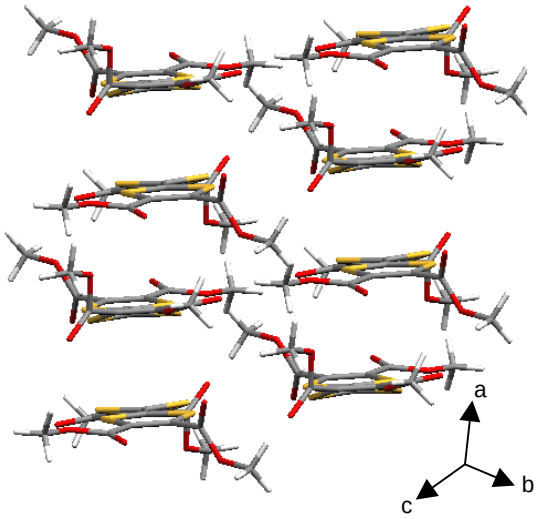

Fig.2 *Crystal structure of a new polymorph of TCM-TTF.*

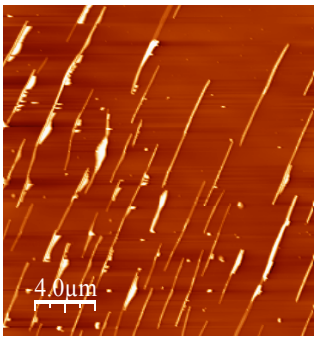

Fig.3 *AFM image of fibres formed from a toluene solution of TCM-TTF on mica.*