Electro-optical properties investigations of a new conjugated polyrotaxane for generating the active layer in organic electronic devices

1. Project objectives

The current proposal is wishing to continue previously collaborations with Laboratoire de Physicochimie des Polymères et des Interfaces (LPPI), Université de Cergy-Pontoise, on the photophysical properties investigations of a new conjugated polyrotaxane toward more application-oriented subject, i.e. the use of a conjugated polyrotaxanes in optoelectronics.

2. Project concept

Interest in the area of conjugated polyrotaxanes for organic electronics applications has intensified during the past few decades as a consequence of their advantages over their non-rotaxane counterparts, such as their better solubility and good film-forming ability, lower aggregation tendency as well as the improvements of the electronic properties.[1] The synthesis of new conjugated polyrotaxanes represents an attractive approach to achieve control over molecular rigidity, prevention of aggregation, improved photoluminescence quantum yield values (PLQE), and surface-morphological characteristics of the resulting conjugated polymers.[2-6] Such threading of macrocycles onto the conjugated chains does not disrupt the π-conjugation and can additionally improve the solubility as well as the morphological characteristics of the resulting polymers. Furthermore, the construction of mechanically interlocked molecules, such as polyrotaxanes leads to an enhancement of both the thermal stability and a reduction of fluorescence quenching compared to those observed on non-rotaxinated analogues. More than that, macrocyclic encapsulation of conjugated has been employed as an alternative supramolecular approach to achieve an "insulation" of the individual molecular wires (IMWs).[1,6,9] Even more, it is our special interest to explore the effect of different macrocyclic encapsulations, as an alternative approach to bring some benefits on the photophysical properties of conjugated polymers, for which particular attention is paid for generating the active layer in organic electronic devices. The present study is significantly valuable and will allow us to investigate the optical, electrochemical behaviors, surface free-energies as well as transport properties of a new conjugated polyrotaxane. In addition, our preliminarily atomic force microscopy (AFM) investigations showed promising results concerning the elaboration of IMWs, as shown in Fig. 1.[4,10]

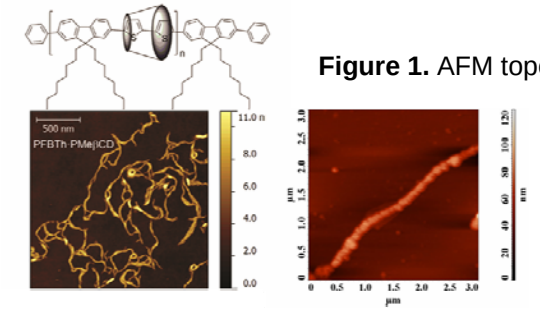

Figure 1. AFM topography images of spin-coated conjugated polyrotaxanes thin films on silicon-oxide substrates

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9. Unpublished results