

FINAL MASTER PROJECT PROPOSAL



Title

Preparation and characterization of nanostructures of pyrene-containing bent-core molecules by self-assembling techniques.

Supervisor(s)

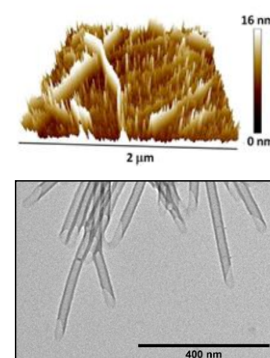
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Summary of the project

Objective: Fabrication of ordered nanostructures of bent-core molecules by self-assembling processes for optoelectronic applications.

Motivation: Bent-core molecules are a class of compounds that lead to very attractive supramolecular organizations such as liquid crystal phases [1] or aggregates in solvents [2], showing unusual polar and chiral structures and properties upon layering, even by using achiral molecules. However to achieve well-ordered materials from them is still a challenging and scarcely explored task. The target of this research project is to explore different self-assembling strategies to this goal, using pyrene-containing bent-core molecules. In an innovative approach the pyrene-graphene interaction offers wide possibilities towards graphene-based materials, opening very attractive possibilities to apply graphene as a transparent electrode for flexible optoelectronic devices based on bent-core liquid crystals [3]. As a second target, and due to some of these pyrene-containing molecules are able to form nanotubes, their controlled deposition onto substrates by Langmuir-Blodgett techniques [4] for practical applications is pursuit.

Activities: A series of pyrene-containing bent-core molecules will be self-assembled onto Highly Ordered Pyrolytic Graphite (HOPG) and graphene, while nanoobjects deposited onto surfaces by Langmuir-Blodgett methodologies. The formed films will be characterized by using spectroscopic (XPS, Raman, FTIR, etc), microscopic (SEM, TEM, etc) and scanning probes microscopic (AFM or STM) techniques to study both the molecular and nanoobject organizations and the interaction molecule-HOPG or graphene. Structural parameters such as the number of pyrene units (one or two) in the molecule as well as the spacer length connecting the bent core and the pyrene unit will be checked in order to study their influence in the nanostructure geometry of the films prepared.



References:

- [1] Jesús Etxebarria and M. Blanca Ros, *J. Mater. Chem.* **2008**, 18, 2919. Noel Clark et al., *Science* **2009**, 325, 456.
[2] M. Blanca Ros et al. *Angew. Chem. Int. Ed.* **2014**, 53, 13449. [3] a) Jong-Hyun Ahn et al. *J. Mater. Chem. C*, **2014**, 2, 2646. b) Rajratan Basu et al., *Liquid Crystals*, **2016**, 13–15, 2375. [4] a) Katsuhiko Ariga et al, *Adv. Mater.* **2013**, 25, 6477. b) Malkolm Hinnemo, et al., *Langmuir* **2017**, 33, 3588.