

## Fabrication of molecularly defined and atomically thick steps on HOPG – “2Dto3D” project

Université Libre de Bruxelles - Free University of Brussels - (ULB) is a major academic institution with international recognition for scientific achievements. See <http://www.ulb.ac.be>

Geerts group works on crystal engineering and crystallization of molecular materials in specific conditions to control thin film structure and ultimately optoelectronic properties. See <http://www.ulb.ac.be/sciences/chimpoly>

Max Planck Institute for Polymer Research (MPIP) is one of the most-recognized research institutions in Europe, devoted to polymers and soft matter. See <http://www.mpip-mainz.mpg.de/home/en>

Müllen's group works on the synthesis of molecular and macromolecular materials with unique structures and properties, among which nanographenes occupy a special place. See <http://www.mpip-mainz.mpg.de/4613038/director>

Summary of “2Dto3D” research project: The occurrence of two or more crystal structures for a given molecule, a phenomenon, which is called polymorphism, is ubiquitous to various classes of synthetic and natural compounds. Examples of polymorphism are known in numerous application fields, such as food, explosives, pigments, semiconductors, fertilizers, and pharmaceutical drugs. Different crystal structures, so-called polymorphs, of the same compound exhibit sometimes very different physical properties, chemical reactivity, and biological functions. Understanding and controlling polymorphism is therefore very important. Simple questions, such as "How many polymorphs has a given compound?" or "What drives polymorph selection?" remain unanswered yet. In this scientific context, scientists have started to explore the occurrence of substrate-induced polymorphism, i.e. the formation of polymorphs that exist only near solid substrates. In particular, 2Dto3D has the ambition to elucidate how positional and orientational order of molecules propagate from the substrate to the upper crystal layers. In this manner, 2Dto3D will gain a fundamental understanding of polymorphism at the interface with solid substrates.

Summary of doctoral thesis: Synthesis of graphene nanoribbons and subsequent deposition on HOPG to fabricate molecularly precise steps with the height of one carbon atom. Study of the crystallization of organic compounds on such molecularly defined surfaces will be studied.

General references "Substrate-Induced and Thin-Film Phases: Polymorphism of Organic Materials on Surfaces" A. Jones et al. *Adv. Funct. Mater.* **2016**, 26, 2233 and "Synthesis of structurally well-defined and liquid-phase-processable graphene nanoribbons" A. Narita et al. *Nature Chemistry* **2014**, 6, 126.

A talented highly motivated young chemist with a solid background in organic synthesis and supramolecular chemistry of self-assembly systems is actively searched. The candidate must have a sound knowledge of organic chemistry, crystallization and characterization methods. He/she must be open-minded, hard at work, easy-going, rigorous, and have strong laboratory skills. He/she must be fluent in English. Only applicants who have obtained good grades and who have studied in major North-American, Asian, or European universities will be considered.

The duration of a PhD thesis is four years. The selected applicant will spend the two first years in Müllen's group. Then, he/she will work in Geerts group during the two last years. Within four years, the candidate is expected to defend a high-level PhD thesis that will be awarded by ULB.

He or she will get a monthly salary of around €1800, before tax at MPIP and a monthly fellowship of around €1950, after tax at ULB.

To apply, candidates must send to Prof. Yves Geerts, [ygeerts@ulb.ac.be](mailto:ygeerts@ulb.ac.be), his/her curriculum vitae, a letter explaining his/her motivations, a list of publications, and the name and email address of three reference persons.

The application deadline is June 1, 2018.