

## Joint PhD position KU Leuven - UCLouvain

### *“Nanopatterned chemically modified carbon surfaces for carbohydrate valorization”*

This is a joint PhD between KU Leuven, under the supervision of Prof. Steven De Feyter, and UCLouvain, under the supervision of Prof. Sophie Hermans.

At KU Leuven, the research is carried out in the Nano(bio)chemistry at surfaces group, at the Division of Molecular Imaging and Photonics of the Department of Chemistry, under the supervision of Prof. Steven De Feyter. The team currently counts 5 post-docs, 16 PhD students, 3 master thesis students, and 2 senior staff members, performing research on the functionalization and characterization of surfaces. The research has two main pillars: the controlled functionalization of mainly carbon surfaces via molecular physisorption and chemisorption, in a nanopatterned way, and the characterization of these modified surfaces using a variety of tools, including scanning probe microscopes for the visualization with (sub)molecular resolution.

The position has a joint appointment with the research group of Prof Sophie Hermans at UCLouvain. Her group currently has 2 post-docs, 8 PhD students, 3 master thesis students, and 1 technical staff members. The group is now working on the elaboration of nano-structured materials by molecular chemistry synthetic methods. This includes the preparation of nanoparticles of controlled shape and composition, their surface functionalization and hybridation with organic functionalities, as well as detailed characterization at each stage of the synthesis. The main focus is on carbon-based materials for applications in heterogeneous catalysis and in particular for biomass valorization transformations.

Unit websites: KU Leuven (<https://www.defeytergroup.org>) and UCLouvain (<https://uclouvain.be/en/research-institutes/imcn/most/sophie-hermans.html>)

### **Project**

Catalysts, i.e. materials that enhance the rate of chemical reactions, are essential for the functioning of the contemporary industrialized world. Carbocatalysis predominantly relies on ill-defined carbonaceous materials. Nevertheless, carbon-based catalysts stand out as ideal candidates for bio-based chemical transformations as they often necessitate harsh conditions including high temperatures and pressures, as well as the use of acidic or alkaline media. However, it is very difficult with the traditional carbon materials to control the amount, and particularly the precise location of catalytically active sites. The utilization of well-defined, inert carbon materials, including high-quality few-layers graphenes (FLGs) and graphite, emerges as a compelling option. They encompass a combination of advantageous properties, including inertness, sustainability, a high surface area in case of FLGs, as well as thermal and mechanical stability. For the immobilization of well-defined molecular catalytically-active sites, covalent modification strategies can be used. Furthermore, these (functionalized) well-defined carbon materials offer the prospect of employing advanced surface science microscopy and spectroscopy techniques for in-depth characterization.

As a PhD candidate on this research project, you will prepare advanced carbon-based multi-functional catalysts. These catalysts will enable the highly efficient conversion of carbohydrates into valuable compounds. Simultaneously, this approach will establish a robust platform for exploring and understanding the intricate structure-function relationships of chemically modified carbon substrates, especially in the case of bifunctional catalysts prepared by nanopatterning.

### **Profile**

We are looking for a self-motivated candidate with a Master degree in chemistry, materials chemistry, bio-engineering or equivalent. The candidate should have a good knowledge of physical chemistry, synthetic inorganic and/or organic chemistry, and instrumental analytical methods.

### **Offer**

We offer a fully-funded, 4-year joint PhD scholarship between KU Leuven and UCLouvain. The candidate will officially start their degree at KU Leuven for two years, and then move to UCLouvain. However, from the very beginning on, this position will require regular travel between both institutes which are located 30 km from each other, and are easy to reach by public transport so as to foster collaborative work and benefit from the expertise from both groups.

At KU Leuven, the candidate will join the Arenberg Doctoral School, and at UCLouvain, the CDD from the Science & Technology Sector. These doctoral schools offer a wide array of training opportunities for professional growth.

We promote young researchers by giving them opportunities to report on their findings regularly in internal meetings and international events (workshops, conferences), and support them thoroughly in their scientific development.

### **Interested ?**

For more information and applying, please contact Prof. Steven De Feyter, [steven.defeyter@kuleuven.be](mailto:steven.defeyter@kuleuven.be), and Prof. Sophie Hermans, [sophie.hermans@uclouvain.be](mailto:sophie.hermans@uclouvain.be)

### **How to apply?**

Applications should be sent by email to both Prof. De Feyter and Hermans, and include the following documents:

- A detailed Curriculum Vitae including academic background, details of courses taken and grades of each year of study;
- A (self)-assessment of English language level;
- A covering letter including the applicant's motivation;
- A list of at least two referees that could be contacted (recommendation letters should not be included in the email but sent separately by the referees).