Master projects LPDC – first semester 2018-19:

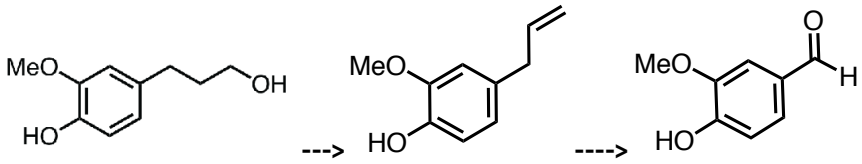
1) Upgrading biomass-derived guaiacols and syringols to high-value specialty chemicals:

Specialty chemicals are mostly derived from crude oil and certain industries, like the flavour and fragrance industry, are increasingly looking for bio-based alternatives to avoid blending petrol in their products. Yet, the extraction of corresponding biomolecules remains uncompetitive and often leads to complex mixtures of molecules, which are difficult to separate. Furthermore, the global trend for natural products compels the industry to look into new, sustainable route for the synthesis of their molecules

To solve this problem, the LPDC laboratory has recently developed a groundbreaking technology that allows to source a range of these food and flavour molecules from lignin, the second most abundant biopolymer on earth. However, in order to best valorize these platform molecules, further optimization needs to be carried out.

In this master project, we offer an excellent opportunity for an outstanding student to understand the chemistry of fragrances in the context of an applied project. The purpose of the project is to establish a protocol to convert 4-propylguaiacol to eugenol, the main component of clove oil that is expected to represent a market of 500 million $ globally by 2025. Eugenol is a potent precursor for other flavours, such as vanillin, and can also be used as platform molecules for polymer chemistry. Other derivatives of syringols and guaiacols can also be investigated with the same approach.

We are looking for a highly motivated student with solid background in chemistry or chemical engineering. The applicant should be independent and ambitious to improve the biosourcing of molecules for the chemical industry. As a hosting laboratory, we provide state-of-the-art equipment and close supervision from experts in the upgrading of lignin. If desired, collaboration with industry can be initiated on this project.



Guaiacyl-propanol **Eugenol** **Vanillin**

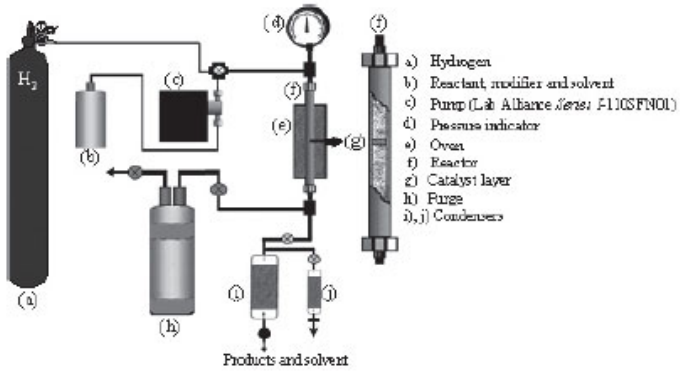
2) Development of lignin flow hydrogenolysis

Recent finding on the efficient upgrading of lignin, the second most abundant biopolymer on Earth, opened new routes for the synthesis of bio-based molecules. These routes are, for the first time, cost-competitive with petrol-based alternatives and represent a breakthrough in the field.

However, the industrial production of these bio-based molecules requires an efficient conversion in a continuous process. To solve this problem, the LPDC laboratory is currently looking into methods to perform a continuous hydrogenolysis reaction for efficient lignin upgrading.

In this master project, we offer an excellent opportunity for an outstanding student to transfer our knowledge of a batch process to a continuous one. This task is very relevant for industrial applications and will teach the basics of industrial process development. The student will be integrated in a team of experts and taught the necessary skills in an applied context.

We are looking for a highly motivated student with solid background in chemistry or chemical engineering. The applicant should be independent and ambitious to improve the biosourcing of molecules for the chemical industry. As a hosting laboratory, we provide state-of-the-art equipment and close supervision from experts in the upgrading of lignin. If desired, collaboration with industry can be initiated on this project.



Scheme 2. Flow reaction system.