



UNIVERSITAT
ROVIRA I VIRGILI

Department of Chemical Engineering

Tarragona, Spain

PhD position

Title: Transformation of biomass using microwave and microbial fermentation reactors into value-added chemicals

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Research Group: Heterogeneous Catalysis Group, CATHETER (<http://www.etseq.urv.es/catalisi/>) and INTERFIBIO (<http://www.etseq.urv.es/nbg/Interfibio/>)

Description:

Nowadays, the main industrial use of lignocellulose is direct combustion. Its usage as feedstock for value-added compounds has a great potential for replacing petrochemical resources in industry. The chemical structure of lignocellulose obstructs its cleavage into profitable products. Lignocellulose is made of lignin, hemicellulose and cellulose and their proportion depends on the concrete biomass source; nonetheless, cellulose usually is the most abundant one. Thus, finding a successful process to hydrolyse cellulose would lead to a satisfactory usage of biomass as a feedstock to any industrial process. Enzymatic hydrolysis of cellulose is the most common treatment found in bibliography. However, in this work, a new process of hydrolysing cellulose and taking benefit of it is followed to replace the expensive enzymatic process. Sulfuric acid is tested on dilute acid pre-treatment of cellulose assisted by microwave reactor, and characterized with TOC (total organic carbon), HPLC (high performance liquid chromatography) and XRD (X-ray diffraction). Then, the hydrolysed carbohydrates are used in fermentative processes, verifying their aptness for microbial feedstock. Lactic acid bacteria (LAB) are used in order to obtain optically pure lactic acid; extremely appreciated starting product for polylactic acid (PLA) production, a highly consumed bioplastic. Microwave pretreatment converted 80 % of cellulose, then, bacterial fermentation produces D-lactic acid 97% optically pure. The growing demand of PLA together with the capability of exploding cellulose potential, places this work as a potential industrial application.

The researcher will study the fractionation and characterization of lignocellulose and/or cellulose materials and their application in microbiological processes.

Very important for the applicant: The PhD application grant will be active before summer, probably in May, and the start date of the PhD contract will be on October 1st, 2017.