

Assignment internship background student Chemistry

Living Lab Biobased Brazil

The Living Lab Biobased Brazil is a transnational Living Lab in the field of Biobased Economy, created in 2014 by a consortium of Dutch Universities of Applied Sciences in collaboration with several Brazilian universities. The Living Lab helps students with internships and graduation projects in Brazil with the focus on Biobased Economy. We also help students finding accommodation, and offer buddy support, Portuguese classes, a bye-bye meeting and an introduction weekend in Brazil

In return the Living Lab expects you contribute to the Living Lab blog. You have to blog about your personal and internship experiences during your stay in Brazil. We also expect you to participate in the mini symposium at the end of each semester.

These events help you to increase your personal network and are focused on your personal development! For more information please visit <https://www.biobasedbrazil.org/student/brazil/>.

Company/University information:

The Federal University of São João del-Rei (UFSJ) is one of the best public universities in the state of Minas Gerais, Brazil, with 47 undergraduate and 27 Graduate programs in almost all fields of expertise. Founded in 1986, UFSJ's highly accredited programs are distributed among 6 campuses, attending a number of 15,000 students. Among our strongest areas of expertise, we highlight our Engineering Programs; Physics and Chemistry of Materials; Sustainable Development Technologies; and our Humanities and Arts Programs. In its Institutional Development Plan, UFSJ assumes the international integration of its graduate and undergraduate programs among its strategic objectives, aiming at developing initiatives to promote cooperation with international institutions, programs, groups and researchers.

<http://www.ufsj.edu.br/>

Research Project:

Biomass use for obtaining carboxylic acid.

General background:

Currently, several methods are used to obtain fuels, thermal energy and chemicals through biomass. Among the various processes, ozonolysis is one of the most promising oxidative pretreatments of lignocellulosic biomass, with ozone being one of the strongest oxidizing agents ($E^{\circ} = 2.07V$, $25^{\circ}C$), soluble in water (110 mg/L, $25^{\circ}C$), and readily available for use after its production from oxygen in an endothermic reaction (TRAVAINI et al., 2016). This project proposes the use of ozone as an oxidizing agent of the biomass (rice husk) in the presence and absence of catalysts. In order to increase biomass conversion and reduce reaction time, low cost catalysts with high oxidative potential will be used. Among the several catalysts, the use of industrial waste containing iron is an economically and environmentally excellent alternative in this process.

In Brazil, annual steel production is 25 million tons and about 1.2 million tons of wastes are generated per year (CARVALHO et al., 2015), thus, in addition to increasing the reaction speed, it would be possible minimizing environmental impacts and reducing process costs.

In the process of biomass oxidation, formic, acetic and oxalic acids are generally found, with acetic acid being the major proportion. Ozonolysis of the rice husk may be a route of production of acetic acid to reduce the import of this product.

References

CARVALHO, P. S. L.; MESQUITA, P. P. D.; ARAÚJO, E. D. G. Sustainability of the Brazilian steel industry: energy efficiency, emissions and competitiveness. *BNDES*, 41, 181-236, 2015.

TRAVAINI, R.; JUÁREZ, J. M.; HERNANDO, A. L.; RODRÍGUEZ, S. B. Ozonolysis: an advantageous pretreatment for lignocellulosic biomass revisited. *Bioresource technology* 199, p. 2-12, 2016.

Goal of internship:

Considering the diversity of chemicals that can be obtained from rice husk depolymerization, among them acetic acid (which can be used to produce ethyl acetate, high export product), the use of steel residues and the low cost of process, this project proposes the study of rice husk depolymerization through ozonolysis in aqueous solution using industrial residues (steel mill and lamination).

At the end of this project you should be able to:

- Work within a group and be able to make key decisions
- Plan and execute within a group tasks related with the project
- Do literature survey and select relevant information for a process
- Do critical analysis on the influence of key variables in a process
- Do a conceptual process design
- Evaluate the technical and economic feasibility of a process

Activities:

The Project involves:

- Prepare and select the rice husk using granulometric screens;
- Evaluate biomass conversion as time function (5, 10, 30, 60, 120, 240, 300 min) in the aqueous ozonolysis reaction of rice husk using industrial residues (steel mill and lamination) as catalysts;
- Quantify the carboxylic acid produced.

Results:

- A project plan report and execution schedule
- A final report containing the findings.



Starting date

February/2019

The intern will be part of a research team lead by the adviser and supervised by Prof. Marcelo S. Batista

Desirable skills/qualities of the student

- Good knowledge of the English (and preferably Portuguese) language is required.

Information of the company:

Contact person concerning this assignment	: Erik Lammers
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Interested?

Please send your CV and motivation letter to Erik Lammers (Coordinator Living Lab Biobased Brazil). For further questions you can contact: +316 101 83 092 or ekf.lammers@avans.nl.

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