

Valorisation énergétique et matière des coproduits de l'industrie du bois

Energy and material recovery of wood industry co-products

Laboratoire : DSEE UMR GEPEA/ Free University of Bozen-Bolzano

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Encadrement :

Gérente Claire IMT Atlantique Campus de Nantes claire.gerente@imt-atlantique.fr

Co-encadrante Audrey Villot audrey.villot@imt-atlantique.fr

Marco Baratieri Libera Università di Bozen-Bolzano · Faculty of Science and Technology · Technical Physics Marco.Baratieri@unibz.it

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Mots clés en anglais: circular economy, energy recovery, wood industry, activated carbons, wastewater treatment

Context

Among renewable energies, bioenergy has one of the biggest potentials. Biomass can be used as feedstock not only for heat and power generation, but also for the production of biofuels, with properties similar to the ones of conventional fossil fuels. In particular this pathway can be an attractive option for biomass gasification, in the view of generating gaseous energy carrier (syngas) and solid byproducts (char) valuable and useful for innovative applications such as activated carbon production. This latter is the most commonly-used carbonaceous adsorbent in treatment processes involved in drinking and wastewater treatment, indoor air control and gas treatment and purification. With the rising demand from the global industrial environmental protection, home/automotive environmental protection, water purification and other fields, the world's demand for activated carbon was estimated to hit 1.733 million tons in 2017. For China, the leading producers, 35% of commercial active carbons are produced from fossil fuel (coal). To reduce the green house gases emission, there are different ways to produce a sustainable activated carbon. Biomass and residues locally available are good candidate to be used in the perspective of a circular economy. So the targeted precursors can be waste from timber industry with high carbon content. Among the EU Member States France produce close to 52 million m³ of roundwood with respectively 26 million of Fuel wood and 26 million of industrial roundwood in 2016. Close to 40 % of the Italian autonomous province of South Tyrol is covered by forest and the timber industry represent in 2014 844 369 m³ of wood.

Objectives

The objectives of this thesis project could be divided in 4 steps:

- ✓ The production of activated carbons at the laboratory scale, using a combined pyrolysis and activation process from wood. The production will be made with a twice purpose which consists in producing high and environmental friendly quantities along with quantifying the energy balance. Another targeted precursor is the gasification chars produced at industrial scale in South Tyrol.
- ✓ Characterization of the produced activated carbons in order to define their properties and to be compared with commercial ones. A QSAR analysis is planned to link the features of activated carbon to those of its precursor.
- ✓ Implementation in water treatment processes for the removal of pharmaceuticals compounds.
- ✓ End of life (energy recovery) of used activated carbons in circular economy scheme.

Compétences requises

- ✓ Scientific knowledge in energy engineering or chemical engineering or environmental engineering, skills in scientific writing
- ✓ Practical knowledge: experimental work in laboratory, data analysis and modelling
- ✓ Intrapersonal competence: analytical and synthetic skills, rigour
- ✓ Fluent in English