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Paper-ID	88421
Paper title	Brazilian production of non-wood biomass residues and challenges breakthrough technologies for its used as feedstock for industrial applications
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Content

Brazilian production of non-wood biomass residues and challenges breakthrough technologies for its used as feedstock for industrial applicationsMauro Donizeti Berni[1], Sergio Valdir Bajay[1], Tania Forster Carneiro[2], Telma Teixeira Franco[3]

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Abstract:

Few countries, worldwide, have grown as Brazil in the international commercialization of agricultural products. Since the late 90s, Brazil has been one of the main producers and exporters of agricultural products, however, the potential generation of agricultural lignocellulosic residues can be used as feedstock for production new products and energy. Oil, natural gas, and their products represent 56.5% of final energy consumption in Brazil. It is necessary to find substitutes for these fuels and an alternative that presents itself is the use of lignocellulosic residues. In Brazil lignocellulose residues whether agricultural or forestries are low cost and large quantities production with potentially renewable resources for the sustainable production of fuels and organic chemicals that are obtained currently from petroleum. The utilization of such residues is of great interest since their generation does not compete with the use of land for food production nor is there the necessary of expanding the agricultural sector for feedstock production. This article presents the initiatives taken in the Brazil regarding the use of lignocellulose residues for valuable products and energy production in the context of the lignocellulosic biorefinery annex industrial plant. Show to survey available technologies for the biological and chemical process to the transformation of lignocellulosic waste (forest, sugarcane, soybean, maize and rice) in differents forms of energy and bioproducts have advanced speed and commercial plants for the exploitation of such feedstock become a reality. Today, Brazil is in a sufficiently privileged position to assume the leadership in the integral exploitation agricultural waste and to follow its natural vocation for developments in this area.

Keywords: Biorefinery; Lignocellulosic, Feedstock; Brazil.

Paper-ID 93231

Paper title CHARACTERIZATION AND CHEMICAL PRETREATMENT OF CORN STRAW WITH OBTAINING ENZYMES FOR BIOPRODUCTS PRODUCTION.

Presentation format Poster

Date of submission 08.03.2017 21:16 Uhr

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Content

CHARACTERIZATION AND CHEMICAL PRETREATMENT OF CORN STRAW WITH OBTAINING ENZYMES FOR BIOPRODUCTS PRODUCTION.

Abstract

The chemical pretreatment of biomass has been integrated with enzyme production through the recycling of aqueous fractions. Alkaline/H_2O_2 delignification of corn straw (CS) was performed to obtain a 75.1% w/w cellulose solid fraction and to dissolve 94.4 % and 83.5 %, respectively, of the original lignin and hemicellulose. Next, a Pleurotus cystidiosus native strain was left to grow for 120 h in the resulting liquid fraction. After filtering the cells, the liquid medium was used alone or combined with the commercial enzyme. To reduce chemical and water usage, the liquid fraction from pretreatment was recycled to perform another treatment; the pH and H_2O_2 were adjusted. Samples of every liquid fraction from the fungal growing medium were analyzed to determine the chemical oxygen demand (OCD), glucose (Glu), xylose (Xyl), and total reducing sugars (RS). Separately, to obtain valuable polymers from this integration process, solid hemicellulose and lignin were isolated from the remaining liquid fractions through pH variation. The composition of the samples was determined using scanning electron microscopy (SEM), optical stereoscopic microscopy and IR spectroscopy and was compared with commercial homologs. The maximum conversion of cellulose to glucose by the obtained liquid fraction of the fungal medium was 67% of the theoretical conversion yield of the commercial enzyme. The results obtained in this work are valuable for future research in bioproducts production from lignocellulosic materials by process integrated with native strains.

Keywords: Alkaline delignification, enzymatic hydrolysis, Pleurotus, biorefinery, lignocellulosic materials, low water consumption.

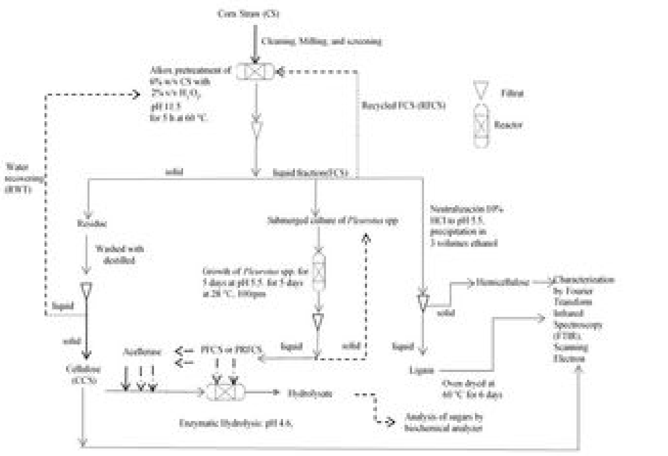

Figure 1. Global scheme for isolation of bio-products from the alkaline hydrogen peroxide pretreatment and low water consumption for simultaneous production of glucose, xylose, cellulose, hemicellulose, lignin and enzymes from corn straw.

Paper-ID	89606
Paper title	Glacial acetic acid production from bioconversion of poplar biomass: techno-economic assessment and environmental impacts
Presentation format	Oral presentation
Date of submission	28.02.2017 20:57 Uhr

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Content

Current commercial production of glacial acetic acid is exclusively by petrochemical routes with a current market price of $550-850/ton. Acetic acid is an intermediate for the production of plastics, textiles, dyes, paints and acetates deicers. Production of acetic acid from biomass might be a sustainable and economically feasible alternative to petroleum derived routes. However, when producing pure acid from biomass, conventional liquid liquid extraction (LLE) using ethyl acetate for acetic acid purification is a major expense, and requires considerable energy. The purpose of this study is to evaluate and compare technical and economic feasibility of glacial acetic acid production using ethyl acetate and a tertiary amine (Alamine) in kerosene as organic solvents for LLE purification. Acetic acid production follows the path of pretreatment, enzymatic hydrolysis, acetogen fermentation, and acid purification (Figure 1). To meet large energy requirement for the processes, different energy sources including combustion of natural gas, and lignin supplemented with natural gas were investigated. Aspen Plus software was used to simulate a biorefinery processing 250,000 tons/yr poplar, producing in average 136,300 tons/yr of glacial acetic acid. Capital and operating expenses for each configuration and profitability using discounted cash flow analysis to establish minimum selling prices (MSP) were used to assess economic viability. Additionally, in this research preliminary life cycle impacts of producing acetic acid from poplar are reported and compared to acetic acid from fossil fuel, cradle to biorefinery gate life cycle assessment (LCA) is used to investigate the environmental impacts. Alamine in kerosene consumed 56% less energy than ethyl acetate during the recovery of acetic acid. Total capital expenses, in average, were 19% lower when natural gas was used as source of energy. The MSP/ton of acetic acid ranged from US$677 to US$819, for the different scenarios. Largest source of greenhouse gases (GHGs) is the combustion of biomass and natural gas at the biorefinery. Compared to petroleum based acetic acid, the global warming potentials (GWP) could be reduced by 41% using lignin and natural gas for bio acetic acid production.

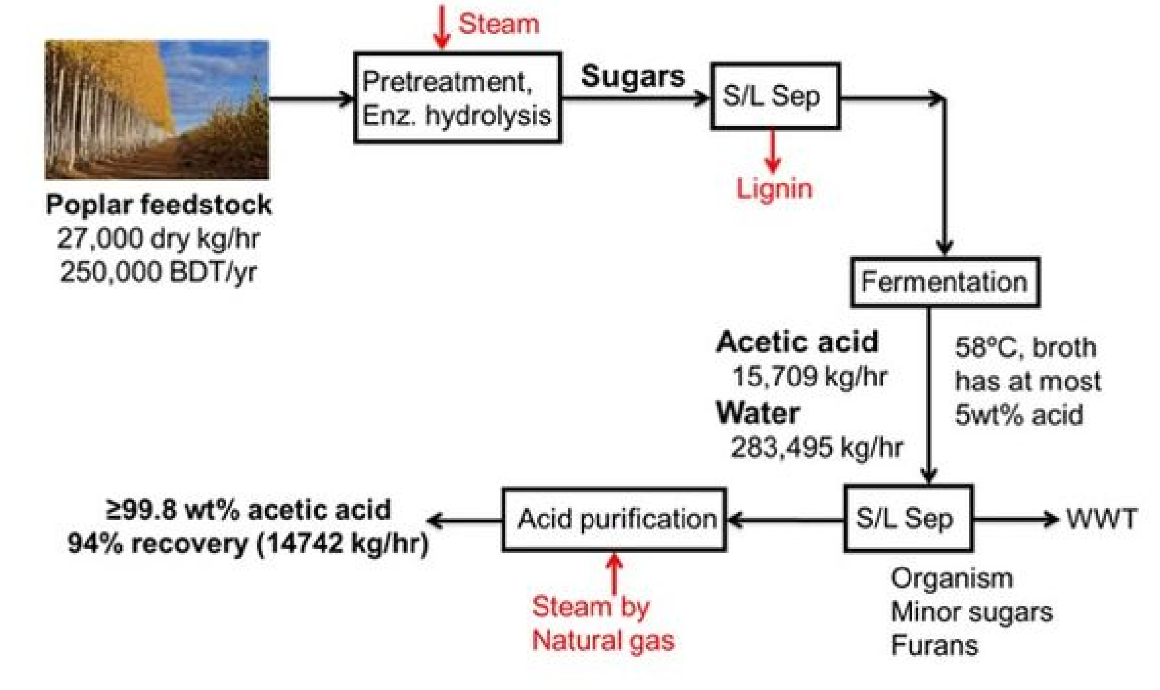

Figure 1: Generalized flow diagram of production of glacial acetic acid. This biorefinery follows the path of pretreatment, enzymatic hydrolysis, acetogen fermentation, and acid purification.

Paper-ID	75166
Paper title	Glycerol upgrading to acrylonitrile in the context of oil plants biorefineries design
Presentation format	Oral presentation
Date of submission	26.02.2017 20:29 Uhr

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Content

Oil plants biorefineries design obviously involves the advanced use of fatty compounds, but also of the generated co-products, including glycerol. We developed catalytic systems for efficient glycerol dehydration to acrolein in a first step, before extending the concept to conversion of acrylonitrile, a compound especially used in the carbon fibres industry.

Glycerol conversion to acrolein. The catalysts used for glycerol dehydration to acrolein suffer from deactivation by coking. We studied the regeneration of spent catalysts based on Keggin-type silicotungstic acid (STA). A 20 wt.% STA sample supported on bare SBA-15, and a specifically developed 20 wt.% STA sample supported on SBA-15 containing 20 wt.% of ZrO_2 nanoparticles were prepared. Their performances were determined at 275 °C in a fixed bed reactor. STA/ZrO_2/SBA-15 showed significantly increased long-term performances (69 % vs. 24 % acrolein yield after 24 h), which was explained by a decrease in the acid strength of the STA due to a modified active phase/support electronic interaction, which further increased its thermal stability and prevented STA decomposition during one-shot regeneration of the catalyst by coke burning under air. Over the ZrO_2-free catalyst, the regeneration step led to a significant loss in acrolein yield (30 %) due to thermal destruction of STA. As this decomposition proceeds *via* the loss of constitutional water from the Keggin-structure, addition of water in the regeneration feed enabled recovering a slightly higher yield in acrolein (42 %), due to equilibrium displacement. Finally, cyclic regeneration of the catalyst was performed using iso-chronical cycles of 10 min for reaction and coke burning. STA/ZrO_2/SBA-15 exhibited poor performances (35 % yield in acrolein) due to the longer activation period needed for this catalyst. The ZrO_2-free catalyst exhibited stable performances (74 % acrolein yield) without STA destruction. We then patented an integrated process for simultaneous reaction and regeneration, based on a Two-Zone Fluidized Bed Reactor.

Glycerol conversion to acrylonitrile. For this reaction, we examined two different routes: (1) In Route 1, acrolein was selected as the intermediate reactant using a previously optimized WO_3/TiO_2 catalyst for the first step (glycerol dehydration to acrolein) and a Sb-Fe-O catalyst for the second step. (2) In Route 2, allyl alcohol was selected as the intermediate reactant. We then studied ammoxidation of allyl alcohol as a new alternative while a new efficient technology for producing allyl alcohol from glycerol was developped. Ammoxidation of allyl alcohol was demonstrated over optimized antimony-iron mixed oxide catalysts with Sb/Fe ratios of 0.6 and 1. Both catalysts showed a high acrylonitrile yield (ca. 84%) at the steady state.

Paper-ID	81021
Paper title	Low-cost sugar production using mechanical refining of lignocellulosic biomass
Presentation format	Oral presentation
Date of submission	28.02.2017 05:15 Uhr
Authors	- Sunkyu Park *(sunkyu_park@ncsu.edu)* (Presenter)

Content

Production of fermentable sugars from lignocellulosic biomass still remains expensive. To make the overall process more economically attractive, mechanical refining has been suggested to overcome biomass recalcitrance and process complexity for the following reasons. a) Sugar conversion can be enhanced by 10-20% with commercially attractive levels of enzymes and enzyme dosage can be reduced since the substrate is more digestible. b) Pretreatment severity (e.g. dilute-acid treatment) can be greatly reduced to achieve the same level of sugar conversion, resulting in lower concentrations of inhibitors for fermentation or catalytic upgrading. c) Mechanical refining technology can be installed in conjunction with any type of pretreatment scheme. d) Mechanical refining is a commercially proven technology at process flows of ~2,000 dry tons/day of biomass.

The 12-inch disk refiner was used to study the effect of refining variables such as gap size and solid content on refining energy and digestibility. It was found that there was a maximum in sugar conversion with respect to the amount of refining energy. To evaluate the energy consumption, the 36-inch refiner was tested at 33% solid content and the sugar conversion was increased from 69% to 79% at 130 kWh/dry ton biomass. For the 42-inch refiner, the sugar conversion was increased from 47% to 72% at 5 FPU/g with refining energy at 67 kWh/dry ton biomass. We will discuss the opportunity in refining plate design in terms of refining actions (external fibrillation, internal delamination, and cutting) and the optimization of refining energy in terms of high-solid enzymatic hydrolysis.

Paper-ID	75211
Paper title	Overview of biomass upgrading activities at Lille University
Presentation format	Oral presentation
Date of submission	26.02.2017 21:01 Uhr
Authors	- Franck Dumeignil *(franck.dumeignil@univ-lille1.fr)* (Presenter)

Content

Lille University is now a clearly identified player in the field of biorefineries.

The present author coordinated the PCRD7 European EuroBioRef Programme 'EUROpean Multilevel Integrated BIOREFinery Design for Sustainable Biomass Processing' (www.eurobioref.org), gathering 29 partners (553 persons, ca. 3400 persons.months) from 15 countries for a global budget of €38 million (€23 million of European subvention) during 4 years (01/03/2010 - 28/02/2014). End 2011, he was awarded the ANR EQUIPEX REALCAT project ('Advanced high throughput technologies platform for biorefineries catalysts design'; €8.3 million) and created the Franco-Japanese International Associate CNRS Laboratory CAT&P4BIO ('Innovative Catalysts for Oxidation Reactions and Processes, Biomass Conversion') of which he is Director. He is also piloting the SP3 'Catalysis and Biocatalysis' of the 'Genesys of Lipids Biorefinery' GENESYS program in the framework of the ANR ITE P.I.V.E.R.T. 'Picardy Plant Innovations, Teaching and Technological Research' (2011-2020; €247 million). Recently, he was nominated as responsible of the French Mirror of the Mixt International Unit ('UMI') number 3464 CNRS/Solvay in Shanghai 'Eco-Efficient Products and Processes Laboratory' (E_2P_2L).

The above projects will be succinctly presented, together with other ongoing actions at Lille University (Figure 1) centred on biorefineries design, development and implementation.

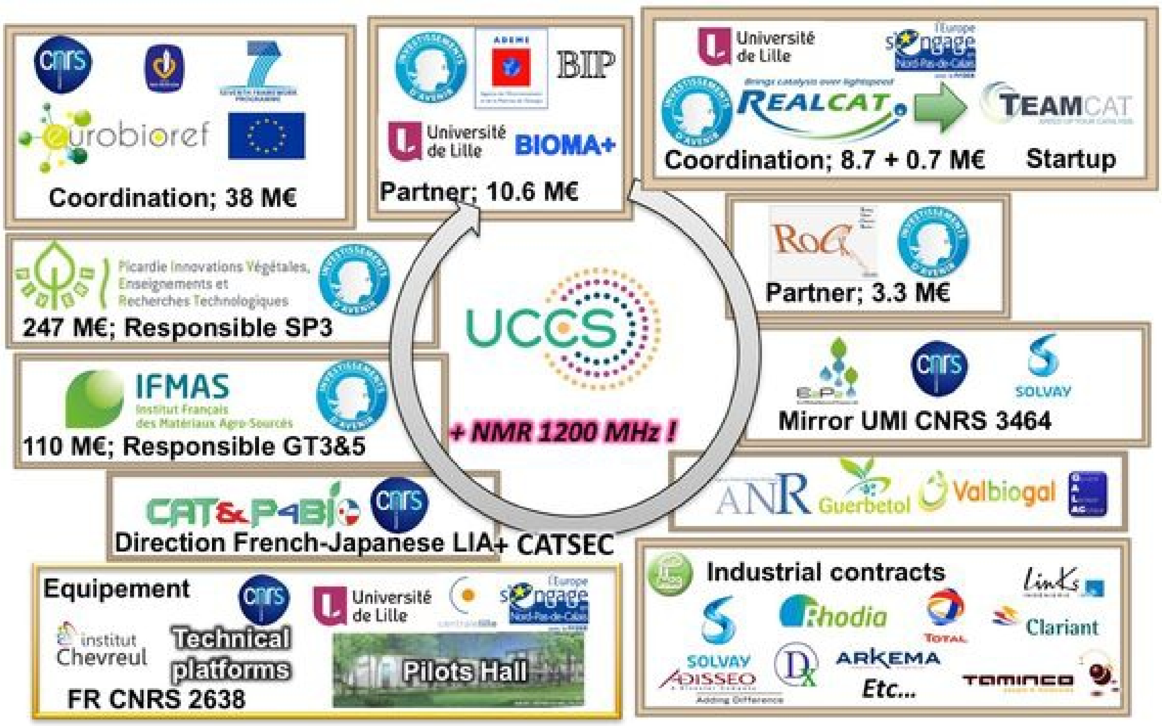

Figure 1. Network of flagship projects on biomass upgrading at Lille University

Paper-ID	69066
Paper title	The LignoCity Initiative - upscaling of lignin concepts
Presentation format	Oral presentation
Date of submission	09.02.2017 16:16 Uhr
Authors	- Per Tomani *(Per.tomani@innventia.com)* (Presenter)

Content

The background to the LignoCity test bed initiative, which is a business development project, is the need for an infrastructure during upscaling of ideas for lignin processes and products. The test bed platform is today´s operations by LignoBoost Demo in Bäckhammar. It was built by Innventia to develop and demonstrate the LignoBoost. It is a unique operation able to tailor-make lignin in quantities for upscaling of lignin valorisation concepts (max capacity is around 6000-8000 tonnes kraft lignin/year). The facility can in principle use all available alkaline black liquors from kraft and soda pulping and can be developed for other lignin-rich feedstocks, such as bio-ethanol production by-products. We develop a business concept for opening up the facility to more users and make it into a ´center´ where ideas are brought together, opportunities for commercial development are identified, up-scaled and supported.

Several, start-up`s, SME`s and larger companies need competence, key connections in different networks, lignins and upscaling infrastructure for further development of their green ideas into commercial, demonstrated concepts. R&D organizations need development partners and different types of lignins to be able to build green ideas into something qualified for upscaling. This testbed will facilitate the potential for new companies in the bioeconomy area. The project want to contribute to opportunities for more lignin to the market and increased use of lignin in bio-based products and applications. The project has the ambition to contribute to building the bio-based economy locally in Kristinehamns municipality, the Region Värmland, in Sweden and, hopefully, on the international arena. The project has 18 industrial and societal partners and comprises both business model development including organization and ownership, and technical development of the test site and its RDI opportunities.

The presentation will describe the LignoCity initiative and give examples from the ongoing work.

Paper-ID	78241
Paper title	The Research Activities from the Laboratory for Catalysis Engineering
Presentation format	Oral presentation
Date of submission	27.02.2017 15:53 Uhr
Authors	- Jun Huang *(jun.huang@sydney.edu.au)* (Presenter)

Content

Research in Jun Huang's group is focused on nanocatalysts for biorefining, clean fuel production, CO_2 capture and conversion, and waste-to-chemical. They are particularly interested in the development of emerging catalytic technologies for more attractive, practical, and cleaner processes using in situ spectroscopy, coupled with new catalyst design and innovative reaction engineering.