FRAUNHOFER CENTER FOR CHEMICAL-BIOTECHNOLOGICAL PROCESSES CBP

The open scale-up facility of Fraunhofer IGB at the chemical site Leuna





The chemical site of Leuna looks back on more than 100 years of history

1916





BASF SE



Production of 12 million tonnes of goods annually



1.300 ha total surface area



> 100 companies on site



Fraunhofer CBP: From laboratory to industrial scale





Modular pilot plants for different biorefinery processes



- Bio safety level S1 approval, partwise ATEX-compatibility and floor coating according to WHG
- All media directly accessible: RO-water, steam, pressurized air, N₂, O₂, CO₂, NH₃ and cooling water
- Waste water inactivation and neutralization, off-gas incineration



EXTRACTION AND PULPING OF BIOMASS

CBP

Lignocellulose biorefinery – Sustainable use of renewable resources Research topic of the future



Pilot plant at Fraunhofer CBP

- Processing of up to 70 kg of wood / batch
- Balancing the material and energy cycles
- For scaling and implementation of
 - external processes for industrial customers
 - own process developments





Commissioning of novel oilseed extraction plant

- Process development of an alternative extraction process of oilseeds with focus on rape seed (patent WO 2017 041776 A1)
- Funded project for the erection of a plant with a capacity of 150 kg/h of rape seeds







References

Processes

ÆRTÚS Lignoplast Liberate LIGNOCELLULOSE BIORAFFINERIE carbonec Schlüsselkomponenten für biobasierte Produkte Different Adhesives, Electrochemical Ethanol-water fractionation coatings, polyurdepolymerisation Carbon fibers organosolv process ethane, epoxides of lignin processes **Xylosolv** KomBiChem^{Pro} ELBE-NH ₄arbon Bioraffinerie der Zukunft Mild FABIOLA™ Pharmaceutic Raw materials for fractionation Xylose products from hydrothermal applications lignocellulose using acetone Aquasolv process carbonisation SPONSORED BY THE Federal Ministry Federal Ministry of Food BB of Education Horizon 2020 S Bio based Industries and Agriculture and Research European Union Funding Consortium for Research & Innovation Fachagentur Nachwachsende Roh

Products





Equipment - Biotechnological processes

Upstream processing

- 10 L 10 m³ bioreactors (CIP & SIP)
- Greenhouse and outdoor plants for cultivation of microalgae
- Microbiology laboratories

Downstream processing

- Separator (cell separation)
- Homogenizer (cell disruption)
- Micro / ultrafiltration (concentration)
- Crystallization tank and vacuum filtration (conditioning)
- Chromatography (product fine cleaning)
- Freezing and spray dryer (product preservation)





Project examples







Chemical processes - catalysis

Competences

- Reactions in gas and liquid phase
- Continuous or discontinuous catalytic reactions
- High pressure (up to 350 bar) and high temperature (up to 500 °C) reactions

Products

- Biofuels and additives for fuels
- Bio-based aromatic compounds





Pilot plants

- Hydrothermal plant, including up- and downstream processing
- Stirred reactors for reactions under atmospheric pressure (100 L) and high pressure (50 L)
- Continuous high-pressure reactor



Base-catalyzed depolymerization of Lignin to Bio-Phenolics



Base-catalyzed depolymerisation



DOWNSTREAM PROCESSING AND PRODUCT ISOLATION

1524B300

15248500

at say 5

Married Street

Equipment Downstream processes

Laboratory and pilot plants for mechanical and thermal separation processes

- Crystallizer, separators and equipment for filtration and membrane filtration
- 7 evaporators and distillation units for working at atmospheric pressure and under vacuum up to 350°C with a capacity of 1 L / h to 80 L / h
- Extraction plants for solid-liquid and liquid-liquid extraction under atmospheric conditions and under high pressure with liquid propane or supercritical carbon dioxide





Lignocellulose Biorefinery and DSP Platform

Improving the efficiency of the purification and conversion of hemicellulosic sugars



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Fraunhofer CBP accelerates the integration of industrial biotechnology into chemical manufacturing

- Owned and operated by Fraunhofer
- Open to all interested parties
- Laboratory- to pilot-scale process dimensions
- State-of-the art technology and equipment: feedstock pretreatment, conversion, downstream processing
- Reduction of scale-up time and costs for participants
- Integration of activities into the chemical manufacturing network
- Nucleus and "role model" for industrial biotechnology activities
- Several product driven development projects ongoing







Thank you for your attention!

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