Biopolymers and Biochemical Conversion Technologies

Leif Jönsson

Bio4Energy Researchers' Meeting
June 17, 2020

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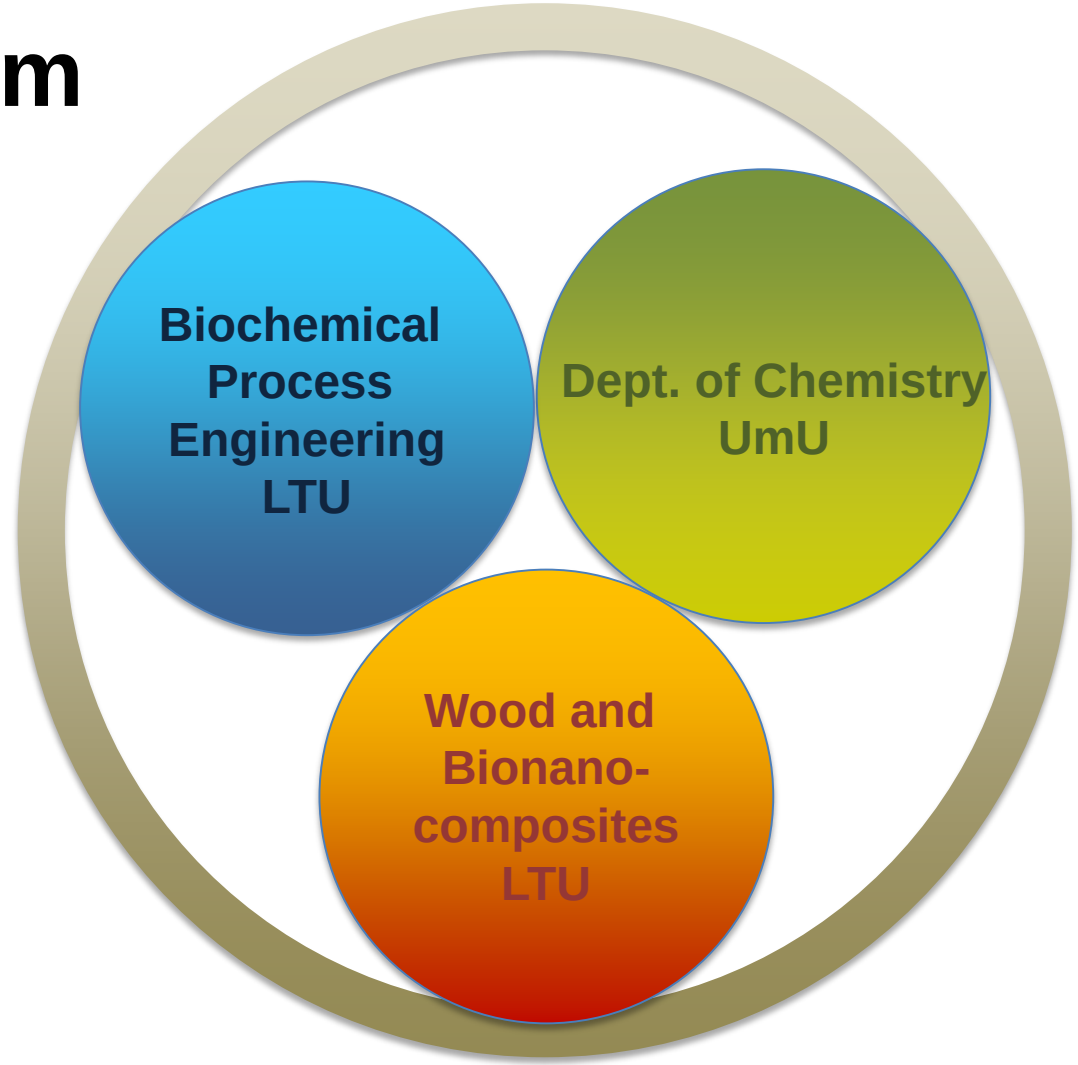
BioPolChem Platform



Highlights

Biochemical Process Engineering LTU

Bark valorization

New project on conversion of bark into green fuels (BarkGF) was funded by the Swedish Energy Agency. The partnership includes LTU and RISE Processum.

Highlights

Biochemical Process Engineering LTU

BatterFlai

EIT RawMaterials

EIT RawMaterials is supported by the EIT, a body of the European Union

Lignin valorization

Research on Organosolv Lignin Nanoparticles (OLN) for flotation of Cu, Zn, Pb and Ni for the mining industry resulted in 1 patent, 3 publications, 2 Vinnova projects, and the 4-year project BATTERFLAI (Supply of BATTERy minerals using lignin nanoparticles as FLotAtIon collectors) funded by EIT RawMaterials. Collaboration partners of LTU researchers include Boliden, Nouryon, Sveaskog, KGHM, and Hellas Gold.

Highlights

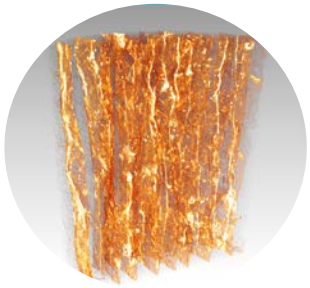
Biochemical Process Engineering LTU

Nutraceuticals from forest biomass

Nutraceuticals from lignocellulosic biomass, docosahexaenoic acid [DHA, an omega-3 fatty acid and squalene], were produced using marine oleaginous microorganisms (Thraustochytrids).

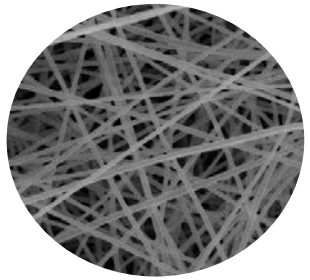
Highlights

Wood and Bionano-composites LTU



- Efficient separation from biomass of nanocelluloses with functional properties, e.g. fractionation of seaweed residues containing alginate and cellulose for biomedical products.

- Developing transparent light-weight nanocomposites with oriented structure. Studied in MAX IV and using WAXD for investigating orientation and using microtomography for 3D imaging.

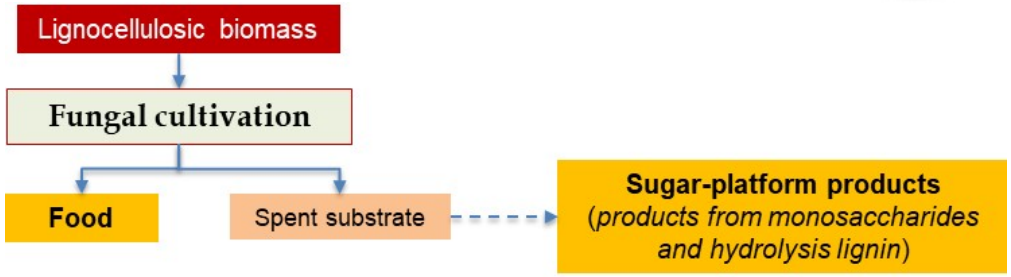


- Developing electrospun lignin nanofibers for energy-storage applications

Highlights

Dept. of Chemistry UmU

- Collaboration with Bio4Energy Wood Pre-Processing platform on **novel biorefinery concept based on biological pretreatment** of woody substrate using edible white-rot fungi.



- First publications on a novel **more resource-efficient type of wood chipping** for forest-industrial applications. The research in this area involves collaborations with industrial partners in Örnsköldsvik and the Wood Pre-Processing platform.

- **Highly Downloaded Article 2019** award for Jönsson LJ and Martín C (2016) *Bioresour. Technol.* 199, 103-112.

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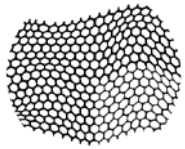
Planning ahead

Wood and Bionano-composites LTU

Investigate separation of **nanocelluloses** from industrial bioresidues aiming at specific functional properties for added-value applications

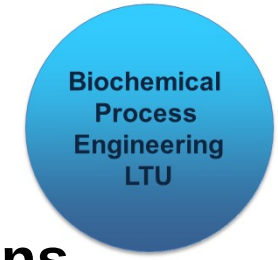
Deepen the understanding of **cellulose-based nanocomposites**, and develop new processing technologies to reach properties on the level of theoretical estimations

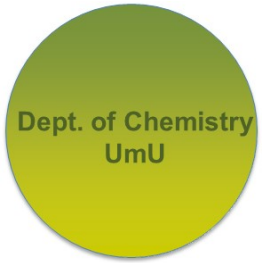


Better understanding of how **lignin-based carbon nanomaterials** can be tailored

Improve the performance of **lignin-based carbon nanomaterials**, targeting high performance and novel applications, such as energy storage and CO_2 capturing

Planning ahead





- **Valorization of under-utilized fractions** from forest industries and biorefineries, such as bark, lignin, and wood extractives.

- **Novel biorefinery products** including
  (1) Energy carriers: furan biofuels, hydrogen gas.
  (2) Advanced materials including novel biobased and biodegradable packaging materials.
  (3) Cellulose derivatives with new functionalities.
  (4) Nutraceuticals. Bioactive substances. Food additives. Antioxidants.

- Moving towards industrial implementation: **up-scaling, higher TRL levels, techno-economical assessments**.

Thank you for your attention

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