

Competence centre for biorefining research (BIORAF)

BIORAF project (TE01020080), supported by the TACR, employs the techniques of green chemistry for biomass utilization to the high added-value products and energy sources. By refining, it is possible to obtain food supplements, fodders and fertilizers, new-generation biofuels and energy from the biomass of microbial, plant or animal origin. Biorefining is a unique way of new sustainable substitution of fossil fuels minimizing the adverse effect on environment while exploiting the whole volume of biomass.

The project creates an interdisciplinary center with high innovation potential for sustainable utilization of renewable sources, and will bring the Czech Republic to the leading position in next-generation biorefinery within next eight years. The project links the private sector with experts from different fields of science (e.g., biosciences, phycology, analytical chemistry, enzymology, microbiology, chemical and biochemical engineering, material engineering, etc.).

Joint organizations:

- Institute of Chemical Process Fundamentals
- Institute of Chemical Technology, Prague
- Institute of Botany of the ASCR
- Rabbit Trhový Štěpánov, a.s.
- Agra Group, a.s.
- Briklis, spol. s r.o.
- EcoFuel Laboratories, spol. s r.o.



Director of the Centre and project manager: Ing. Petr Kaštánek, Ph.D.

Scientific director of the Centre: Ing. Olga Šolcová, CSc., DSc.

Technological director of the Centre: Prof. Ing. Jiří Hanika, DrSc.

Project web pages (<http://bioraf.icpf.cas.cz/>) provides up-to-date information about projects results, milestones and events.

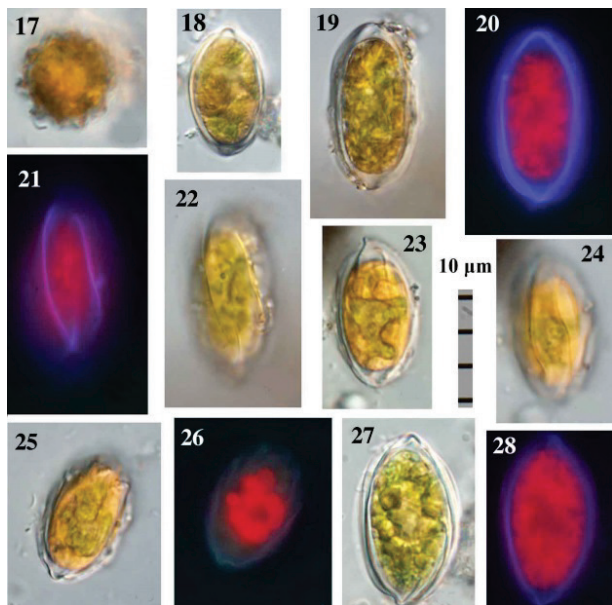
Biorefinery research centre of competence

(O. Šolcová, solcova@icpf.cas.cz)

Sustainable biomass resources, which will not compete with food crops in the use of agricultural land, will be employed in the project. New environmentally friendly processes for biomass biorefining will be developed in the order to obtain products with high market value and increase the market opportunities of participating companies, which will promote job creation. New technologies will be validated in the demonstration and pilot plant units; the developed products and technological processes will be commercialized.

Within four years, new intellectual property in the field of biorefinery will be created. The transfer of know-how from research to commercial sector will help to increase innovation potential and export opportunities of the participating companies. The project will bring the lend support to the Czech agriculture and industry and attract significant long-term investment opportunities in new technologies with high socio-economic impact.

Educational programs for graduates and young scientists have been developing to create experts in emerging technologies and opportunities for their employment. Finally, the project will contribute to the independence of the Czech Republic on fossil fuels and help to reduce the emissions of greenhouse gases.



COBIEM collection



Inulin and fructose syrups

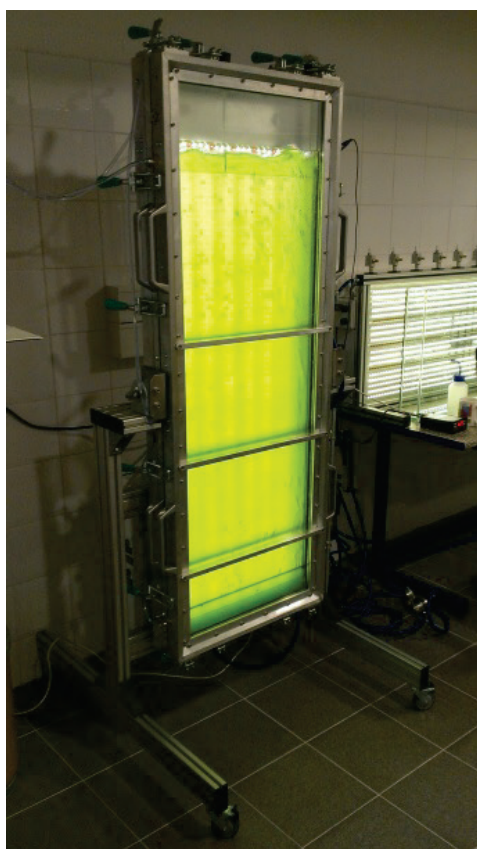


Photo-bio-reactor



Feathers as reusable materials

Method for processing algae and cyanobacteria

(J. Sobek, V. Veselý, sobek@icpf.cas.cz, vesely@icpf.cas.cz)

The method for processing algae and blue-green algae to obtain oil by breakage of their cell wall with the use of microwave radiation has been applied. Water suspension of algae was first adjusted by the addition of a hydrophobic sorbent in an amount ranging from 0.5 to 5 % by weight and so adjusted suspension was heated at a pressure in the range of about 200 to about 2000 kPa by the action of microwave radiation to a temperature in the range of 105 to 190 °C for a period of 1 to 5 minutes. Subsequently, the suspension was led to expand and after cooling down and separation of disintegrated algae, the sorbent with sorbed oil was separated from the water layer wherein the sorbed oil was then isolated by extracting agent. [Ref. 1]



Sedimentation of algae

Method and device for hydrolysis of inulin solution

(J. Sobek, V. Veselý, sobek@icpf.cas.cz, vesely@icpf.cas.cz)

Inulin represents a mixture of polysaccharide molecules with the general formula GF_{n-1} , where G is glucose, F is fructosyl, and n is degree of polymerization (polycondensation). It was obtained from Jerusalem artichoke from underground part.

Method of hydrolysis of inulin from natural juice was based on membrane electro dialysis device, in which the anode compartment was fed a solution of natural juices containing inulin.

This solution was treated together with mineral salts from a previous separation of juice. In the cathode compartment provided a hydrolyzate formed in the anode compartment. [Ref. 2]



Root of topinambour and process of drying

Publications

Patents

- [1] Sobek J., Hájek M., Veselý V., Punčochář M., Církva V.: Způsob zpracování řas a sinic. (Czech) Method for Processing Algae and Cyanobacteria. *Pat. No. 304392/PV 2013-323*. Applied: 13.04.30. Patented: 14.02.26.
- [2] Punčochář M., Sobek J., Veselý V.: Způsob hydrolýzy inulinového roztoku a zařízení k provádění způsobu. (Czech). Method and Device for Hydrolysis of Inulin Solution. *PV 2013-799*. Applied: 13.10.18.