

Probark

A Sustainable process for production of green chemicals from softwood bark

Project Start Month: 0108

Project Duration: 36 months

Project Consortium

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Project Objectives

PROBARK is strongly focused on exploitation and upgrading of softwood bark-derived natural components. The main objective is to develop a biorefinery concept, in which softwood bark is efficiently used as a biomass feed stock for production of industrial and consumer products or suitable intermediates, and energy. A central part of the work is to evaluate the technological and economical feasibility of the Integrated Bark Bio-refinery concept. Designing the total concept will be closely interlinked to development of a technology platform suited for production of chemicals, biomaterials and biofuels from softwood bark components. In addition, the aim of the project is to evaluate possible business potential of the concept together with the industrial partners.

Project Approach

The project is divided into five Workpackages which are strongly interlinked to each other.

WORKPACKAGE 1. Fractionation and chemistry of softwood bark components. WP 1 will provide chemically well-characterized softwood bark extracts and components for product development in WP2, WP3 and WP4. Separation processes will be developed for selected bark components and pre-treatment methods will be evaluated for improved extraction and hydrolysis.

WORKPACKAGE 2. Biopolymer and composite products. This WP will test the aromatic bark components obtained from WP1 in various materials applications. These materials can substitute thermoplastics and wood in engineering applications. Low molecular mass multi-functional extractives obtained in WP1 may be tested as additives. The aim is to obtain all main components for bio-composites

from bark. Various techniques, including chemical and enzymatic modification, will be used to obtain more functional derivatives of bark components with increased applicability for bio-composites, and adhesives and binders.

WORKPACKAGE 3. Bioactive specialty chemicals. Many natural phenolic and polyphenolic compounds are considered beneficial for human health due to their bioactive properties. Since the regulatory issues related to the pharma and food areas are strict, the most immediate applications are, however, envisaged for various phenolic compounds as technical products, such as natural anti-oxidants or anti-microbial agents. Detailed analysis of bark phenolic components in terms of bioactivity/functionality and chemical composition will be carried out. Initial testing of the components also in real technical applications will be carried out.

WORKPACKAGE 4. Bioethanol production from carbohydrate-containing bark fractions. Bioethanol will be used as an example of a product that can be produced via sugar platform from carbohydrates of bark. Ethanol case will also be basis for evaluation of the technical and economical feasibility of softwood bark sugar platform. This WP includes evaluation of various process alternatives for (optional) pre-treatments, saccharification, optimisation of sugar yields in hydrolysis and testing the hydrolysates in bioethanol production. The outcome of the workpackage is a process concept for ethanol production from bark fractions. Data to be used as a basis for material and energy balances will be produced for feasibility studies in WP 5.

WORKPACKAGE 5. Bark bio-refinery process concepts and techno-economical feasibility studies. This WP will evaluate the technical and economic feasibility, as well as exploitation potential, of developed processes and products. Process concepts for the production of selected bark components and fermentation products from bark are created. Raw-material logistics and mass- and energy balance-simulations are carried out to identify bottle necks and potentially favourable processing routes and products. Ecological impact will be drafted when possible. Cost and investment estimates for each concept will be calculated and the steps needing more efficient processing and cost reductions are identified. Bark Bio-Refinery integration options in the pulp-mill are determined.

Expected Project Impact

PROBARK is strongly focused on exploitation and improvement of softwood bark-derived natural components for different industrial end-uses. The technologies and products developed are expected to be exploitable after short or medium term period by fibre manufacturers, chemical and materials industries, adhesives industry, cosmetics industry, food ingredient producers, energy industry and biochemical industry. The possibilities for commercialisation are good provided that the technical and economical viability can be proved in the feasibility analysis. It is expected that pulp and paper industry will acquire a possibility to diversify their product portfolio and develop new business. Also, other industrial sectors benefit from the project by achieving new technologies and materials to develop their product lines. PROBARK will furthermore impact on sustainable development as biomass derived materials and chemicals are considered environmentally friendly, and development of bio-refinery concepts for more efficient use of biomass feed stocks thus have environmental and societal relevance in a very broad sense.

Contact

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