CHEMICAL AND PHYSICAL REQUIREMENTS OF THE FOREST BIOMASS TO BIOREFINERIES, FRACTIONATION OF BIOMASS, AND PREPARATION OF BIO-CHEMICALS

The purpose of this sub-project is to define future quality requirements of the forest biomass raw material for various types of biorefineries. Example raw material assortments will be produced and characterized. The most interesting forest biomass fractions will be sampled for laboratory and pilot scale tests to determine their processing properties. To be able to make cross border comparison the same material will be processed in Sweden and Finland.

REQUIREMENTS FOR THE FOREST BIOMASS TO BIOREFINERIES

Today's supply chains for saw logs to saw mills and pulp wood to pulp mills are well developed. The wood is characterized and its price is set based on quality criteria of the industries. Also supply chains for logging residues to heat and power plants have developed during the past decades. The raw material quality requirements of future biorefineries may, however, differ from those of the current industries. Different raw material characteristics may be desirable for different types of biorefineries, and the industry can be expected to strive to acquire raw material with high value for their process at the lowest possible cost. An important task of the project is to find relevant parameters to characterize the raw material by, and to describe the key characteristics that are relevant for different biorefinery processes. Initially, a comprehensive literature review will be accomplished in order to provide an overview of the historic development of the forest processing industry and of the current developments in biorefining in Finland and Sweden. Based on this review, key stakeholders within biorefinery development will be identified and interviewed and a questionnaire will be sent out in order to gather information on raw material requirements for various biorefining processes. Contribution of information from a broad range of biorefinery developers is vital to give a comprehensive picture of the raw material quality requirements of future biorefinery industries. A few possible biorefinery configurations will be selected for a more detailed study in a systems analysis performed within Forest Refine sub-project 4.

FRACTIONATION OF BIOMASS AND PREPARATION OF BIO-CHEMICALS

The processability of new forest biomass assortments in the BA region will be tested for biochemical conversion into ethanol or butanol at lab-scale. Forest biomass contains mainly the polymers cellulose, hemicelluloses and lignin. During the fractionation of wood it is possible to separate these main fractions for subsequent hydrolysis and fermentation to e.g. alcohols. Dependent on methods and type of raw materials used it can be expected that the results will differ regarding e.g. quantities and qualities (amount of impurities, e.g. lignin). Biomass samples from the sub-project 2 will be used in the tests. Methods, including treatment with ionic liquids, organic acids and inorganic acids will be assessed. After fractionation or pre-treatment, the biomass will be converted into fermentable sugars by acid or enzymatic hydrolysis. The sugars will subsequently be fermented to ethanol or butanol by using microorganisms as biocatalysts. The most promising technologies will be scaled up in the Swedish pilot plant for production of 2nd generation bioethanol.

Furthermore, forest biomass assortments in the BA region will also be tested for extraction of valuable chemicals at lab or pilot-scale. The extraction method will be selected depending on the chemical and physical properties of the new assortment. Assortments will be chosen depending on the results from sub project 2. Additional assortments could also be interesting to test and apply on other, not yet defined, conversion methods.

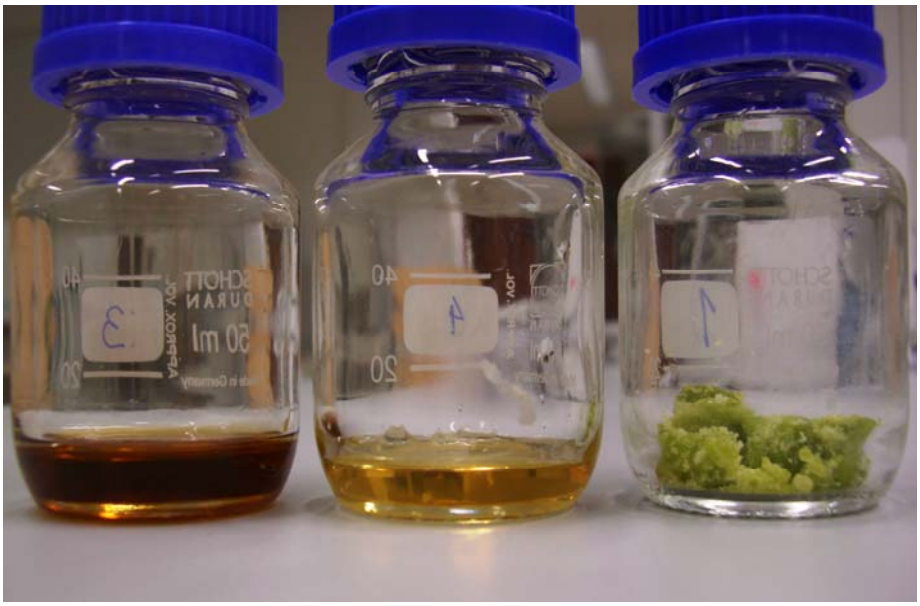

Figure 1. *Ionic liquids (ILs) can be used in the fractionation of biomass. ILs from left to right: [AMIM]Cl, [BMIM]Cl and [EMIM]Cl.*

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