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Funding decision

Name	Organisation	Project title	Decision No.	Decision date	Funding period	Funding
Kordás, Krisztian	OY	NEW, INNOVATIVE SUSTAINABLE TRANSPORTATION FUELS FOR MOBILE APPLICATIONS: FROM BIOCOMPONENTS TO FLEXIBLE LIQUID FUELS(SUSFUFLEX)	124357	19.11.2007	01.01.2008 - 31.12.2011	114 320

Project description
This research focuses on the production of higher (bio)alcohols and other components suitable as oxygenates (e.g. butanol, pentanol, mixed alcohols; e.g. glycerine ethers, glycerol carbonate). The microbiological approach starts from biomass by means of fermentation. Several Clostridium species are able to metabolize carbon compounds to butanol in high yields. Moreover, as a second approach, a chemical synthesis path starting from compounds such as glycerol (a by-product of the 1st generation biodiesel manufacturing) or methanol/ethanol by means of novel catalytic processes is studied. This approach is more challenging because a direct catalytic conversion route from glycerol involving e.g. chain elongation is currently not available in the literature. The integration of both the fermentation and the chemical route for chemicals suitable as liquid fuel substitutes or additives is also considered as follows: utilization of the carbon dioxide released upon metabolic transformations as a reagent to form 1) dimethylcarbonate and 2) glycerol carbonate. A part of the research consortium is already engaged in a research program (CO2UTIL by the Academy of Finland within the research program 'Sustainable Processes and Production') in which the clean synthesis of alkylcarbonates utilizing carbon dioxide as a reactant is targeted. For microbiological butanol process, the main challenges are 1) digestion of the raw material to fermentable sugars, 2) complex multistage fermentation process, 3) inhibition caused by high solvent contents and 4) instability of solvent production. The recent progress in butanol fermentation techniques (e.g., immobilization of microorganisms) has partly solved these problems. Also the separation of butanol is a technological challenge. Butanol, although significantly less water soluble than ethanol, still exhibits water solubility and starts to phase out only after the concentration exceeds 7%. A possibility for improving the efficiency is extraction by means of an organic or ionic liquid layer residing separated of the hydrophilic layer that has a high affinity for butanol. Various immobilization techniques for microorganisms can be used to improve the catalytic activity and optimally facilitate also the phase-out of the product. They may also enable fixed bed technologies, separation and recycling of microorganisms. In the case of a chemical route, an entirely new synthesis route and catalyst development is required. However, certain concepts adapted from recent literature are expected as key-steps for the desired goal. These technologies are expected to be applicable for the conversion of glycerol (a higher alcohol) and lower (bio)alcohols into high-value liquid fuels.