Description of Funded Research Projects
1st Call for H.F.R.I. Research Projects to support Post-Doctoral Researchers

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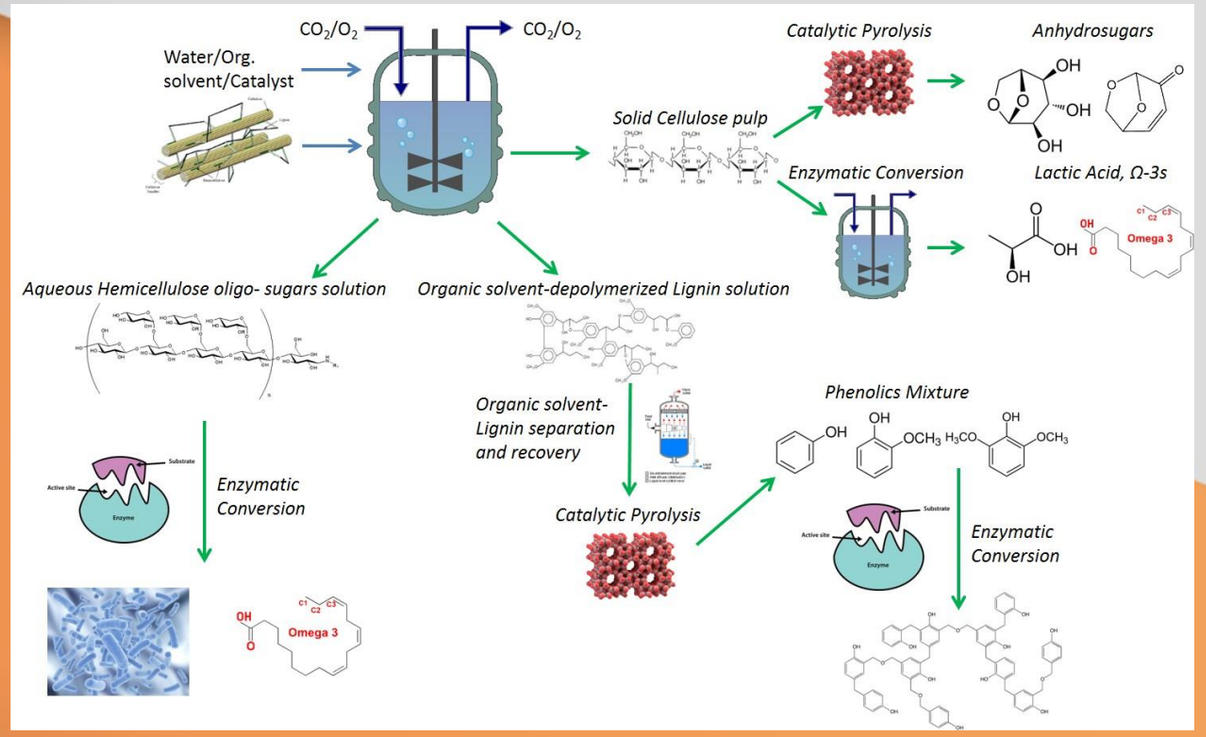
Research Project Title:

Novel Conversion Technologies of Waste Biomass to Food additives and Fine Chemicals

Principal Investigator:
Konstantinos Kalogiannis



Popular Title:
NoWasteBioTech

Scientific Field:
Engineering and Technological Sciences, Environment and Energy

Host Institution:
Centre for research and Technology Hellas

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Research Project Summary

The NoWasteBioTech aims at developing a zero-waste biorefinery concept by using novel pretreatment/fractionation technologies and combining them with thermochemical and enzymatic/fermentation technologies. Agricultural residues such as corn stover and cotton stalks will be fractionated to their three basic constituents, producing three distinct streams: (1) A solid cellulose pulp, (2) An aqueous stream of hemicellulose oligo- and mono- sugars, (3) A depolymerized lignin. Enzymatic and biotransformation processes will be employed to produce high added value chemicals and food additives such as Prebiotics, Lactic acid and Polyunsaturated fatty acids (PUFAs).

The main objectives are: a) developing the biorefinery concept, b) converting and increasing the value of Greek waste biomass streams such as agricultural residues, c) providing a holistic approach to convert all three biomass polymers with zero wastes generation, d) developing a flexible robust platform that is feedstock independent through the use of agnostic methods, e) production of targeted high added value food additives and fine chemicals.

Key innovation points: (1) Development of a low-cost green fractionation method to efficiently separate biomass into its basic constituents. A 90% delignification/ hemicellulose hydrolysis and 85% pulp purity and cellulose recovery will be targeted, (2) development of efficient enzymatic hydrolysis and saccharification processes, reduction of enzyme loading, high cellulose conversion rates of 90+% to pure sugar streams, (3) maximal lactic acid productivity (>85%) and omega-3s lipids accumulation (75+%), (4) cellulose and Lignin pyrolysis, coupled with tailored heterogeneous catalysts, aiming at the production of anhydrosugars and phenols at more than 50 and 30 % on cellulose and lignin feed respectively.

Project Impact on Society

Greece has large amounts of unexploited agricultural residues and the food, pharmaceuticals and materials industries, are important for its economy and need to stay competitive in a global market. This project will have a threefold impact. (1) It will add value to agricultural wastes, increasing farmer income and creating new jobs. (2) The development of a circular economy biorefinery will diminish the environmental impact that farming, pharmaceutical, materials and food industries have. (3) The above industries will gain a competitive advantage since biorefinery technologies can reduce overall cost and environmental impact of their products. The high added value product portfolio means that the results of the project may be exploited by SMEs, an integral part of Greek economy. Finally, the project will present the achieved technologies and the future prospects of biorefineries and zero waste circular economies to young scientists and SMEs in Greece.

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To me, H.F.R.I. funding would mean...

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As a postdoctoral researcher I have been working for more than 15 years in this competitive field. Research can be frustrating and challenging at times, however it can also repay you greatly if you persevere. For the first time in many years, I now have the opportunity to develop my own ideas, team and vision. This feeling of freedom and independence is unique and I wholeheartedly wish that HFRI work will continue with greater involvement and breakthroughs, that it will empower and give prominence to even more scientists.

The Principal Investigator,
Konstantinos Kalogiannis

Funding

Amount: **225,000 €**

Duration: **36 months**

Foundation: **H.F.R.I.**

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