Press release

A biorefinery concept for the transformation of biomass into 2nd generation fuels and polymers

Launch of the EU project BIOCORE

Thursday, 4th March 2010

Contact for information: Aurélie Faure, BIOCORE Project Manager, tel: 00 33 1 42 75 91 26 or mail to aurelie.faure@paris.inra.fr

SUMMARY

Contact for information: Aurélie Faure, BIOCORE Project Manager, tel: 00 33 1 42 75 91 26 or mail to aurelie.faure@paris.inra.fr

PRESS RELEASE

LAUNCH OF THE EU PROJECT BIOCORE

A BIOREFINERY CONCEPT FOR THE TRANSFORMATION OF BIOMASS INTO 2ND GENERATION FUELS AND POLYMERS

Guy-Riba, vice-president of INRA, Michael O'Donohue, research director (INRA) and scientific manager of BIOCORE, Bruno Schmitz and Philippe Schmid (DG Research, European Commission) and Andreas Redl, Green Chemistry Project manager at Syral S.A.S. announced on the 4th March 2010 the launch of a FP7 EU project, BIOCORE, which is focused on the development of a biorefinery concept for the transformation biomass into a variety of products, including 2nd generation fuel and polymers.

Today, concerns linked to climate change and Europe's excessive dependency on petrol are providing the driving force for the move towards the diversification of energetic resources and for the use of renewable carbon. In this regard, biomass is unique, because it is the only natural resource that can satisfy both needs, providing feedstock for biofuel production and for the manufacture of chemicals and materials.

The EU project BIOCORE, managed by INRA, will conceive and demonstrate the industrial feasibility of a biorefinery concept that will allow the conversion of cereal by-products (straws etc), forestry residues and short rotation woody crops into a wide spectrum of products including 2nd generation biofuels, chemical intermediates, polymers and materials. Through the development of a range of polymer building blocks, BIOCORE will show how 70% of today's polymers can be derived from biomass.

To meet the challenge of developing a competitive biorefinery concept, BIOCORE will unite the forces of 24 partners who will work together over a 48 month period. Among its European partners, BIOCORE counts 10 companies, of which five are SME's, one NGO and 12 public R&D organizations (i.e. universities etc). Additionally, BIOCORE counts among its partners a world-class Indian R&D institute (TERI, New Delhi). The BIOCORE project will benefit from a budget of 20.3 million €, of which 13.9 million € represents aid from the European Union within the framework seven (FP7) research program.

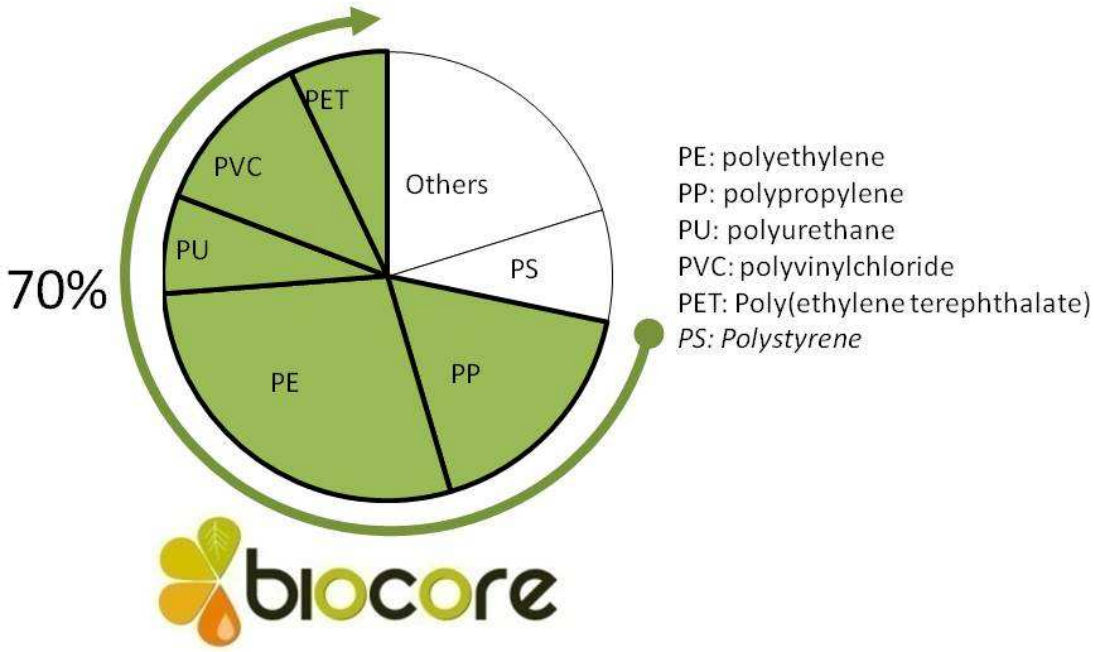
Contact for information: Aurélie Faure, BIOCORE Project Manager, tel: 00 33 1 42 75 91 26 or mail to aurelie.faure@paris.inra.fr

FOUR QUESTIONS FOR MICHAEL O'DONOHUE, SCIENTIFIC MANAGER OF BIOCORE AND DEPUTY MANAGER OF THE SCIENCE AND ENGINEERING OF BIOPRODUCTS DIVISION OF INRA.

What are the principle challenges behind the BIOCORE project?

Climate change and excessive dependency on fossil resources are pushing society towards a new economy that will use biomass as its primary resource. To enable this so-called bioeconomy to develop, it is now important to accelerate the industrialization process of 2nd generation biofuels and to replace other petrol-derived products with appropriate biomass-derived substitutes. The urgent nature of this biomass revolution becomes clear when one considers the European Union's intention to reduce GHG emissions by >80% in 2050.

BIOCORE is completely in phase with these objectives, because it aims to produce bioethanol at pilot scale and to produce a wide spectrum of molecules, notably chemicals that will allow the manufacture of many of today's key thermoplastics (e.g. polyolefins, polyurethanes, PVC etc), which together represent 70% of the global plastic market.



Contact for information: Aurélie Faure, BIOCORE Project Manager, tel: 00 33 1 42 75 91 26 or mail to aurelie.faure@paris.inra.fr

What makes BIOCORE original?

To overcome difficulties linked to biomass fractionation, BIOCORE will use a variant of organosolv technology for the biomass cracking process. The patented organosolv technology developed by the French company CIMV allows the extraction from biomass of its three major components (cellulose, hemicelluloses and lignins). In this way, the CIMV process provides the means to use all of the biomass in an optimal and technologically smart way. A second advantage of organosolv technology is linked to the fact that this technology will tolerate a wide variety of biomass feedstocks. Therefore, BIOCORE will use several types of biomass resources, including cereal by-products (straws etc), forestry residues and short rotation woody crops.

The idea that biomass is a precious source of renewable carbon is central to the BIOCORE project, even though one aim will be to manufacture 2nd generation fuel. Unlike other biorefinery concepts, BIOCORE will better address future needs for chemicals, notably through the development of production pipelines for olefins and organic acids, which will be ultimately used for the production of polymers. Regarding olefins, BIOOCORE aims to develop original processes that will use engineered microorganisms and produce ethylene and a propylene precursor. Moreover, through the use of pilot scale equipment and the smart integration of chemical and biotechnological processes, BIOCORE will demonstrate a cellulose to bio-PVC value chain.

Finally, BIOCORE is an outward looking, international project, which includes input from an Indian partner. The future bio-economy will be global, but its implementation is likely to be unequal in different world regions. Therefore, BIOCORE will attempt to account for this potential variability using scenario modeling to predict how a BIOCORE biorefinery could be supplied in Europe or Asia and to measure the impact of biorefining activities in terms of economic gains, social mutations and environmental changes.

Can you how BIOCORE fits into INRA's missions ?

Tomorrow's agricultural and forestry industries must fulfill several functions, including the production of food, energy and renewable carbon that will replace petrochemicals. Consequently, as a major R&D partner of these industries, in recent years INRA has been conducting research aimed at the development of new technological solutions in this area.

In particular, through the recent implementation of an internal programme focused on renewable carbon for energy and chemicals, INRA has reinforced its position as a major R&D actor in the biomass area both at national and European levels. Similarly, INRA is partner of a national programme, FUTUROL, which aims to bring 2nd generation biofuel manufacture to maturity, through the development of new technologies and the construction and operation of a pilot facility.

Therefore, the BIOCORE project is part of an overall strategy implemented by INRA, which aims to support the development of the whole biorefining value chain, from the production of biomass (c.f. INRA–led EU projets such as NovelTree and EnergyPoplar) through to the elaboration of technologies that will allow the production of marketable bioproducts.

Contact for information: Aurélie Faure, BIOCORE Project Manager, tel: 00 33 1 42 75 91 26 or mail to aurelie.faure@paris.inra.fr

What is the implication of INRA in BIOCORE?

The workforce implicated in BIOCORE is drawn from the Science and Engineering of Bioproducts division (Caractérisation et Elaboration des Produits Issus de l'Agriculture, CEPIA), with the main actor being the Biosystems and Chemical Engineering laboratory (LISBP) in Toulouse. This jointly sponsored (INRA and CNRS) laboratory housed by INSA Toulouse focuses a major part of its activities on industrial biotechnology applied to renewable carbon use. The LISBP will be backed up by researchers from the FARE laboratory, which is an INRA-University of Reims Champagne-Ardenne laboratory, whose research is focused on the characterization of biomass and its conversion into value-added non-food products.

Overall, INRA will mobilize 4 FTE within the BIOCORE project during the 4 year project period.

Contact for information: Aurélie Faure, BIOCORE Project Manager, tel: 00 33 1 42 75 91 26 or mail to aurelie.faure@paris.inra.fr

BIOCORE OR "BIOCOMMODITY REFINING" IN BRIEF

Today, concerns linked to climate change and Europe's excessive dependency on fossil resources are providing the necessary impetus for Society's transition towards a new economy that will use biomass as its primary source of carbon and energy. In this respect, biomass is completely unique, because it is the only naturally renewable energy source that can also supply carbon for the production of the chemicals and products that are vital for our daily life.

The Euopean project BIOCORE will conceive and analyse the industrial feasibility of a biorefinery that will allow the conversion of a variety of non-food biomass, including cereal by-products (straws etc), forestry residues and short rotation woody crops, into 2nd generation biofuel, chemicals and polymers.

The first challenge for BIOCORE will be to show how a biorefinery can use a mixed biomass feedstock. To do this, analyses will be performed in order to establish how a biorefinery ca be stably supplied with a mixture of cereal by-products (straws etc), forestry residues and short rotation woody crops. Several scenarios will be generated that will take into account harvest seasonality, transport and storage for biorefineries located in different regions of Europe and Asia.

From a technical point of view, BIOCORE will develop and optimize processes that will allow maximum use of the biomass resource. The first step will involve the extraction of each of the principle biomass components (cellulose, hemicelluloses and lignins). To achieve this, patented technology, which uses organic solvents to solublize the lignin components, will be employed.

Afterwards, BIOCORE will combine the development of biotechnologies and chemical processes in order to create smart transformation itineraries that will allow the production of 2nd generation biofuel, resins, polymers (and their intermediates), surfactants and food/feed ingredients.

In BIOCORE, the biomass feedstock will be used as a source of energetic molecules, but special emphasis will be placed on the use of biomass as a source of renewable carbon for the manufacture of chemicals that will substitute for petrochemicals. The ultimate aim of BIOCORE is to supply a range of products for a series of very different markets. Notably, through the production of a series of polymer building blocks, BIOCORE will cover 70% of the polymer families that constitute the current world plastics market.

Through pilot scaling testing of certain technologies, BIOCORE will be able to demonstrate the industrial feasibility of biorefining in conditions that are close to the market. Pilot tested processes will be modeled and optimized both from technical and economic standpoints in order to demonstrate the pertinence of a certain number of value chains.

From a sustainability point of view, BIOCORE will implement multicriteria sustainability studies of the overall concept, which will aim to demonstrate the impacts of BIOCORE with respect to the environment and society. Among the numerous criteria, analyses will account for water use and soil fertility, land usage, biodiversité, GHG emissions etc.

Contact for information: Aurélie Faure, BIOCORE Project Manager, tel: 00 33 1 42 75 91 26 or mail to aurelie.faure@paris.inra.fr

Finally, BIOCORE will actively organize technology and information transfer that will benefit all partners (the agricultural, forestry and energy sectors and the chemical and biotechnology industry), as well as policy makers and economic actors.

Contact for information: Aurélie Faure, BIOCORE Project Manager, tel: 00 33 1 42 75 91 26 or mail to aurelie.faure@paris.inra.fr

EXPECTED RESULTS

The BIOCORE project will establish biomass management plans that will describe how a biorefinery can be supplied with a mixed biomass feedstock. Models for different geographical scenarios (Europe and Asia) will be made available, which will account for regional differences, including crop seasonality, harvesting and transport logistics and storage. These results will be used to guide future industrial implantations of BIOCORE biorefineries.

BIOCORE will also demonstrate in an integrated pilot process the efficiency of an innovative fractionation process that will allow the optimal extraction of the major biomass components (cellulose, hemicelluloses and lignins). The high quality and purity of the different fractions will form the basis for the manufacture of natural polymers and fermentable sugars and lignins suitable for the production of a variety of products, including bioplastics and feed/food ingredients.

BIOCORE will also develop and test (i) biotechnological tools such as microorganisms and enzymes and (ii) chemical processes that will employ novel catalysts and low temperature pyrolysis technology. Together, these technologies will be used to transform cellulose and hemicellulose-derived sugars and lignins into added value products.

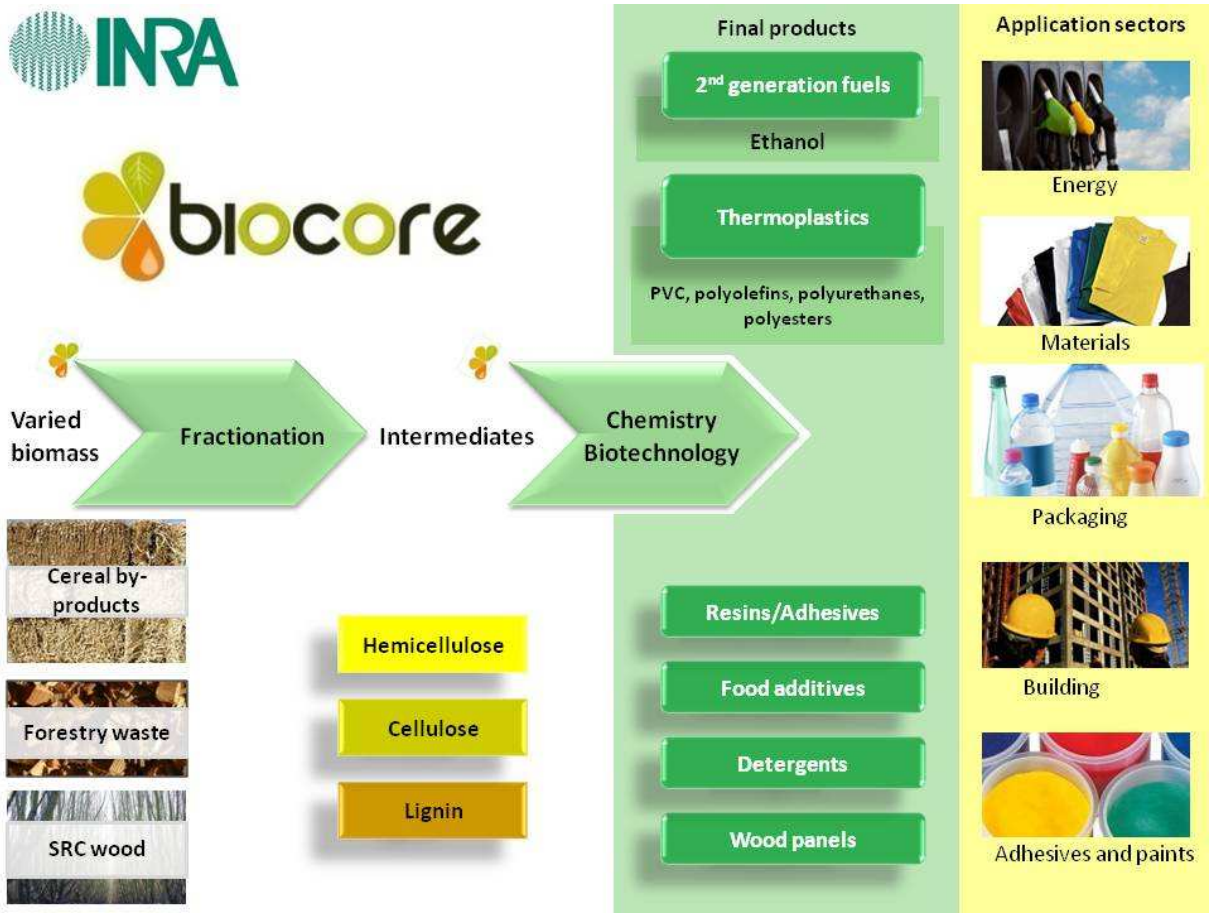
In an unprecedented way, BIOCORE will implement technologies that will provide the means to make ethylene and propylene, using cellulose and/or hemicelluloses as the feedstock. Similarly, using biomass as the starting material, BIOCORE will open the way towards a new generation of polymers, including bio-PVC and bio-polyurethanes.

BIOCORE will also develop integrated production processes that will be tested and perfected at industrial pilot scale. These processes will be modeled and flowsheets will be produced.

Finally, BIOCORE will deliver a sustainable concept that will be thoroughly tested with regard to its environmental, societal and economical impact. The multicriteria analyses will account for all aspects of the biorefinery value chain and will consider implementation of biorefining in geographically and socioeconomically different contexts.

Contact for information: Aurélie Faure, BIOCORE Project Manager, tel: 00 33 1 42 75 91 26 or mail to aurelie.faure@paris.inra.fr

A SCHEMATIC VIEW OF BIOCORE



Contact for information: Aurélie Faure, BIOCORE Project Manager, tel: 00 33 1 42 75 91 26 or mail to aurelie.faure@paris.inra.fr

INRA THE INSTITUTE

Ranked the number one agricultural institute in Europe and number two in the world, INRA carries out mission-oriented research for high-quality and healthy foods, competitive and sustainable agriculture and a preserved and valorized environment.

A MISSION-ORIENTED RESEARCH INSTITUTE THAT ADDRESSES CORE DEVELOPMENT ISSUES, FROM THE LOCAL TO THE INTERNATIONAL LEVEL

Our research is guided by developments in scientific fields and focuses on worldwide challenges related to food and nutrition, the environment and land use facing the world of agriculture and agronomics today. Challenges such as climate change, human nutrition, competition between food and non-food crops, the exhaustion of fossil resources and appropriate land management put agronomists in a position to generate compatible economic, social and environmental development. INRA produces fundamental knowledge that leads to innovation and know-how for society. INRA lends its expertise to public decision-making.

Open to society

- INRA initiates research projects in France and Europe that it knows are relevant for society, because it is attentive to society's needs. That is why it carries out forward-planning research with a strategic vision in concert with representatives of society (strategy partners).
- INRA commits to contributing to society through four-year contracts that set out specific objectives, together with the French government.
- It lends its expertise to public decision-making.

Producing knowledge, innovation and know-how for society

- INRA assists the development of industries and regions of France: it actively participates in a transfer partnership while seeking the public good
- INRA shares its knowledge with a vast public

Maintaining scientific excellence and research relevance

- INRA is ranked 2nd in the world and 1st in Europe for publications in the agricultural sciences, and plant and animal sciences.
- It maintains scientific partnerships with major scientific research institutes worldwide, universities, and agronomy and veterinary schools, and is committed to helping build the European Research Area.
- INRA encourages a multidisciplinary approach to research.
- It has received a number of prestigious awards for its researchers and their work.

A foremost scientific research institution

- 1,820 researchers and 1,833 doctoral students work at INRA; 1,519 foreign researchers and students come to INRA every year.

Contact for information: Aurélie Faure, BIOCORE Project Manager, tel: 00 33 1 42 75 91 26 or mail to aurelie.faure@paris.inra.fr

- Research equipment, experimental facilities and major technology transfer are managed by a staff of 2,462 engineers and 4,108 technicians

Contact for information: Aurélie Faure, BIOCORE Project Manager, tel: 00 33 1 42 75 91 26 or mail to aurelie.faure@paris.inra.fr