

## Presentation of the funded projects in 2010 for the « Bioénergies » Programme

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## « Bioénergies » programme

**YEAR 2010**

<b>Project title</b>	<b>ALGO-H2</b> – Genetic, metabolic, and process optimisation of hydrogen photobioproduction by the green microalga <i>Chlamydomonas reinhardtii</i>
<b>Abstract</b>	Biohydrogen production by microalgae is a transient phenomenon in nature. The goal of the project is to turn this marginal reaction into a major metabolic flux, by redirecting photosynthetic reducing power towards H <sub>2</sub> production. To reach this aim, three optimisation levels will be explored: genetic optimisation in order to lower hydrogenase sensitivity to oxygen, metabolic optimisation through the study of algal bioenergetic pathways and search for mutants in which hydrogen generating pathways are enhanced, and optimisation of production processes in photobioreactors. A transverse modelling approach will be carried out in order to integrate in a rational way the improvements which will arise from these different investigations, and to evaluate their impacts on system performance.
<b>Partners</b>	LBVME/CNRS GEPEA/Université de Nantes BIP/CNRS DR12 LPB/IBiTecS/CEA LGCB/Université Blaise Pascal Clermont-Ferrand
<b>Coordinator</b>	Laurent Cournac – LBVME/CNRS laurent.cournac@cea.fr
<b>ANR funding</b>	1 240 363 €
<b>Starting date and duration</b>	January 2011 – 48 months
<b>Reference</b>	ANR-10-BIOE-004
<b>Cluster label</b>	CAPENERGIES

## « Bioénergies » programme

**YEAR 2010**

<b>Project title</b>	<b>BIOPAC– Biomolecules as hydrogen oxidation catalyst in fuel cells</b>
<b>Abstract</b>	<p>BIOPAC aims to the use of hydrogenases, the key enzymes for the enzymatic conversion of hydrogen into protons, in replacement of chemical catalysts in fuel cell devices. Production of temperature, oxygen and CO resistant hydrogenase will be a major asset.</p> <p>BIOPAC will study hydrogenase immobilization onto various electrodes, from analytical to porous electrodes developing high surface areas, with three main issues: (i) Choice of the most resistant and stable hydrogenase, (ii) Efficiency of the interfacial electron transfer process, including the control of the orientation of the enzymes at the electrode, so that no redox mediator will be needed, (iii) Increase in the surfacic enzyme concentrations, hence current densities. These fundamental queries will open the route for H<sub>2</sub>/O<sub>2</sub> biofuel cell tests.</p>
<b>Partners</b>	<p>BIP/CNRS DR12 IS2M/CNRS DR Alsace LCP/CNRS DR12 LBT/CNRS DR Paris B</p>
<b>Coordinator</b>	<p>Elisabeth LOJOU - BIP/CNRS DR12 lojou@ifr88.cnrs-mrs.fr</p>
<b>ANR funding</b>	<p>650 745 €</p>
<b>Starting date and duration</b>	<p>December 2010 – 48 months</p>
<b>Reference</b>	<p>ANR-10-BIOE-003</p>
<b>Cluster label</b>	<p>CAPENERGIES</p>

## « Bioénergies » programme

**YEAR 2010**

<b>Project title</b>	<b>DIVA– Characterization of Digestate and evaluation of their agronomic VALorisation</b>
<b>Abstract</b>	<p>The current development of anaerobic digestion as a process for organic waste valorisation leads to production of digestate that to date are not or only poorly characterized. Currently, these digestates do not have a real status and are generally applied on agricultural soils. The DIVA project aims at their characterization and at the evaluation of their management channels within a goal of agricultural recycling.</p> <p>The project contains 5 work packages: (i) identify and characterize the different types of digestate and management methods currently used in France ; (ii) assess the ability of digestate to be used directly in agriculture or to be processed through post-processing operations to achieve the status of product ; (iii ) clarify the agronomic value and assess the environmental impact of soil application of raw and processed digestate (nitrogen biogeochemical cycle and N<sub>2</sub>O emission) ; and (iv) conduct a techno-economic and environmental assessment (LCA) of digestate management (post-treatment and soil application) compared with direct soil application. This work should encourage modification of the digestate status from "waste" to "product".</p>
<b>Partners</b>	<p>Cemagref Solagro ARMINES UMII LGPEB Geotexia Suez Environnement EGC / INRA</p>
<b>Coordinator</b>	Patrick DABERT – Cemagref - <a href="mailto:patrick.dabert@cemagref.fr">patrick.dabert@cemagref.fr</a>
<b>ANR funding</b>	1 226 387 €
<b>Starting date and duration</b>	December 2010 – 48 months
<b>Reference</b>	ANR-10-BIOE-007
<b>Cluster label</b>	AGRIMIP INNOVATION

## « Bioénergies » programme

**YEAR 2010**

<b>Project title</b>	<b>FORESEE– FOrest RESource Assessment applied to bio-Energies</b>
<b>Abstract</b>	<p>A good knowledge of the biomass location, its characteristics (quantity and quality) and its mobilization conditions (exploitability, service roads, mobilization costs) is essential to the development of the forest biomass industry. This knowledge is currently insufficient to provide at reasonable costs, the required guarantees on the wood supply and on its sustainability. The demand is however increasing due to a large number of new projects requiring increasingly large biomass volumes.</p> <p>The Foresee project aims to provide new tools for assessing the characteristics and dynamics of the forest resource biomass and the conditions of its mobilization at the supply basins level by using notably the Lidar technology.</p>
<b>Partners</b>	FCBA IFN Cemagref BEF / INRA MATIS / IGN SINTEGRA ONF
<b>Coordinator</b>	Nicolas Nguyen The - FCBA nicolas.nguyen-the@fcba.fr
<b>ANR funding</b>	901 960 €
<b>Starting date and duration</b>	December 2010 – 42 months
<b>Reference</b>	ANR-10-BIOE-008
<b>Cluster label</b>	TENERRDIS Xylofutur (ex Industries et Pin maritime du Futur)

## « Bioénergies » programme

**YEAR 2010**

<b>Project title</b>	<b>GAMECO – Improved Gasification for Heat and Power Applications</b>
<b>Abstract</b>	Air-blown fluidised bed biomass gasification is a well adapted technology for CHP applications with syngas valorisation in a gas engine. However, it is not mature yet. Despite promising prototypes, CHP gasification needs further improvements to become the reference technology in the medium-size CHP market. This is the purpose of the GAMECO project, which aims at improving an existing technology by optimising its operation, increasing its feedstock flexibility and optimising its upscaling, based on a better understanding of the key points of biomass BFB gasification. The bottlenecks identified will be assessed through modelling, lab tests, and pilot tests. Several feedstocks will be tested for this purpose in the frame of GAMECO project.
<b>Partners</b>	EDF FJV / LRGP CEMHTI EQTEC Novabiom
<b>Coordinator</b>	Jose Carlos Valle Marcos - EDF jose-carlos.valle-marcos@edf.fr
<b>ANR funding</b>	1 015 184 €
<b>Starting date and duration</b>	December 2010 – 48 months
<b>Reference</b>	ANR-10-BIOE-001
<b>Cluster label</b>	Fibres Grand Est

## « Bioénergies » programme

YEAR 2010

<b>Project title</b>	<b>HYCOFOL_BV</b> – Production of hydrogen from plant biomass using a combination of light and dark fermentation processes
<b>Abstract</b>	The aim of this project is to propose a bioprocess for the production of hydrogen from wheat straw, an agricultural by-product. The treatment of this biomass releases an effluent rich in pentose and hexose sugars that can be converted biologically into H <sub>2</sub> by fermentation. The first stage of the bioprocess involves fermentation at high temperature (70-80°C) by hyperthermophilic bacteria of the order <i>Thermotogales</i> , which can ferment pentose and hexose sugars into acetate, CO <sub>2</sub> and H <sub>2</sub> . The second stage involves photo fermentation of acetate in the light, using mesophilic, photoheterotrophic bacteria of the genus <i>Rhodobacter</i> . The coupling of these two processes can theoretically lead to a complete conversion of sugars into hydrogen, with a maximum theoretical yield of 12 mol H <sub>2</sub> /mol glucose and 10 mol H <sub>2</sub> /mol xylose.
<b>Partners</b>	LCBM/CEA CNRS/LEPMI IRD/LMBEC EPI/BRGM ARD
<b>Coordinator</b>	John Willison - LCBM/CEA john.willison@cea.fr
<b>ANR funding</b>	775 468 €
<b>Starting date and duration</b>	November 2010 – 36 months
<b>Reference</b>	ANR-10-BIOE-005
<b>Cluster label</b>	

## « Bioénergies » programme

**YEAR 2010**

<b>Project title</b>	<b>MECABIOFOR</b> – Mechanization and optimization of techniques for the production and harvest forest biomass coming from specific cultures
<b>Abstract</b>	MECABIOFOR aims to create innovative tools to foster the development of lignocellulosic biomass crops (Short Rotation Coppices, Very Short Rotation Coppices, semi-dedicated plantations) by ensuring their economic viability through technological innovations for planting, weeding and harvesting these stands. The development of appropriate tools, combining both lightness, mechanical strength, accuracy and reduced cost is at each stage a technological challenge. The sum of these improvements represents a significant technological leap for strongly reducing the cost of production of forest biomass in these dedicated cultures.
<b>Partners</b>	FCBA UCFF Cemagref SKCDP FIBRE EXCELLENCE R&D KRAFT
<b>Coordinator</b>	Emmanuel CACOT - FCBA emmanuel.cacot@fcba.fr
<b>ANR funding</b>	939 500 €
<b>Starting date and duration</b>	January 2011 – 36 months
<b>Reference</b>	ANR-10-BIOE-006
<b>Cluster label</b>	AGRIMIP INNOVATION - VIAMECA - Xylofutur (ex Industries et Pin maritime du Futur)



## « Bioénergies » programme

**YEAR 2010**

<b>Project title</b>	<b>RECO2– Recycling and valorisation of CO<sub>2</sub> in a fluidized bed process for steam gasification of biomass</b>
<b>Abstract</b>	<p>This project deals with CO<sub>2</sub> recycling and valorisation in biomass steam gasification process performed in a fluidised bed.</p> <p>The CO<sub>2</sub>, produced by the process itself, can be reintroduced into the gasifier, either instead of neutral gas with biomass feeding, or to replace a part of the steam in the gasifier itself. Firstly, analytical studies will be led at the particle scale to isolate the pyrolysis and gasification mechanisms with CO<sub>2</sub>. Then, the same mechanisms will be studied in a fluidised bed continuously fed with biomass. After this important experimental step, these results will be analyzed and transposed so as to be used in technical and economical simulation tools for industrial processes evaluation.</p> <p>The last step of the project consists in an environmental evaluation of the process.</p>
<b>Partners</b>	LITEN/CEA ARMINES EDF SD TUW
<b>Coordinator</b>	Serge RAVEL - LITEN/CEA serge.ravel@cea.fr
<b>ANR funding</b>	665 267 €
<b>Starting date and duration</b>	January 2011 – 36 months
<b>Reference</b>	ANR-10-BIOE-002
<b>Cluster label</b>	TENERRDIS - AGRIMIP INNOVATION