

RESEARCH CONFERENCES

ESF-BU-CeBiTec Research Conference

Microorganisms for Bio-fuel Production from Sunlight

Center for Interdisciplinary Research (ZIF), Bielefeld • Germany
18-21 September 2011

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Highlights & Scientific Report



Conference Highlights

Please provide a brief summary of the conference and its highlights in non-specialist terms (especially for highly technical subjects) for communication and publicity purposes. (ca. 400-500 words)

The conference on “Microorganisms for biofuel productions” was attended by more than 120 people from 16 countries including experts from universities and research centers as well as delegates from industry and European institutions. The conference can be overall regarded as extremely successful, which was underlined by many positive reactions after the meeting. The very high scientific level of the speakers was reflected by lively sessions providing very interesting new insights into the current state of the art of bioenergy research with microorganisms that are able to convert sunlight into fuels. A particular emphasis was put on effective biomass production from microalgae, but also on constructing new efficient and cheap bioreactor systems for growth and biofuel production. New insights in future perspectives were provided in several talks concentrating on the use of “synthetic biology” for the introduction of direct metabolic pathways for biofuel production in cyanobacteria and microalgae. The conference perfectly reflected the interdisciplinary background of this new research field by combining molecular biology research with ecobiology, process engineering of photobioreactors and last but not least with life cycle analyses and energy balance calculations. In addition, practical economic feasibility studies, provided by several speakers during the conferences, gave new insides into the milestones and future chances, risks but also prospects of this important research field. The conference was used by several international research consortia (EuroCores, EU-FP7) as a meeting and discussion platform and thereby we managed to manifest this meeting as one of the main conferences platforms in this research field. This is also reflected by the fact that at the end of the meeting two outstanding scientists from the Netherlands and from the U.K., Prof. Rene Wijffels (Wageningen) and Prof Alison Smith (Cambridge), already agreed to become Scientific Chairs for the next conference with this topic in 2014 in Bielefeld. In conclusion, with this second conference in the series “Industrial Biotechnology” we manifested this conference series as a type of “Gordon Conference” with high visibility within the scientific community..



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Scientific Report

Executive Summary

(2 pages max)

As highlighted in the ESF white paper “Clean Solar Fuels” and the ESF Science Policy Briefing “Harnessing Solar Energy for the Production of Clean Fuel”, solar energy is one of the major options for a sustainable fuel source that will allow a switch to a carbon neutral energy economy. At present 2/3rds of our worldwide energy use is based on transportable and storable fuels. Many international research projects currently aim to use sun light as a major source not only for the production of electricity but also for the generation of new fuels. This includes the biological pathway via production of photosynthetically active biomass. Under the umbrella of this theme this conference series provides a platform for exchange of information on highest international standards.

Harnessing Solar Energy for the production of clean fuel is one of the major options for a sustainable fuel source that will allow a switch to a carbon neutral energy economy. In the context of ethical and economical discussion regarding the use of arable land masses and crop plants for biofuel production, an increased focus is currently set on photosynthetic microorganisms such as green microalgae, cyanobacteria and purple bacteria as alternatives in industrial biofuel production systems. The advantages of using microorganisms are high photon conversion efficiencies and production rates, low water requirement and multiple uses in bio-refinery concepts.

The conference “Microorganisms for Bio-Fuel Production from Sunlight” focused its attention on new developments in bio-engineering approaches of different phototrophic microorganisms, advances in the development of cultivation in bioreactors, the conversion of microorganism biomass into fuels of the second generation and the integration of phototrophic biofuel production processes in bio-refinery concepts.

The conference successfully discussed state of the art issues from fundamental research questions to applied projects.

Scientific Content of the Conference

(1 page min.)

- *Summary of the conference sessions focusing on the scientific highlights*
- In this context

In this conference 120 participants from 16 countries discussed the biological and technical progress regarding the use of phototrophic microorganisms for the production of biofuels from sunlight. During four conference days 35 speakers presented newest results from their research fields during 7 different conference sessions.

These sessions included topics related to biofuels from microalgae and cyanobacteria, process engineering, down processing and reactor design, state of the art and new frontiers and molecular tools for light to biomass conversion. In addition to the oral presentations, more than 50 posters were presented with newest and partly unpublished results from international laboratories.

Highlights of the oral presentations the introduction to new metabolic pathways in phototrophic microorganisms to enable them for direct sun to fuel production, the improvement of oil production in cyanobacteria, the successful metabolic engineering of light harvesting and new insights into production pathways such as the production of hydrogen, oils and carbohydrates. These results demonstrated the potential future impact of Synthetic Biology for the whole research field.

Engineers and Scientific advisers from algae production companies gave insights in their projects

focusing on the efficient production of biomass for biofuels. Two multi-international projects were in the focus of interest: The “Algae Parc” project in Wageningen (Netherlands) and the “SOLARBIOFUELS Research center” project in Brisbane (Australia). The Directors for both projects were present at this meeting and introduced the participants to the research background and the targets.

In addition to the established speakers, this conference gave also room to young investigators. A group of young researchers were given the opportunity to present their data in oral presentations in a special session. Of particular note is that many of these young researchers participated after the conference at a 4 days Summer School at the Center for Biotechnology (CeBiTec). During this School, 15 young researchers coming from all over the world, studied practical issues of biofuel production with microalgae in lab courses and in seminars thus nicely connecting theoretical background discussions of the conferences with practical experience in the lab.

Of further note is that the conference was attended by many industrial representatives e.g. Siemens AG, Neste Oil, Cyano-Biofuels GmbH, TOTAL, ExxonMobil Biomedical Sciences, Inc., Saudi Basic Industries Corporation (SABIC), Solarzyme, Sapphire and Algenol.

In a final podium discussion round, future strategies of sun-to-biofuel research was intensively discussed with representatives of the ESF and the European Commission together with scientific coordinators of ESF-EuroCores programs as well as of EU-FP7 collaborative projects.

In conclusion, this ESF conference provided new insights into state of the art of microalgae-to-fuel research using sunlight and gave new

Assessment of the results and their potential impact on future research or applications

Forward Look

(1 page min.)

- *Assessment of the results*
- *Contribution to the future direction of the field – identification of issues in the 5-10 years & timeframe*
- *Identification of emerging topics*

This conference topic is clearly an emerging field in the bioenergy research area which is reflected by that fact that the Editor-in-Chief of “Journal Biotechnology” invited the participants for a Special Issue summarizing recent advances. In addition, during the conference the creation of a new ESF Network initiative has been discussed and will be further evaluated in the near future.

- **Is there a need for a foresight-type initiative?**
-

Atmosphere and Infrastructure

- *The reaction of the participants to the location and the organization, including networking, and any other relevant comments*

The feedback of the participants regarding the overall atmosphere of the conference and the quality of the infrastructure at the ZiF was very positive. The combination of accommodation site (Park Inn Hotel) and conference site (ZiF) will be therefore kept for the next conferences.

Sensitive and Confidential Information

This report will be submitted to the relevant ESF Standing Committees for review.

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Bielefeld, 24.10.2011

Olaf Kruse