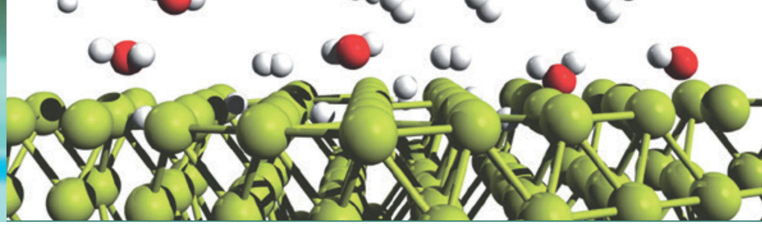

Consortium and People

Under the coordination of Prof. Dr. Bastian Etzold, junior professor for catalytic materials at the Friedrich-Alexander-Universität Erlangen-Nürnberg, nine further institutions are involved in SusFuelCat coming from Finland, United Kingdom, Italy, Netherlands, Germany, Russia, and Spain. The consortium is comprised of six universities and four companies, including three small and one large enterprise.

Friedrich-Alexander-Universität Erlangen-Nürnberg, Germany
Coordinator
Prof. Dr. Bastian Etzold

Abo Akademi University, Finland
Prof. Dmitry Murzin

Boreskov Institute of Catalysis, Russia
Dr. Irina Simakova

BTG Biomass Technology Group BV, Netherlands
Dr. ir. Robbie Venderbosch

FutureCarbon GmbH, Germany
Dr.-Ing. Tim Schubert

Johnson Matthey PLC, United Kingdom
Dr. ir. Aalbert Zwijnenburg

Universidad Autónoma de Madrid, Spain
Prof. Miguel A. Gilarranz

University of Palermo, Italy
Prof. Dario Duca

University of Twente, Netherlands
Prof. Dr. ir. Leon Lefferts

Bavarian Research Alliance, Germany
Dr. Nico Riemann

Project Profile

SusFuelCat
Sustainable fuel production by aqueous phase reforming – understanding catalysis and hydrothermal stability of carbon supported noble metals

Funding Programme
SusFuelCat is a small or medium-scale focused research project funded under the European Union's 7th Framework Programme (FP7), within the key thematic area 4, "Nano-sciences, nanotechnologies, materials and new production technologies (NMP)".

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Coordination
Prof. Dr. Bastian Etzold
Friedrich-Alexander-Universität
Erlangen-Nürnberg
Lehrstuhl für Chemische
Reaktionstechnik
D- 91058 Erlangen

Phone: +49 (0)9131 85-27430
Fax: +49 (0)9131 85-27421
E-mail: bastian.etzold@crt.cbi.uni-erlangen.de
www.crt.cbi.uni-erlangen.de

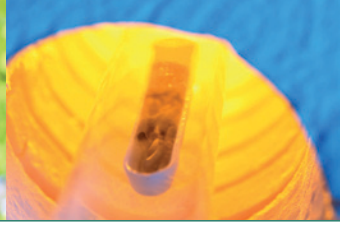
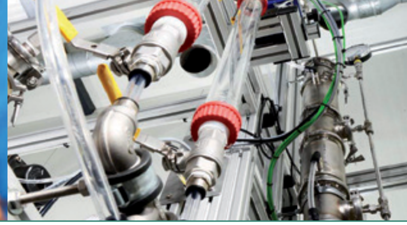
www.susfuelcat.eu

pictures: Friedrich-Alexander-Universität Erlangen-Nürnberg, BTG Biomass Technology Group, University of Palermo, Fotolia

SusFuelCat

Sustainable **Fuel** production by aqueous phase reforming – understanding **Cat**alysis and hydrothermal stability of carbon supported noble metals

This project receives funding from the European Union Seventh Framework Programme (FP7)


Project SusFuelCat – Overview

Utilizing biomass as a renewable energy source is an important step for reducing Europe's dependence on fossil fuels and decreasing greenhouse gases. Biomass can serve as a base material for energy carriers like hydrogen. One advantage that hydrogen offers over fossil fuels is that when combusted it produces only water vapour instead of CO_2. The EU research project SusFuelCat focuses on the production of hydrogen based on aqueous phase reforming (APR). Catalysts are the key components here and are responsible for efficiently converting biomass into hydrogen.

The goals of SusFuelCat are:

- Production of almost carbon monoxide free hydrogen
- Highly active catalyst with high selectivity towards hydrogen
- Validated long-term stability of catalysts
- Lowering costs of catalysts

The methodology of SusFuelCat is:

- Tuning model catalytic materials for their properties
- Detailed *in-situ* and *ex-situ* materials characterization
- Combining computational, *in-situ* kinetic and long-term experiments
- Testing of model and real raw material feedstock
- Rational catalyst design geared by industrial key performance indicators

Objectives and Methods of SusFuelCat

Optimizing catalysts for sustainable production

In order to be able to introduce the APR process on an industrial scale, the catalysts enable conversion of more biomass per unit of time at moderate operating costs, i.e. low energy requirements. The key to optimizing the catalyst and the overall process is understanding the relationship between the structure of the catalyst on an atomic level and its resulting effect.

Decisive factors in this context are a long service life of the catalysts, a fast conversion (activity) and the purity of the end product (selectivity). Carbon-based carrier materials such as nanotubes or activated carbon promise higher process stability and are used as carriers in the project.

Optimizing process and analyzing costs

The researchers of the SusFuelCat project are varying and monitoring systematically the material characteristics of the metals and carriers and are examining the release of hydrogen in experiments. To this end, they utilize spectroscopic methods and computer simulations in order to be able to observe the catalysts while they are working. This combination should help to work out the requisite understanding of the structure/effect relationship step by step, which in conjunction with long-term experiments conducted with industrial partners should ultimately result in catalyst optimization.

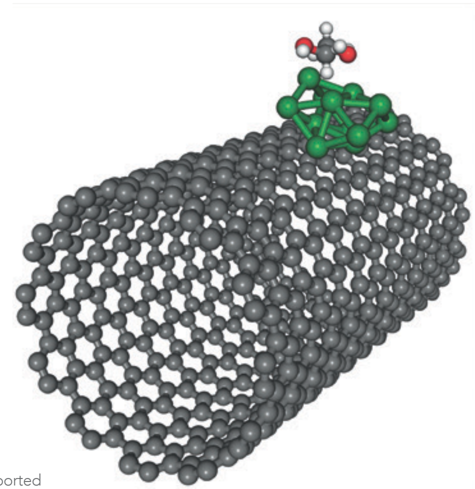
In addition to that, the scientists are testing different catalysts on the basis of different base products like pyrolysis oils or hydrolyzed wood-based biomasses. Progress is gauged with the aid of measurable key performance indicators. At the same time, SusFuelCat researchers are also comparing the costs of materials used and the processes.

Exploitation of Project Results

Increasing impact for Europe's industry

By optimizing the APR process, Europe is taking the first step toward a high-performing and sustainable technology that will enable the conversion of cost-effective biomass into environmentally friendly energy carriers on an industrial scale. The hydrogen produced can serve, for instance, as a fuel. In fuel cells, it can moreover provide electricity and heat for the energy industry or for vehicles.

Aqueous or water-soluble biogenic base materials such as cellulose are converted into hardly contaminated hydrogen in the APR process at comparably low process temperatures and with moderate pressure. That eliminates energy-intensive processes for drying biomass. The industry will benefit from these advantages by saving money and energy.



Model of Pd cluster supported on a carbon nanotube used for simulation studies.