

A beacon for future hydrogen research

The Max Planck Institute for Chemical Energy Conversion together with the Helmholtz-Zentrum and the Fritz-Haber-Institute in Berlin are building a catalysis research platform named CatLab to achieve leaps of innovation in hydrogen research

Hydrogen as a sustainable fuel source will play a key role in our energy system for the future. Hydrogen-based chemical energy media are needed as long-term storage repositories in the energy system and are crucial for climate-neutral design of industrial processes. The German federal government's National Hydrogen Strategy clearly identifies the great need for research in this area, which will be the foundation for breakthroughs and leaps in innovation. The Max Planck Institute for Chemical Energy Conversion, the Helmholtz-Zentrum Berlin, and the Fritz Haber Institute are pooling their expertise for this purpose and are jointly establishing the CatLab research platform in Berlin. CatLab is intended as a bridge between pure research and industry, and is being funded by the German Federal Ministry of Education and Research (BMBF) with more than 50 million euros. In total, the five-year development project will cost about 100 million euros.

Catalysts are the key to many technologies and processes that are needed to build a climate-neutral economy. New innovative catalytic processes are needed to produce hydrogen and synthetic fuels using renewable energies in a closed CO₂ cycle. Conventional catalysts mostly consist of complex combinations of powders within a chemical reactor. The focus of research in Catlab is completely new approaches, ones that promise innovative leaps forward: catalysts based on tailor-made functional thin films that can be specifically adapted as required for conventional chemical reaction processes and revolutionise them.

The Helmholtz-Zentrum Berlin (HZB) has broad expertise in the synthesis and characterisation of thin films and materials systems. The Max Planck Institute for Chemical Energy Conversion (MPI CEC) and the Fritz Haber Institute (FHI) of the Max Planck Society will be contributing their expertise in catalysis research. Synthesis and analysis methods are to be coupled with new procedures for automated evaluation through machine learning to accelerate rational material design for tailor-made catalysts by means of digital catalysis.

The project begins with a five-year start-up phase. CatLab will be funded by the Federal Ministry of Education and Research (BMBF) with about 51 million euros as part of the National Hydrogen Strategy in addition to considerable contributions by the participants themselves.

German Federal Minister for Education and Research Anja Karliczek wishes the project great success and emphasises: “Hydrogen as a sustainable fuel source is the opportunity of the century for Germany as an industrialised country and for climate protection worldwide. To make the sustainable hydrogen economy successful, we need innovative leaps forward. CatLab is superbly positioned for this. With the pioneering collaboration of the HZB and Max Planck Society, its integration into the Berlin research landscape, and the participation of technology companies, CatLab concentrates top expertise along the entire innovation chain.”

Michael Müller, Mayor of Berlin and Senator for Science, sees Berlin as an energised location for the sciences: “Federal funding for the CatLab project underscores the huge potential of Berlin's catalysis research and the high level of innovation that emanates from our research institutes in Berlin for the development of green hydrogen technology. The CatLab fits in perfectly with Berlin's science landscape and the Adlershof Technology Park. The close cooperation between research and industry means that new concepts in catalysis can be tested more quickly for their application potential, thus triggering innovation.”

“CatLab will establish a new research focus in catalysis in the immediate vicinity of BESSY II, the synchrotron radiation source in Adlershof. State-of-the-art synthesis and analysis methods will be available there to analyse chemical and physical processes during catalytic processes in real time at atomic resolutions“, says Prof. Bernd Rech, Scientific Director at HZB.

Prof. Robert Schlögl, Director at the MPI CEC and FHI emphasizes: “We have already established unique operando measurement infrastructure at BESSY II in recent years. They will complement each other perfectly here. This has already enabled us to develop a new functional model of catalysts that can be improved using thin-film technology. Now we will further develop and expand these activities under the umbrella of the CatLab through a unique symbiosis of synthesis and operando analysis.“

The chemical industry has also been involved from the very beginning. BASF is participating in the construction as well as in the selection and scaling of the processes, and in development of the chemical reactors. In addition, there are also collaborations with Humboldt-Universität, the UniSysCat cluster of excellence and the BasCat laboratory, which the Technische Universität Berlin operates together with BASF. Further partners can be integrated via these collaboration programmes. CatLab thus has the potential to become a world leader in catalysis and hydrogen research through a large Berlin alliance of university and non-university research institutions.

(Source: [Helmholtz-Zentrum Berlin](#))