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VORWEG GEHEN

Bayer MaterialScience

Bayer Technology Services

News Release

Catalysis as key technology for sustainability

From waste product to raw material – manufacturing quality polymer materials based on CO₂

German Federal Ministry of Education and Research provides funding of more than EUR 4.5 million for “Dream Production“

Leverkusen, June 07, 2010 – Researchers from Bayer MaterialScience and Bayer Technology Services are working together with RWE Power AG and academic partner RWTH Aachen University on the sustainable use of carbon dioxide (CO₂). At the heart of what has been called the “Dream Production” project, sits the construction and commissioning of a pilot plant at Chempark Leverkusen. This is to be the location for the kilogram-scale production of polyether polycarbonate polyols (PPPs) that will be processed into polyurethanes and will involve the chemical bonding of CO₂, which will be an integral raw material in this sustainable process. The key technology for this is catalysis.

While catalysis is currently used in the manufacture of more than 85 percent of all chemical products, the low energy density of carbon dioxide has hindered the application of this technology in any attempt to put CO₂ to practical use.

But in recent laboratory tests, 'dream reactions' have been achieved; i.e. reactions created in a laboratory but the industrial application of which have yet to be proven; resulting in the process being described as a 'dream', for the time being.

For the first time, these promising results will be transferred from the laboratory to a larger scale in the 'Dream Production' project. During the next three years the German Federal

Ministry of Education and Research (BMBF) will invest a total of more than EUR 4.5 million in the initiative, the project supervision of which is the German Aerospace Center (DLR).

Polyether polycarbonate polyols (PPP) produced using catalysis are extremely attractive materials. As well as the incorporating CO₂ in the process, there are also further interesting possibilities involving their use in polyurethane chemistry. "Using the waste product CO₂ to manufacture versatile materials is an amazing achievement made possible by catalysis – and one which both we and our project partners are very proud of," said Patrick Thomas, Chief Executive Officer of Bayer MaterialScience AG. "What's more, as an ultra-efficient organic insulating material, polyurethanes save around 80 times more energy during their service life than is required for their production. This ensures that PPPs have a doubly positive effect on climate protection."

As well as being used for building insulation, lightweight polyurethane components also help to reduce weight in the automotive industry, for example, resulting in significant energy savings. However, polyurethanes are also part of everyday life when used as a material for manufacturing high-quality mattresses and upholstered furniture.

"Dream Production" is based on a forerunner project "Dream Reactions", which was initiated by Bayer Technology Services and also funded by the BMBF. "As part of this project, we dealt with fundamental questions focusing on harnessing CO₂ by using newly developed catalysts. We have achieved promising results that form the basis for industrial implementation in the Dream Production project," explains Dr. Dirk Van Meirvenne, managing director of Bayer Technology Services GmbH.

"The rewarding collaboration with Bayer MaterialScience and Bayer Technology Services as part of the CAT Catalytic Center, laid the foundations for this consortium. Unifying the entire value chain from the source to the product in one single project is unique in CO₂ usage. This offers enormous opportunities but also requires open and intensive communication, an aspect that was a great success in the project preparation phase," says Prof. Walter Leitner, executive director of the Institute of Technical and Macromolecular Chemistry (ITMC) at RWTH Aachen University.

Using CO₂ as a raw material for manufacturing polymers helps cut consumption of conventional raw materials and therefore fossil fuels. This strategy also shows future generations how to make sustainable use of natural resources.

The CO₂ used for the project will come from RWE Power's lignite-fired power plant at Niederaußem. This is where the electricity generator operates a CO₂ scrubbing system at its coal innovation centre, by which the carbon dioxide is captured from the flue gas. For the Dream Productions project the CO₂ scrubber will be equipped with an additional liquefaction system so that the carbon dioxide can be transported to Leverkusen. The CO₂ liquefaction system will be designed and operated with flexibility to meet various CO₂ pressures and purities on a scale ranging from kilograms up to tonnes.

"In a broad-based energy mix, coal will continue to play an important role in the future", said Dr. Johannes Lambertz, Chief Executive Officer of RWE Power AG. "This is why the Dream Production project is also important to RWE. Apart from capturing CO₂ with an utmost of energy efficiency from the power plant process as a building block for significant carbon dioxide reductions in coal-fired power plants, we are also developing the additional path of CO₂ usage in a cross-industry cooperation. This comes under the heading: CO₂ – a new resource“.

About Bayer MaterialScience:

With 2009 sales of EUR 7.5 billion, Bayer MaterialScience is among the world's largest polymer companies. Business activities are focused on the manufacture of high-tech polymer materials and the development of innovative solutions for products used in many areas of daily life. The main segments served are the automotive, electrical and electronics, construction and the sports and leisure industries. At the end of 2009, Bayer MaterialScience had 30 production sites and employed approximately 14,300 people around the globe. Bayer MaterialScience is a Bayer Group company.

About Bayer Technology Services:

Bayer Technology Services GmbH offers fully integrated solutions throughout the lifecycle of chemical and pharmaceutical plants – from development, planning and construction, to the process optimization of existing plants. The Bayer subsidiary employs almost 2,600 experts worldwide at its headquarters in Leverkusen and other German sites, as well as in regional offices in Belgium, India, Mexico, Switzerland, the United States, the United Arab Emirates and China. In 2009, the company achieved sales of approximately EUR 380

million. Additional information about Bayer Technology Services is available at www.bayertechnology.com.

About RWE Power:

RWE Power is Germany's largest electricity producer. Over 15,000 employees work in the opencast mines and power plants, processing facilities and research projects, training centres and administration offices. With a power plant capacity of just over 33,000 megawatts, the company contributes to RWE's broad-based energy mix of lignite, hard coal, nuclear power, gas and renewable energy. RWE Power invests billions in the construction of new, low-carbon power plants and in the development of even more efficient, environmentally benign technologies for power generation in the future.

About RWTH Aachen University:

More than 30,000 students are enrolled in the nine departments and more than 85 fields of study of the RWTH Aachen, including 5,000 international students. The RWTH has 440 professors and 6,800 employees. The main educational and research area is engineering. The university has traditionally close relations with industry, which is reflected in the funding of roughly 150 million Euros from third parties. The key features of the RWTH's scientific work is a complex interdisciplinary network comprising 19 individual research and competence networks, currently 11 special research areas (SFB) as well as participation in Transregio-SFB and in six interdisciplinary forums. The RWTH is a member of international research associations such as the IDEA League, a focused network of leading European universities of science and technology.

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