

Bacteria Open up New Possibilities for Climate Control and Synthesis

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With the support of Evonik Industries, Freiburg University discovers new metabolic pathway to bind the greenhouse gas CO₂

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Not only plants can absorb the greenhouse gas CO₂ from the atmosphere and bind it via their metabolism, some bacteria are also capable of this. The working group headed by Prof. Dr. Georg Fuchs at the elite University of Freiburg has now discovered a new metabolic pathway in bacteria in which this so-called biological CO₂ fixation is especially active and which may be useful in the area of climate control. The research work was supported by the state of North Rhine Westphalia, the European Union, and Evonik Industries AG as the industry partner.

The results have, in the meantime, been published in the reputed scientific journal *Science*¹ and have also drawn attention from outside scientific circles. The work carried out by the Freiburg team could contribute towards reducing the greenhouse gas CO₂ in the atmosphere. "Besides technologies aimed at reducing CO₂ emissions, biological fixation of CO₂ is one of the most promising areas of research," said Dr. Harald Schmidt, head of the research unit Creavis Technologies & Innovation at Evonik. With biological fixation, not only can the greenhouse gas be removed from the atmosphere, CO₂ emissions from industrial processes can also be reduced.

From a chemist's aspect, the results from Freiburg offer a second approach. These metabolic pathways open up new possibilities in the field of synthesis—either to substitute chemical production processes with more environmentally friendly biotechnological processes or to develop new products using completely new methods. The Biotechnology Science-to-Business-Center of Evonik in Marl, Germany, which is managed by Creavis, is pursuing this goal. For the last two years, the company has been working on the innovative biotechnological production of advanced materials. "We are increasingly using the

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¹ I. A. Berg, D. Kockelkorn, W. Buckel, G. Fuchs 2007. *Science* 318: 1782-1786

metabolic pathways of bacteria and fungus as a sort of factory in the cell," explains Schmidt. "While looking for new metabolic pathways, we struck gold in the working group headed by Professor Fuchs."

"Initially, our basic research into exotic bacteria was significant only for biology," says Fuchs, "It was only when we began working together with Evonik that we realized how the metabolic pathways could be used for environmentally friendly biological synthesis of chemical building blocks." Prof. Dr. Bernhard Arnolds from the Technology Transfer Office at Freiburg University established contact to the chemical industry.

Among researchers it has long been known that certain bacteria can bind CO₂. Scientists have so far identified five different metabolic pathways in bacteria and plants. In plants, a key enzyme is responsible for the biological CO₂ fixation—ribulose biphosphate carboxylase/oxygenase. However, in the metabolism this enzyme is involved in other conversion processes, which reduces the efficiency of the CO₂ fixation. The new metabolic pathway that the Freiburg scientists have discovered is more efficient.

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