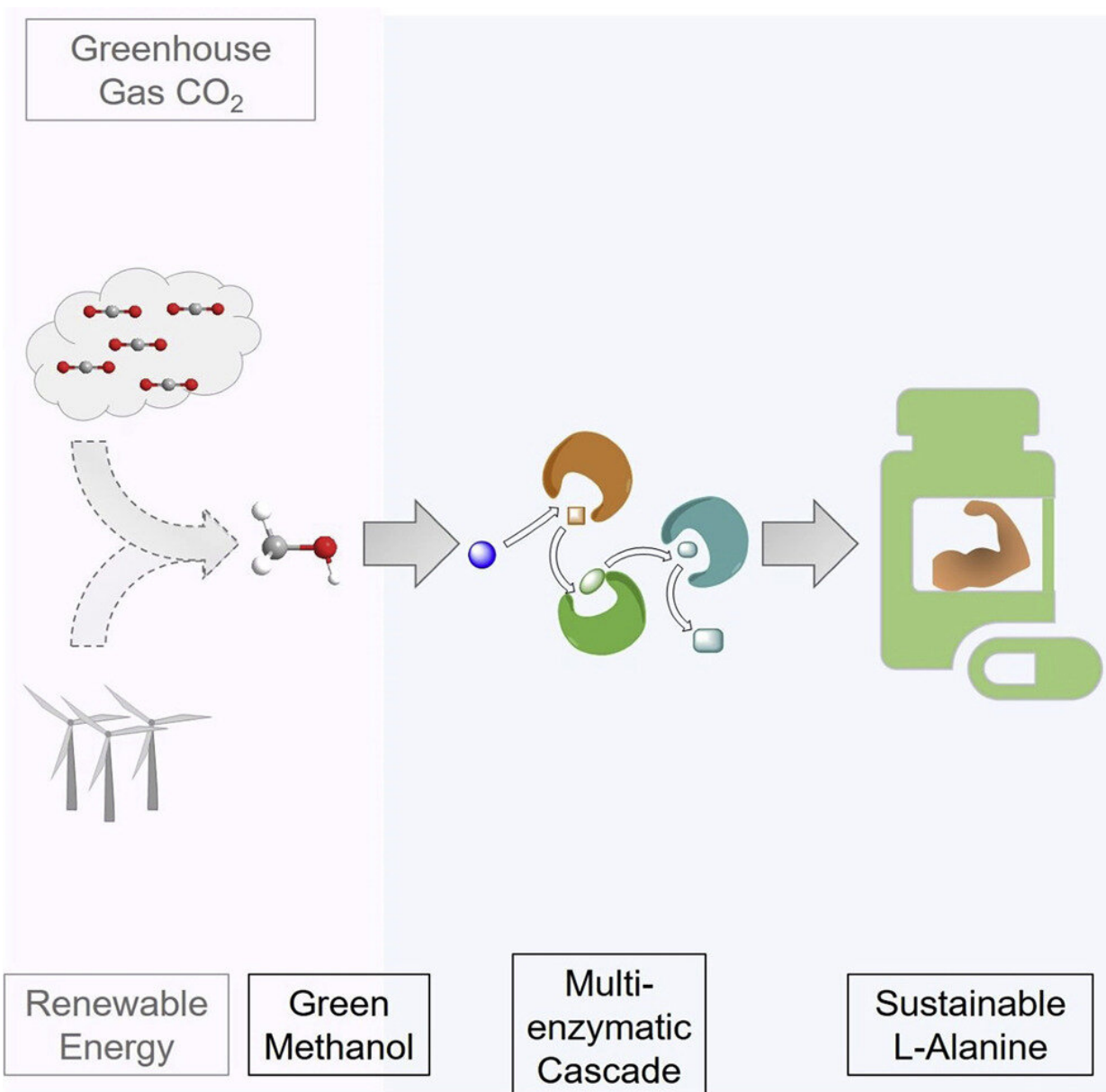


Artificial photosynthesis for environmentally friendly food production

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Graphical abstract. Credit: *Chem Catalysis* (2023). DOI: 10.1016/j.checat.2022.100502

Ensuring the supply of food to the constantly growing world population and protecting the environment at the same time are often conflicting objectives. Now researchers at the Technical University of Munich (TUM) have successfully developed a method for the synthetic manufacture of nutritional protein using a type of artificial photosynthesis. The animal feed industry is the primary driver of high demand for large volumes of nutritional protein, which is also suitable for use in meat substitute products.

A group led by Prof. Volker Sieber at the TUM Campus Straubing for Biotechnology and Sustainability (TUMCS) has succeeded in producing the amino acid L-alanine, an essential building block in proteins, from the environmentally harmful gas CO₂.

Their indirect biotechnological process involves methanol as an intermediate. Until now, [protein](#) for [animal feed](#) has been typically produced in the [southern hemisphere](#) with large-scale agricultural space requirements and negative consequences for biodiversity. The paper is published in the journal *Chem Catalysis*.

The CO₂, which is removed from the atmosphere, is first turned into methanol using green electricity and hydrogen. The new method converts this intermediate into L-alanine in a multi-stage process using synthetic enzymes; the method is extremely effective and generates very high yields. L-alanine is one of the most important components of protein, which is essential to the nutrition of both humans and animals.

Prof. Sieber, of the TUM Professorship for Chemistry of Biogenic

Resources, explains, "Compared to growing plants, this method requires far less space to create the same amount of L-alanine, when the energy used comes from solar or wind power sources. The more efficient use of space means a kind of artificial photosynthesis can be used to produce the same amount of foodstuffs on significantly fewer acres. This paves the way for a smaller ecological footprint in agriculture."

The manufacture of L-alanine is only the first step for the scientists. "We also want to produce other [amino acids](#) from CO₂ using [renewable energy](#) and to further increase efficiency in the realization process," says co-author Vivian Willers, who developed the process as a doctoral candidate at the TUM Campus Straubing. The researchers add that the project is a good example of how bioeconomy and hydrogen economy in combination can make it possible to achieve more sustainability.

More information: Vivian Pascal Willers et al, Cell-free enzymatic L-alanine synthesis from green methanol, *Chem Catalysis* (2023). [DOI: 10.1016/j.checat.2022.100502](#)

Provided by Technical University Munich

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