Technology Offer

# Novel carbon-carbon bond forming enzymes for carbon-neutral bioeconomy

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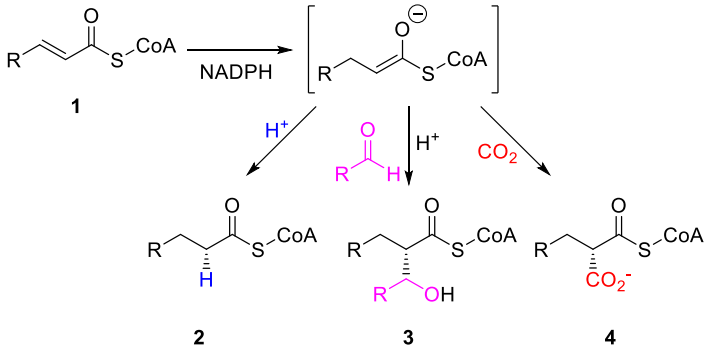
**To realize a circular, carbon-neutral economy, it will become important to utilize the greenhouse gas CO2 as a sustainable carbon source. One-carbon (C1) substrates, such as methanol or formate, are attractive feedstocks for bioeconomy due to their low cost and easy availability. These substrates are typically converted into formaldehyde, serving as the entry point into metabolism. Biocatalytic carbon-carbon bond formation is one of the most important reactions for green and sustainable C1 assimilation which allows the synthesis of complex biomolecules from C1 substrates. Among the most important C-C forming reactions are aldol reactions through which two carbonyl compounds are converted into a,β-hydroxy functionalized carbonyl product. However, these enzymes are not capable of directly forming C-C bonds on α,β-unsaturated carbonyl substrates.**

## Technology

Scientists from the Max-Planck-Institute for Terrestrial Microbiology could show that two distinct classes of enzymes i) enoyl-CoA carboxylases/reductases (ECRs) and ii) ene reductases (ERs) can be readily turned into reductive aldolases. By modifying the amino acid sequence of ECRs and ERs the enzymes were engineered to accept various α,β-unsaturated carbonyl substrates and to catalyze reductive aldol reactions at high turnover rate, catalytic efficiency and exquisite stereoselectivity.




Their work sets the theoretical and experimental foundation for a new-to-nature enzymatic activity of great potential for different applications in synthetic biology, biocatalysis and organic synthesis. We are now looking for a collaboration partner to further develop the project.

## Patent Information

Two patent applications were filed on April, 11th 2022 and October, 17th 2023: WO2023198697

## Publication

DeMirci et al., ACS Central Science 2024. DOI: 10.1021/acscentsci.2c00057

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