DESIGN OF ARTIFICIAL METALLOENZYMES FOR PHOTOCATALYTIC CO_2 REDUCTION

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The use of carbon dioxide and its derivatives is necessary to achieve a circular carbon economy and minimize environmental problems. However, catalytic systems that operate efficiently in water are scarce.[1] Here we present a general approach for the identification of suitable and stable enzymes for CO_2 reduction, based on structural analysis for potential carbon dioxide binding sites and subsequent mutation.

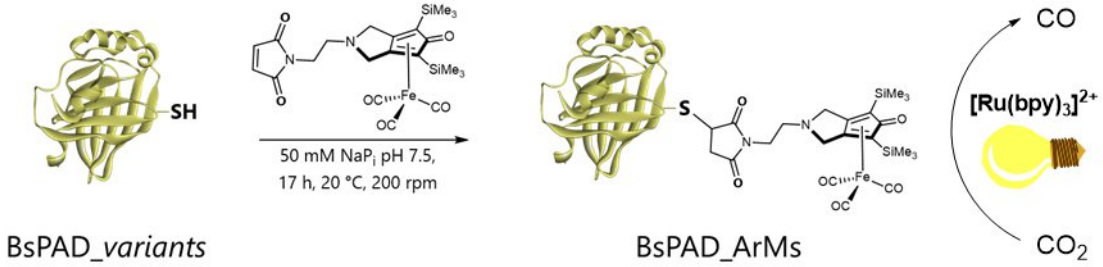

Figure 1. Synthesis of new artificial metalloenzymes based on BsPAD scaffold and their application in photocatalysis.

Development of artificial metalloenzymes allowed us to gain deep insights into the working mode of the enzyme towards photocatalytic CO_2 reduction in combination with a ruthenium photosensitizer and sodium ascorbate as sacrificial electron donor. Overall, enhanced or comparable activity was obtained as previous reports for ArMs.[2] Further evolution of the phenolic acid decarboxylase from Bacillus subtilis helped us to identify key factors for future design of artificial biocatalysts.[3]

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[3] H. Terholsen, H. D. Huerta-Zeron, C. Möller, H. Junge, M. Beller, U. Bornscheuer, *submitted*.