Photosynthesis-driven whole-cell biocatalysis using rec. *Synechocystis* sp. PCC 6803 for the conversion of cyclohexane to ε-caprolactone

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Photosynthetic-driven whole-cell biocatalysis holds tremendous potential for developing sustainable and environmentally friendly processes. Photoautotrophic organisms, such as cyanobacteria, convert inorganic carbon (CO_2) to organic carbon by using water, light energy, and various nutrients. The light energy absorbed by the cyanobacterial cell in the photosynthetic apparatus is used to split water molecules and produce activated reduction equivalents and O_2, which both can serve as co-substrates for oxygenase-catalyzed reactions [1].

In this study, we aim to design a recombinant photoautotrophic strain and gain insight into photosynthetically driven redox biocatalysis using a heterologous enzyme cascade consisting of a cytochromeP450 monooxygenase, a cyclohexanol dehydrogenase, and a cyclohexanone monooxygenase. All three enzymes originate from the soil bacterium *Acidovorax* and are part of the initial cyclohexane degradation pathway [2]. The main objective is to couple this enzyme cascade to the photosynthetic chain by using electrons and reductants generated by photosynthesis for converting cyclohexane to the value-added product ε-caprolactone.

This poster will present a cloning strategy for designing the recombinant *Synechocystis* strain using the CyanoGate modular cloning system [3] and preliminary data confirming the biocatalytic activity of recombinant *Synechocystis* sp. PCC 6803 [4].

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