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Photosynthesis-driven whole-cell biocatalysis using Synechocystis sp. PCC 6803 for the conversion of cyclohexane to cyclohexanone

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PURPOSE OF THE ABSTRACT

Photosynthesis-driven whole-cell biocatalysis holds tremendous potential for developing sustainable and environmentally friendly processes [1]. Photoautotrophic organisms, such as cyanobacteria, convert inorganic carbon (CO2) 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 O2, which can serve as co-substrates for oxygenase-catalyzed reactions [2].
This study aims to design a recombinant photoautotrophic strain and gain insight into photosynthetically driven redox biocatalysis using a 2-step heterologous enzyme cascade, consisting of a cytochromeP450 monooxygenase and a cyclohexanol dehydrogenase. Both enzymes originate from the soil bacterium Acidovorax and are part of the initial cyclohexane degradation pathway [3]. In this poster, our cloning strategy to design the recombinant Synechocystis sp. PCC 6803 strain and the preliminary data for converting cyclohexane to cyclohexanone driven by photosynthetic water oxidation will be presented.

FIGURES

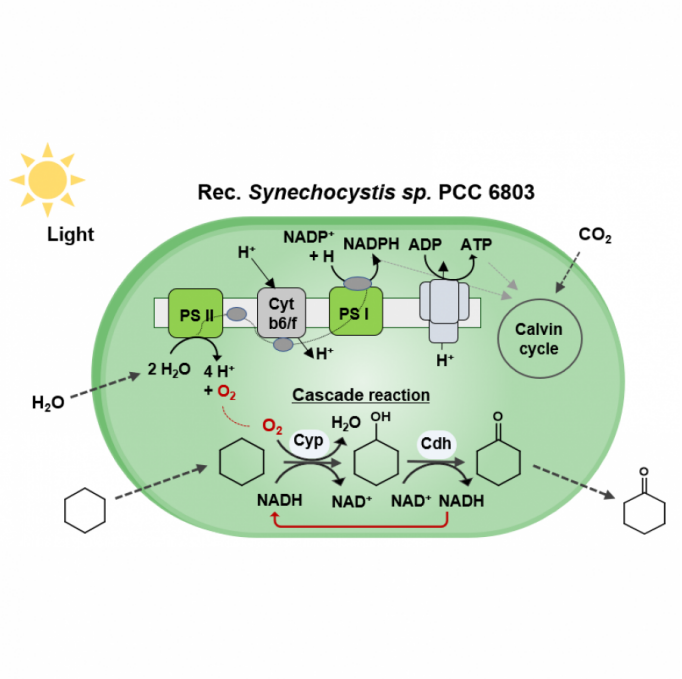

FIGURE 1

Schematic presentation of 2-step enzyme-cascade in Synechocystis sp. PCC 6803 for conversion of cyclohexane to cyclohexanone
Cyp-CytochromeP450 monooxygenase, Cdh-Cyclohexanol dehydrogenase

FIGURE 2

KEYWORDS

Cyanobacteria | Redox-biocatalysis | Cascade reaction | Metabolic engineering

BIBLIOGRAPHY

[1] J. Toepel, R. Karande, S. Klähn, & B. Bühler, Current Opinion in Biotechnology 2023, 80, art. 102892

[2] A. Hoschek, B. Bühler, & A. Schmid, Angew. Chem.-Int. Edit. 2017, 56 (47), 15146 - 15149.

[3] R. Karande, D. Salamanca, A. Schmid, & K. Bühler, Biotechnol. Bioeng. 2018, 115 (2), 312 - 320.