

Enzymatic CO₂ utilization for producing versatile formate

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Abstract

Due to climate change and global warming, carbon dioxide (CO₂) utilization is an interesting research topic. Among chemicals obtained from CO₂, formate is of our interest based on its versatility applicable for various industrial fields such as H₂-storage. Thus, we aimed to explore efficient formate dehydrogenase (FDH) that is capable of catalyzing CO₂ reduction to formate. Through genome mining and phylogenetic analysis, 3 kinds of FDHs was newly discovered and then successfully expressed in *Escherichia coli*. As a result, the newly discovered FDHs catalyze both CO₂ reduction and formate oxidation. Additionally the optimum conditions were investigated; pH 7 and 35 °C for CO₂ reduction and pH 9 and 35 °C for formate oxidation. Furthermore, kinetic parameters were determined. The results of this study might suggest that the newly discovered FDHs can be used for constructing biocatalytic CO₂ utilization system for producing formate in near future.