Characterization of recombinant RaFDH to produce formate from carbon dioxide

박용수[1,2], 고창현[2], 이진석[1], 민경선[1,†]
[1]한국에너지기술연구원; [2]전남대학교
(min4605@kier.re.kr[†])

CO_2 causes global warming and climate change and thus recent researches have focused on producing useful chemicals from CO_2. Among chemicals that can be obtained from CO_2, formate is emerging due to its high energy density and versatility in various industries. Accordingly, CO_2 conversion to formate is of our interest. Herein, we aimed to characterize formate dehydrogenase from *Rhodobacter aestuarii* (RaFDH) as a newly discovered CO_2 reductase. RaFDH was successfully expressed in *E. coli* and highly concentrated recombinant was obtained, about 2.5 mg from 300 mL culture. Then, optimum condition, effect of KNO_3 on RaFDH stability and kinetic constants were examined. As a result, RaFDH-driven CO_2 reduction was optimized at pH 7 and 30 ℃. KNO_3 has a positive effect on the RaFDH stability, thereby retaining 50.5 % of its initial activity over 216 hours when adding 10 mM of KNO_3. Previously reported FDHs interconverting CO_2 and formate reversibly prefered formate oxidation to CO_2 reduction, but RaFDH-driven CO_2 reduction far surpassed formate oxidation. Consequently, RaFDH discussed in this study can be a promising alternative for biocatalytic CO_2 reduction to produce formate.