Expression of Duneliala sp. Carbonic Anhydrase and Its Application to CO_2 Capture/Conversion

백승필*
고려대학교
(spack@korea.ac.kr*)

Carbonic anhydrases (CAs) has been focused as biological catalysis for CO2 sequestration process because the enzyme is known to have ability to convert CO2 to bicarbonate. In this report, we made codon-optimized sequence of α type-CA cloned from Duneliala tertiolecta. (Dt-aCAopt) and subsequently characterized its catalyzing properties to apply for CO2 capture technology. The expression level in E. coli BL21 (DE3) was better for codon-optimized Dt-aCAopt than intact sequence of Dt-aCA. The expressed amount of Dt-aCAopt is 27.79 mg/L at 1.0 mM of IPTG induction and 20°C of growth temperature (for the case of intact Dt-aCA, negligible). Dt-aCAopt enzyme shows half-denaturation temperature at 45°C and show high-stability at pH 7.6/10.0. Apparent values of Km and Vmax for p-nitrophenylacetate substrate are 0.9095 mM and 3.303 x 10-8 mM min-1. The effects of metal ions and inhibitors were investigated to find out adequate reaction conditions for Dt-aCAopt application. In final, we showed that in the Ca2+ solution, Dt-aCAopt enzyme can catalyze well the conversion of CO2 to CaCO3, as the calcite form.