Phosphoenolpyruvate Carboxylase Entrapped Calcium Carbonate Crystalline Composites for CO2 Bioconversion

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Enzyme immobilization is considered as a tool to realize multi-enzyme cascade pathways for the in vitro production of valuable products. In this study, Phosphoenolpyruvate Carboxylase(PEPCase) was immobilized and stabilized on magnetically-separable calcium carbonate crystalline composites(CCCCs) based on the ship-in-a-bottle mechanism. Stabilized CCCCs of PEPCase formed by biomineralization and the successful immobilization of PEPCase on this materials. These PEPCase entrapped CCCCs retained more than 10% of free PEPCase activity. Furthermore, the magnet-based separation was also successful for the reuse of the CCCCs. In our previous study, Carbonic anhydrase (CA) assisted calcium carbonate crystalline composites(CCCCs) were reported. With these two immobilized enzymes, CA assisted CCCCs and PEPCase entrapped CCCCs, oxaloacetate was successfully produced. This immobilized CA-PEPCase integrated system can be used to capture CO2 and produce valuable four-carbon platform chemicals.