CO2 Bioconversion using Novel Phosphoenolpyruvate Carboxylase entrapped Calcium Carbonate Crystalline Composites as a Biocatalyst

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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 have been evidenced by using Fourier transform infrared spectroscopy, scanning electron microscopy, Transmission electron microscopy, Dynamic light scattering (DLS), Elemental analysis, and particle size etc were done. These PEPCase entrapped CCCCs retained more than 50% 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.