152f Nanobiocatalyst for the Synthesis of L-Lactic Acid from Carbon Dioxide

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The fixation of carbon dioxide is an area that has attracted substantial research efforts. Biocatalysis-based “green” tansformations provide a greatly promising alternative approach to conventional chemical processes. In the presented study, we examine the construction of a nanobiocatalyst for the synthesis of L-lactic acid from carbon dioxide and ethanol. In the suggested reaction route, CO_2 is converted via a three-step reaction to lactate. A 56 mol% conversion yield of ethanol to lactate was achieved for a batch reaction using 0.1 mM initial concentration of ethanol. With continuous feed mode, the reaction reached 9 regeneration cycles of cofactor and proceeded at a steady rate for 5 days. For increased stability and reusability, the system was attached on nanoparticles. The active nanoparticle-enzyme system exhibited activities 12-58% of that of the free enzymes for particles in the range of 100-500 nm in diameter. This demonstrated the great potential of biocatalysis for chemical synthesis from the greenhouse gas.