

551e Enabling Multienzyme Synthesis Using Nanostructured Biocatalysts

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Enzyme-catalyzed reactions provide a “green chemistry” alternative to produce value-added products from renewable resources. In the presented study, a triad enzyme system consisting of alcohol dehydrogenase, pyruvate decarboxylase and lactate dehydrogenase was used. Using this enzyme system, carbon dioxide and ethanol can be converted to a value-added product L-lactate. Simultaneously, the electron carrier cofactor (NAD^+) was locally regenerated by the dehydrogenases in the system. Thus, reducing both the cost and waste accumulation in the reaction. Nanoparticles and nanoporous materials were applied to manipulate molecular interactions among the multienzyme catalytic system, thus to achieve effective chemical production from CO_2 . The nanoparticle-enzyme and the particles-cofactor conjugates exhibited activities 12-58% of that of the free system for particles in the range of 100-500 nm in diameter.