589e Production of Lactic Acid and Ethyl Lactate by Combination Process of Fermentation and Reactive Distillation

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A process for efficient production of ammonium lactate by Lactobacillus lactis BME5-18M in pH-controlled fed-batch fermentation was developed. Effects of pH on the production of biomass and ammonium lactate in batch culture were studied at first. When the pH of the medium was maintained at 6.5, the highest biomass concentration and ammonium lactate production was obtained. The ammonium lactate production was remarkably improved by continuous feeding of glucose, when its residual concentration was between 5 and 10 g l-1. Controlling the pH at 6.5 during the fed-batch fermentation under a constant feeding rate of 25 ml h-1, the final concentration of 161.2 g ammonium lactate per liter was obtainedBThe ammonium lactate was then treated to produce lactic acid , and at the same time the NH4H2PO4 and (NH4)2HPO4 as the very useful co-products for fermentation. The lactic acid was used to produce green solvent ethyl lactate by super-fine magnetic solid super-acid SO42|/ZrO2-Fe3O4 catalyzed reactive distillation. The feasibility of ethyl lactate synthesis is examined using the reactive distillation lines diagram. The effects of the reflux ratio, the ratio of ethanol to lactic acid, lactic acid feeding flux and the feed points on ethyl lactate productivity are studied. The optimum operating conditions are given. The kinetics of the reversible reaction of ethanol and lactic acid in the presence of super-fine magnetic solid super-acid SO42|/ZrO2-Fe3O4 are experimentally determined. Numerical simulation of the process using ASPEN Plus simulation package has also been performed , which agreed with experiments very well. This process is part of a biorefinery process in China, So far the whole process shows that it is of great potential with high yield, lower cost and green technology.