

Lipase-catalyzed esterification of lactic acid in supercritical carbon dioxide

Željko Knez, Sabina Kavčič, László Gubicza, Katalin Bélafi-Bakó, Gergely Németh, Mateja Primožič, Maja Habulin

Lactate esters can be used in food industry for preservation and flavouring purpose, as well as in the pharmaceutical and cosmetic industries. Direct esterification of *n*-butanol and lactic acid (LA), catalyzed by immobilized lipase B from *Candida antarctica* (Novozyme 435), was performed in supercritical carbon dioxide (SC CO<sub>2</sub>) with or without co-solvent. Process conditions (pressure and temperature) were optimized performing experiments in a high-pressure batch stirred-tank reactor. Experiments were carried out in the operative pressure range from 7.5 to 40 MPa and at temperatures 35 °C and 55 °C. The highest conversion of LA after 26 h of reaction performance was obtained in SC CO<sub>2</sub> with *n*-hexane serving as a co-solvent, at 40 MPa and 55 °C. The optimal temperature and pressure for butyl lactate (BL) synthesis in SC CO<sub>2</sub> medium was determined at 55 °C and 30 MPa. Phase behavior for LA/*n*-butanol/SC CO<sub>2</sub> system and LA/*n*-butanol/*n*-hexane/SC CO<sub>2</sub> system at different pressures and temperatures was also studied.