P-74

ENZYMATIC SYNTHESIS OF DICAPRYLIN IN SUPERCRITICAL CARBON DIOXIDE

M.L. Tao, H.X. Jiang, X.Q. Dong, M.H. Zhang*

Tianjin University R&D Center for Petrochemical Technology, Key Laboratory for Green Synthesis and Conversion of China Education Department, Tianjin, China

mltao@tju.edu.cn

Enzymatic catalyzed reaction in supercritical fluids (SCFs) is one of the fields of enzymatic catalytic researches. It has been over two decades since the first reports of enzyme-catalyzed reactions in SCFs were published. Since then, a number of enzyme catalyzed reaction in SCFs have been investigated. However, the vast majority of reactions have employed $scCO_2$. This is because CO_2 is cheap, chemically inert, nontoxic, and readily available and because its relatively low critical parameters facilitate the use of enzyme catalysts. In $scCO_2$, the properties of enzymatic reaction have different changes.

There is a growing interest in diglyceride(DG), which are functional oil composed of different carbon-chain fatty acid. Research show that diglyceride has important function on reducing blood lipid, decreasing visceral fat, inhibiting the body weight increasing and so on. And the function of reduced fat accumulation in humans is caused by different metabolic fates of diglyceride and triglyceride(TG) after the absorption into the gastrointestinal epithelial cells. Synthesis of DG with high selectivity has attracted many scholars attention.

The conventional manufacturing process of DG involves the direct esterification of fatty acid and glycerol at high temperature and high pressure, not only with rigorous condition but also with low DG selectivity. Recently the enzymatic synthesis of DG with has emerged as a potential route to replace the conventional chemical procedure.

In this paper, the dicaprylin was synthesized from caprylic acid and glycerol in supercritical carbon dioxide catalyzed by Novozym 435. The reaction was also investigated in solvent-free conditions in closed vessel. The effects of temperature, pressure, molar ratio and enzyme loading on the conversion and selectivity were determined. The experiment results show that for similar enzyme concentrations, 52% of the caprylic acid was converted to ester in $scCO_2$ but little was converted in solvent-free conditions. Furthermore, the selectivity of dicaprylin under $scCO_2$ is up to 85% higher than under solvent-free. And the selectivity of dicaprylin is increased with the increase of pressure.