

## Biodiesel production in supercritical fluid condition by enzymatic process using stepwise reaction method

이종호, 권정훈, 신현용, 강정원, 임정수<sup>1</sup>, 박철환<sup>2</sup>, 김승욱\*  
고려대학교 화공생명공학과; <sup>1</sup>삼성전자 가전연구소 냉각팀;  
<sup>2</sup>광운대학교 화학공학과  
(kimsu@korea.ac.kr\*)

In this study, transesterification of soybean oil was investigated in supercritical fluid condition by enzymatic process using *Candida antarctica*, *Candida rugosa* and *Rhizopus oryzae* lipases. Moreover, to increase reaction rate and enzyme stability, stepwise reaction was carried out. Among various lipases, *R. oryzae* lipase was a suitable enzyme for biodiesel production. The reaction factors, such as pressure, temperature, agitation speed, enzyme concentration, enzyme ratio of *C. rugosa* and *R. oryzae* lipases and water contents were considered to increase biodiesel production in mixed enzyme system. Optimal conditions were as follows: pressure 130 bar, temperature 50 °C, agitation speed 200 rpm, enzyme concentration 20% and ratio of *C. rugosa* and *R. oryzae* lipases 1:1. Moreover, In stepwise reaction, when initial concentration of methanol was 90 mmol in reaction medium and then 90 mmol of methanol were added every 30 min during biodiesel production, conversion yield of biodiesel was over 99 % at 2 h. Finally, in a repeated biodiesel production process, biodiesel conversion was maintained at over 90 % after 10 reuses.