

# **Production of fatty acid butyl esters using the low cost naturally immobilized**

## ***Carica papaya* lipase**

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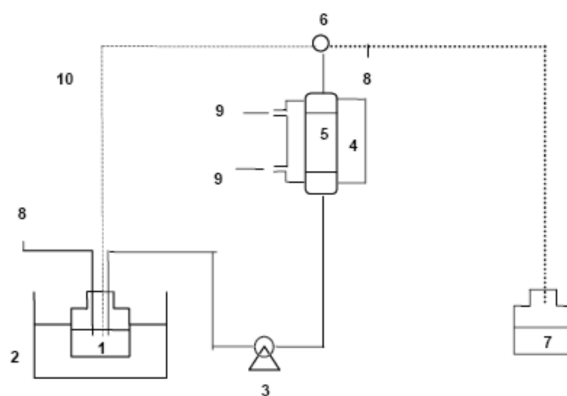


Figure S1. The schematic diagram of naturally immobilized CPL packed-bed reactor for continuous biodiesel production. (1) Substrate reservoir, (2) reactor temperature controller, (3) peristaltic pump, (4) water jacket, (5) bed of CPL, (6) three-way valve, (7) product reservoir, (8) sampling, (9) cooling/heating water; and (10) recirculation. The dashed line describes the flow of materials for recirculating operation; the dotted line describes the flow for the continuous mode.

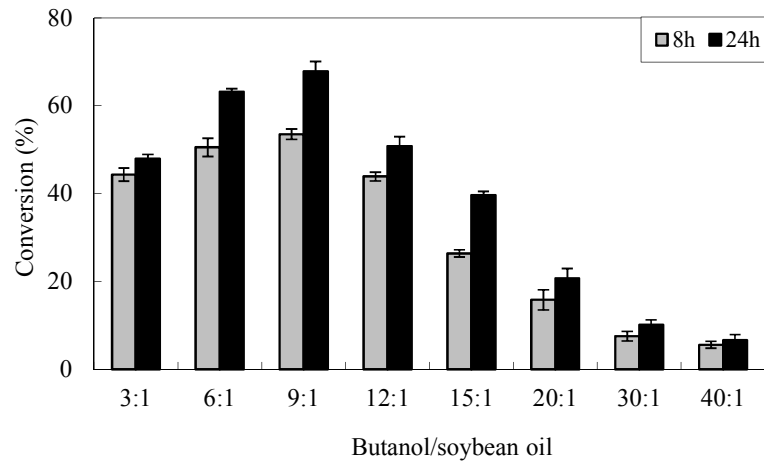


Figure S2. pCPL-GD-catalyzed alcoholysis of soybean oil with butanol as the solvent and acyl acceptor at the same time. Reaction conditions: 50 °C, 150 rpm, 10% pCPL-GD based on oil weight,  $a_w=0.225$ .

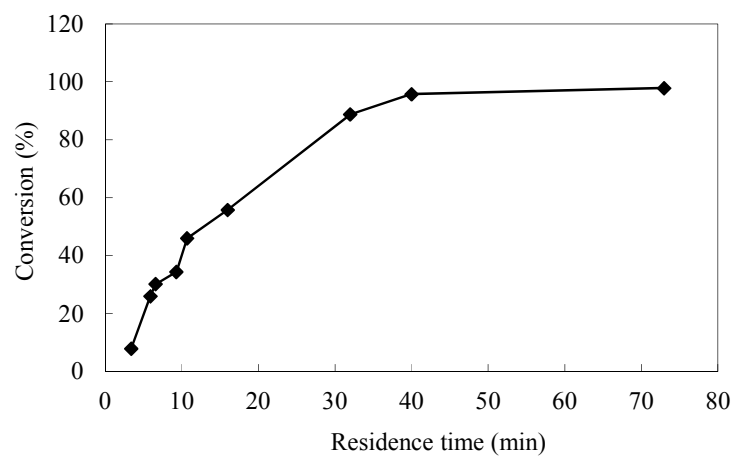


Figure S3. Residence time course of the pCPL-GD-catalyzed alcoholysis of soybean oil with n-butanol in the packed bed reactor. Reaction condition: 55°C, alcohol/oil molar ratio of 12:1,  $a_w=0.225$ .