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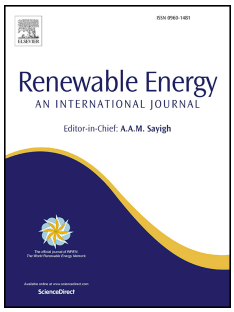

Process optimization for biodiesel production from waste cooking oil using multi-enzyme systems through response surface methodology

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Process optimization for biodiesel production from waste cooking oil using multi-enzyme systems through response surface methodology

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Abstract:

Lipase from *Rhizomucor miehei* (RML) and lipase B from *Candida antarctica* (CALB) were covalently immobilized onto epoxy-functionalized silica. In this study, we developed a multi-enzyme system to produce biodiesel with waste cooking oil and methanol. To increase the biodiesel production yield, a mixture of 1,3-specific lipase (RML) and nonspecific lipase (CALB) was used. Response Surface Methodology (RSM) and a central composite rotatable design (CCRD) was used to study the effects of four factors, CALB:RML ratio, ratio of *t*-butanol to oil (wt.%), water adsorbent content (wt.%) and reaction time on the fatty acid methyl esters (FAME) yield. A quadratic polynomial equation was obtained for methanolysis reaction by multiple regression analysis. The optimum combinations for the reaction were CALB:RML ratio (3:1), *t*-butanol to oil (10 wt.%), water adsorbent content (22.5 wt.%) at the reaction time of 10 h. FAME yield of 91.5%, which was very close to the predicted value of 95.6%, was obtained. Verification experiment confirmed the validity of the predicted model.

Keywords: Biodiesel, Lipase, Immobilization, Waste cooking oil, Response surface methodology

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