

Chapter 4

CONCLUSION

Lipase PS from *Pseudomonas* sp. immobilized on Accurel EP100 (<200 μm) by physical adsorption was suitable for glycerolysis of palm olein to produce MAG. Optimum condition for immobilization included 5.0 mL enzyme solution (50 U/mL), 0.5 g Accurel and stirring at 30 °C for 30 min.

Among the organic solvents tested, acetone/isooctane mixture (3:1,v/v) was suitable for glycerolysis of palm olein. The optimum condition included 10 %(w/v) palm olein in acetone/isooctane mixture (3:1,v/v), the molar ratio of palm olein to glycerol with 8:1, 10 %(w/w) water in glycerol and amounts of IM-PS was 50 % (w/w) of palm olein. The reaction was carried out at 300 rpm at 45 °C.

To compare CSTR and PBR for continuous production of MAG, PBR was more suitable than CSTR. The optimum condition included 1500 mg IM-PS and substrate mixture consisted of 10 %(w/v) palm olein in acetone/isooctane mixture (3:1,v/v), glycerol to palm olein molar ratio was 12:1 and 10 %(w/w) water in glycerol. The substrate flow rate was 0.02 mL/min. The temperature was controlled at 45 °C. Under these conditions, the reactor could be successfully operated for 780 h. The MAG yield was not changed when PBR was scaled up to 10 times. A productivity of 3.32×10^{-3} g MAG/U.day was obtained while a theoretical productivity was 5.66×10^{-3} g MAG/U.day.

For recovery of MAG, fractionation by silica gel column was the best method for harvesting of MAG, compared to crystallization in acetone/isooctane mixture (3:1,v/v) and isooctane. Using fractionation by silica gel column, the purity and MAG yield of 95.36 and 87.6 % were obtained, respectively.

Suggestions

For our study of continuous production of monoacylglycerols by glycerolysis of palm olein with immobilized lipase the suggestions for further study are

1. How to improve the IM-PS activity after using for continuous MAG production in PBR and the reusability of Accurel to immobilize lipase again.
2. The food grade organic solvents should be used instead of acetone/isooctane mixture to produce MAG for food applications.
3. The process to recover and reuse of glycerol residue for continuous MAG production in PBR.
4. The recycling of palm olein and intermediate residues after MAG recovery to mix with fresh substrate for MAG production in PBR.
5. Continuous MAG production by IM-PS in industrial scale should be investigated.