Methee Khamduang 2009: Production of L-Phenylalanine from Glycerol by a Recombinant *Escherichia coli*. Doctor of Engineering (Chemical Engineering), Major Field: Chemical Engineering, Department of Chemical Engineering. Thesis Advisor: Associate Professor Penjit Srinophakon, Ph.D. 152 pages.

L-phenylalanine was produced by *Escherichia coli* BL21(DE3) using glycerol as a substrate. This work can be divided into two parts, the investigation of the composition of the major nutrients and the operational variables effect in the stirred-tank bioreactor. Statistical method (central composite design) was used to design the optimal nutrient composition for the biomass and L-phenylalanine productions. It was found that the optimum medium for the biomass production comprised of 10 g/L glycerol and $(NH_4)_2SO_4$, 0.98 g/L $MgCl_2$, 2.94 g/L K_2HPO_4 and KH_2PO_4, 0.878 g/L yeast extract and 0.0878 g/L thiamine-HCL at the maximum biomass weight of 5.0 g DCW/L. While as 10 g/L glycerol, 100 g/L $(NH_4)_2SO_4$, 0.64 g/L $MgCl_2$, 1.91 g/L K_2HPO_4 and KH_2PO_4, 0.823 g/L yeast extract and 0.0823 g/L thiamine-HCl was the optimum medium for the L-phenylalanine production which gave the highest L-phenylalanine weight of 6.2 g/L.

The stirred-tank bioreactor (2.0 L working volume) was used to investigate the effect of the operational variables on the biomass and L-phenylalanine productions. Fermentations were carried out at 37 °C, pH 7.4, using a defined medium at the agitation speeds of 300-500 rpm and the aeration rates of 2-8 L/min. Under the optimum operating condition at 400 rpm agitation rate, 4 L/min aeration rate, the highest L-phenylalanine productivity of 0.198 g/L.h was produced. While the highest biomass productivity of 0.428 g/L.h was produced at 8.0 L/min. Finally, the fed-batch fermentation was performed to obtain the biomass and L-phenylalanine productions. It was found that the highest biomass and L-phenylalanine concentrations occurred at 72 hour (11.33 g/L) and 60 hour (6.5 g/L), respectively.

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