

Optimasi Konversi Gliserol Murni Menggunakan Katalis CuCr_2O_4 Dengan Pendekatan *Response Surface Methodology*

Optimization of Pure Glycerol Conversion Using a CuCr_2O_4 Catalyst via Response Surface Methodology

Dr. Ir. Silvia Oktavia Nur Yudiastuti S.TP., M.TP.

Anas Tasya Mifta Ningrum

Program Studi Teknologi Rekayasa Pangan

Jurusan Teknologi Pertanian

Study Program of Food Engineering Technology

Majoring of Agricultural Technology

ABSTRACT

Biodiesel production generates a by-product known as crude glycerol (GLPB), which contains various impurities such as water, soap, methanol, and inorganic salts, requiring purification prior to further utilization. However, the purification process conducted in this study did not result in optimal phase separation; therefore, pure glycerol was used as the feedstock for the glycerol conversion process using a CuCr_2O_4 catalyst. This study aimed to investigate the effects of reaction temperature and catalyst concentration on glycerol conversion and to determine the optimum operating conditions using Response Surface Methodology (RSM). The investigated variables were reaction temperature (200–250°C) and catalyst concentration (0.5–2.5 wt.%). The results showed that reaction temperature had a more significant effect on glycerol conversion than catalyst concentration, with conversion values ranging from 36.88% to 58.13%. The optimization process generated a linear model with a coefficient of determination (R^2) of 0.9260, indicating a good fit between the model and experimental data. The optimum condition was obtained at a reaction temperature of 250°C and a catalyst concentration of 2.5 wt.%, resulting in a Predicted glycerol conversion of 55.17% and a desirability value of 0.951368. Verification experiments yielded an average glycerol conversion of 59.14%. Product characterization showed a pH value of 4, a moisture content of 2.92%, and a density of 1.6053 g/mL. FTIR analysis revealed the presence of O–H, C=O, C–H, and C–O functional groups, indicating the possible formation of oxygenated compounds derived from glycerol conversion with characteristics similar to hydroxyacetone (acetol). However, specific compound identification still requires further analysis using more selective analytical techniques such as High-Resolution Mass Spectrometry (HRMS).

Keywords: glycerol, glycerol conversion, CuCr_2O_4 , RSM, FTIR.