ABSTRACT

Methyl acetate is a product of the PTA (purified terephtalic acid) and PVA (polyvinyl alcohol) plant which can be converted by hydrolysis in the liquid phase to acetic acid to be reused as raw materials. Modeling the kinetics of hydrolysis which has been done using a catalyst of amberlyst-15 with the pseudohomogenous and the Langmuir-Hinshelwood Hougen-Watson (LHHW) model. In this study the hydrolysis was conducted with sulfonated sugar catalyst. The new model proposed is complex pseudohomogenous model. Also this research used Langmuir-Rideal Hougen-Watson (LRHW) model. The purpose of this research is to propose a complex pseudohomogenous model and test the suitability with experimental results compared with other existing models i.e, pseudohomogenous model, LHHW model, and LRHW model. Hydrolysis reaction is limited in the liquid phase. Reaction was carried out in a batch reactor equipped with a stirrer and heating. Stirring speed, is set for perfect mixing occurs so that the reaction rate is not influenced by mass transfer. The catalyst is a cylinder with a diameter of 1 cm and 1 cm high. Reaction temperature factor has two levels: 313 and 323 K. Molar ratio factor of water to methyl acetate has three levels: 1, 2, and 4. Weight ratio factor of catalyst to methyl acetate has three levels: 0.01, 0.02, and 0.04. The response variable was the concentration of acetic acid at any time. The concentration of methyl acetate, water, and methanol are calculated based on the stoikhiometric reaction. Reaction kinetics equation based on complex pseuodohomogenous model is proposed,

$$r = \frac{k_f\left(C_A C_B - \frac{C_C C_D}{K}\right)}{1 + K_1 C_A C_B + \frac{C_C}{K_3}}$$

In this case, C is concentration (mol/L), k_f is the reaction rate constants to the right, K is the total reaction equilibrium constants, K_1 is the reaction equilibrium constant of stage-1, and K_3 is the reaction equilibrium constant of stage-3. Tests with experimental results, the complex pseudohomogenous model has an average of absolute relative error (AARE) of 6.7%. Pseudohomogenous model is the worst model with a AARE value of 7.1%. LHHW model is a model that is relatively close to the results of experiments with a AARE value of 5.5%. Best model is LRHW with AARE value of 3.6%. Kinetic model of hydrolysis reaction of methyl acetate to acetic acid is proposed using LRHW model.

Key words: *hydrolysis, metil asetat, pseudohomogeneous, Langmuir-Hinshelwood Hougen-Watson, Langmuir-Rideal Hougen Watson, complex pseudohomogeneous*