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Kinetics of Synthesis of Isobutyl Propionate over Amberlyst-15

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Abstract: The esterification of propionic acid with isobutanol in the presence of Amberlyst-15 as a catalyst was studied. Isobutyl propionate synthesized in this reaction has the fragrance of rum and is used in the food industry. The experiments were carried out in a stirred batch reactor at temperatures from 318 K to 348 K. As a solvent, 1,4 dioxan was used. The effects of the amount of catalyst used, the reaction time, the stirring speed, and the reaction temperature on the synthesis of isobutyl propionate were investigated. It was observed that solid-liquid external mass transfer resistance resulting from various stirring speeds was absent. It was also found that the reaction depended on temperature. A pseudohomogeneous model for Amberlyst-15 was developed from the experimental data. The activation energy and the equilibrium constant of this reaction were calculated to be 52.03 kJ.mol⁻¹ and 5.19, respectively. The expression of the reaction rate as a function of temperature was determined for the synthesis of isobutyl propionate.

Key Words: Esterification, pseudohomogeneous kinetics, isobutyl propionate, ion-exchange resin, Amberlyst-15

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