Effective Moisture Diffusivity and Mathematical Modeling of the Drying Process for Cassava Stalk Biomass

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Abstract

The thermal transformation of lignocelluloses is important because energy is required. The drying process is unique during this transformation. In this study, gravimetric analysis was applied in determining the effective moisture diffusivity and the kinetic parameters for the drying process of cassava stalk lignocellulosic biomass. The drying process was evaluated on the biomass at temperatures 80, 100, and 120 °C from 0 to 8 h using time interval of 0.5 h. The effective moisture diffusivities, Deff, varied from 1.63×10^{-11} m^2/s (80 °C) to 2.56×10^{-11} m^2/s (120 °C). The activation energy (Ea) during the drying process estimated at the three chosen temperatures was calculated to be 12.93 kJ/mole with a pre-exponential factor, Do, of 1.30×10^{-9} m^2/s. Based on statistical analysis (coefficient of determination and average absolute error), the experimental data best fit was provided by the Midilli-Kucuk mathematical model when compared with the other two drying models (Page and Newton).

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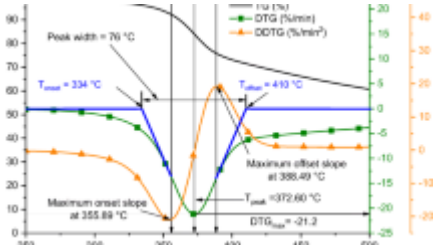

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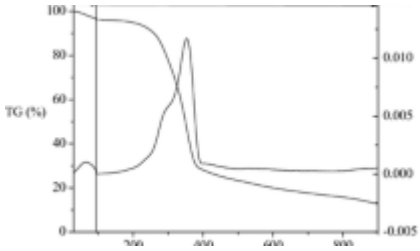

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