

Anhydrous weight loss prediction of meranti sawdust during torrefaction using rousset model

Nur Hazirah Huda Mohd Harun, Noor Asma Fazli Abdul Samad, and Suriyati Saleh
Faculty of Chemical & Natural Resources Engineering, Universiti Malaysia Pahang, Lebuhraya
Tun Razak, 26300 Kuantan, Pahang, Malaysia

ABSTRACT

In torrefaction, the mass loss distribution is evaluated in terms of anhydrous weight loss (AWL). Since temperature gives significant effects on AWL and the behaviour of biomass is highly associated with the AWL, therefore a suitable model for estimating the reaction kinetics is necessary for describing the thermal degradation and predicting the AWL in order to improve its process. In this study, the kinetic parameters of Meranti sawdust are estimated by applying three-parallel reaction models namely the Rousset Model for torrefaction of Meranti sawdust at temperatures of 240°C, 270°C and 300°C. All kinetic parameters are estimated according to the degradation of biomass constituents which are lignin, cellulose and hemicellulose by following the Arrhenius Law. The result shows that AWL estimation using the kinetic parameters predicted from the Rousset model is in good agreement with the experimental result as the R^2 value obtained is 0.99. It shows that the Rousset Model successfully described the degradation of lignin, cellulose and hemicellulose as well as the formation of char, volatile, tar and intermediate compound. Therefore it can be concluded that the Rousset Model is applicable to represent the torrefaction behaviour.

KEYWORDS:

Cellulose; Kinetic parameters; Lignin; Reaction kinetics