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Improved prediction of higher heating value of biomass using an artificial neural network model based on proximate analysis

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Abstract

As biomass becomes more integrated into our energy feedstocks, the ability to predict its combustion enthalpies from routine data such as carbon, ash, and moisture content enables rapid decisions about utilization. The present work constructs a novel artificial neural network model with a 3-3-1 tangent sigmoid architecture to predict biomasses' higher heating values from only their proximate analyses, requiring minimal specificity as compared to models based on elemental composition. The model presented has a considerably higher correlation coefficient (0.963) and lower root mean square (0.375), mean absolute (0.328), and mean bias errors (0.010) than other models presented in the literature which, at least when applied to the present data set, tend to under-predict the combustion enthalpy.

Keywords higher heating value, artificial neural network, biomass, proximate analysis

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