Modifying Dulong's Equation to Better Understand HHV for Hydrochars

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Abstract

Dulong's equation has historically been used to predict higher heating value, the amount of energy stored in a substance. This equation's accuracy has often been questioned. In this paper we sought to resolve the inconsistencies between observed higher heating values and those predicted by Dulong's equation. The data we used for this purpose is experimental data collected from a variety of published papers. In this research, we focused on the higher heating values of hydrochars, a solid biofuel produced by exposing organic waste to high temperature and pressure. In our statistical analysis we considered new variables, such as the percentages of ash, nitrogen, and sulfur in the total mass. We used a centered log normal distribution, a tool that is deployed to deal with variables that are highly correlated. Using this tool, we found that the nitrogen was not a significant factor influencing the higher heating value. Overall, we were able to increase the R^2 in every fit compared to the values predicted by Dulong's equation, even while considering fewer variables.