Optimization of Oxidative Torrefaction Process using Queen Pineapple Waste for Biochar Production

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Abstract:

In recent years, the energy sector has been expanding its focus on lignocellulosic biomass (LCB) for biofuel production because of the alarming global impact of fossil-based fuels and their dwindling sources. Torrefaction method was used to produce solid biofuel from Queen Pineapple Waste. The torrefaction experiment was conducted in an oxidative environment using a muffle furnace. Optimization of the torrefaction condition was performed using a Response Surface Methodology with independent operating parameters of moisture content, torrefaction temperature, and reaction time. The responses or dependent output variables include solid yield (SY), higher heating value (HHV), and energy yield (EY). RSM includes multi-regression analysis and analysis of variance to test the acceptability of the generated models. Based on the results of MRA and ANOVA, torrefaction temperature has the greatest impact on solid yield, higher heating value, and energy yield. Torrefaction temperature has a negative effect on solid yield and energy yield and has a positive impact on higher heating values. It implies that the increase in temperature will cause a decrease in SY and EY and an increase in HHV. Among the factors, MC has the weakest effect on HHV, while RT has the weakest impact on SY and EY.