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Effect of coconut shell in gasification kinetics of palm kernel shells at various blending ratios

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Abstract
This work aims to present the thermal behaviour and pyrolytic kinetics of coconut shell (CS) at various heating rates of 10–50 °C/min to explore the potential of co-gasification with palm kernel shells (PKS) at varying proportions of 10–50%. The degradation profiles have been observed, and the activation energy (E_a) for CS (91.47–50.79 kJ/mol) was found to vary with the increase in heating rate. E_a for the blends of PKS-CS was ranged from 53.35 to 72.21 kJ/mol. The syngas produced through co-gasification had a calorific value of 2.6–3.2 MJ/Nm^3 for various PKS-CS blending ratios. This study with predicted possible synergistic effect could propose the appropriate blending ratio of PKS with CS for co-gasification and promote the agro industry process waste PKS as a suitable single feed and multi-feed fuel source for gasification. Moreover, it also helps offset the concerns of fuel feedstock availability due to demand, seasonal variation and transportation cost for the continuous operation of biomass gasifier plants in remote areas.

Keywords Thermogravimetry · Palm kernel shell · Gasification · Syngas · Coconut shell · Activation energy

1 Introduction

The global energy demand has grown exponentially over the past few decades due to population escalation, tremendous urbanization and rapid industrialization. The world energy sectors have startled due to fossil fuel depletion, since 80% of the global energy demand is being met by coal, oil, and natural gas (Gaulin & Billon, 2020). The threats to the environment due to fossil fuels' use encourage the development of new renewable energy sources for sustainable development technologies (Balasubramanian & Karthickumar, 2012; Newell & Simms, 2020). Gasification being more efficient and environmentally friendly is a

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