

Thermal treatment of tar generated during co-gasification of coconut shell and charcoal

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ABSTRACT

Biomass-derived syngas is one of the most promising, feasible, clean and sustainable bioenergies widely produced through biomass gasification. However, tar content from syngas is essentially needed to be reduced for avoiding engines damage. Therefore, the aim of this study is to investigate the reduction efficiency of tar by performing thermal treatment at the temperature of 700 °C, 800 °C, 900 °C and 1000 °C in a digital Muffle furnace. The tar samples (before and after thermal treatments) were investigated by Fourier-transform infrared spectroscopy and X-ray photoelectron spectroscopy analyses while the morphological changes were examined using a scanning electron microscope coupled with energy-dispersive X-ray analysis. Experimental results show that tar reduction efficiency was significantly increased from 81.87% to 97.25% by applying thermal treatment from 700 °C to 1000 °C. The functional groups were reduced due to rising temperature. Furthermore, the roughness of tar was enhanced considerably with increasing temperature. Therefore, this tar-free syngas can be used as a clean and sustainable bioenergy for future energy demand.

KEYWORDS

Tar; Thermal treatment; Coconut shell; Charcoal; Co-gasification

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