

Air co-gasification of palm kernel shell and polystyrene: Effect of different polystyrene content

Abstract

Plastic waste management has been a problem as most of the plastics are not biodegradable. Although plastics are recyclable, only 21% of total plastic wastes are recycled. Using plastics as gasification feedstock/co-feedstock and converting it to usable energy is one of the solutions of removing plastics waste. Co-gasifying polystyrene (PS) with palm kernel shell (PKS) is promising as both of the feedstocks are abundant and have high energy content. However, the performance of air gasification of PKS and PS has not been studied previously. In this work, co-gasification of PKS and PS was carried out, focusing on the effect of PS content in the feedstock. The PS content was varied from 0 to 30 wt%. By increasing the PS content, the CH₄ volume percentage increases, while CO and H₂ volume percentage decreases. The high heating value of the producer gas increases with PS content, from 11.95 MJ/Nm³ at 10 wt% PS, to 12.36 MJ/Nm³ at 30 wt% PS. Higher PS content also increases the gas yield percentage.