

EXPERIMENTAL INVESTIGATION ON THE EFFECT OF PARTICLE SIZE AND HEATING RATE ON THE SLOW PYROLYSIS OF AGRICULTURAL RESIDUES

GANAPATHY SUNDARAM ESAKKIMUTHU
AND NATARAJAN ELUMALAI

Abstract

In this study, coconut shell, groundnut shell and rice husk with different chemical compositions are taken as the agricultural residue samples to investigate the effects of particle size and heating rate on the pyrolysis product yields when slow pyrolysis is applied in a fixed bed reactor. The experiments are conducted with different particle sizes in the ranges from < 0.15 mm to 1.80 mm with the constant pyrolysis temperature and heating rate of 550°C and of $60^{\circ}\text{C}/\text{min}$ respectively. The effect of heating rate on the pyrolysis yields are investigated by varying the heating rate from $20^{\circ}\text{C}/\text{min}$ to $60^{\circ}\text{C}/\text{min}$ with the constant of temperature 550°C and particle size in the range of 1.18 to 1.40 mm. The oil yield increase from 37.41% to 43.93% and gas yield decrease from 39.58 to 28.74% for the coconut shell, when the particle size is increased from <0.15 mm to 1.80 mm. For groundnut shell increasing the heating rate from $20^{\circ}\text{C}/\text{min}$ to $60^{\circ}\text{C}/\text{min}$ increases the oil and gas yield from 35.42% to 37.84% and 31.53% to 32.51% respectively.

Key words: Particle size, agricultural residues, heating rate, slow pyrolysis.