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- COMPOSITIONAL AND EXPERIMENTAL INVESTIGATION OF THE EFFECT OF REACTOR TEMPERATURE ON SOFTWOOD AND HARDWOOD PYROLYSIS

# Compositional and experimental investigation of the effect of reactor temperature on softwood and hardwood pyrolysis

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Abstract:

Purpose

This study aims to investigate the effect of reactor temperature on softwood and hardwood pyrolysis. Experiments are performed at six temperature levels ranging from 300 to 800°C under N<sub>2</sub> atmosphere. The weights of char, tar and gas yields produced were measured and recorded in percentage of initial weight of the pyrolyzed samples. Results of the study showed that hardwood produces maximum char, tar and gas yields of 41.02 per cent at 300°C, 44.10 per cent at 300°C and 56.86 per cent at 800°C, respectively, whereas softwood produces maximum yields of 30.10 per cent at 300°C, 28.25 per cent at 300°C and 68.73 per cent at 800°C, respectively. Proximate analysis shows that volatile matter, fixed carbon, ash content and moisture content of hardwood are 74.83, 14.28, 2.81 and 8.08 per cent, respectively, and that of softwood are 79.76, 12.65, 0.98 and 6.61 per cent, respectively. Result of the elemental analysis results shows that the carbon, hydrogen, nitrogen, oxygen and sulphur contents for hardwood are 52.20, 6.45, 0.68, 39.64 and 1.03 per cent, respectively, and that of softwood are 45.95, 4.57, 0.56, 48.13 and 0.79 per cent, respectively. The higher heating value of hardwood and softwood are 21.76 and 16.50 kJ/g respectively. This study shows that char and tar yields decrease with increase pyrolysis temperature, whereas gas yield increases as pyrolysis temperature increases for the wood samples considered. At all temperatures considered in this study, gas yields are higher than tar and char yields for softwood, whereas for hardwood, tar yield decreases with increase in temperature with accompanying increase in gas yield.

#### Design/methodology/approach

Experiments are performed at six temperature levels ranging from 300 to 800°C under N<sub>2</sub> atmosphere.

#### Findings

At all temperatures considered in this study, gas yields are higher than tar and char yields for softwood, whereas for hardwood, tar yield decreases with increase in temperature with accompanying increase in gas yield.

#### Originality/value

Results of the study showed that hardwood produces maximum char, tar and gas yields of 41.02 per cent at 300°C, 44.10 per cent at 300°C and 56.86 per cent at 800°C, respectively, whereas softwood produces maximum yields of 30.10 per cent at 300°C, 28.25 per cent at 300°C and 68.73 per cent at 800°C, respectively.

#### Keywords:

[Biomass](#), [Energy](#), [Pyrolysis](#), [Hardwood](#), [Reactor temperature](#), [Softwood](#)

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