

# Kinetic parameters from wood thermal degradation under vacuum to implement a mathematic model

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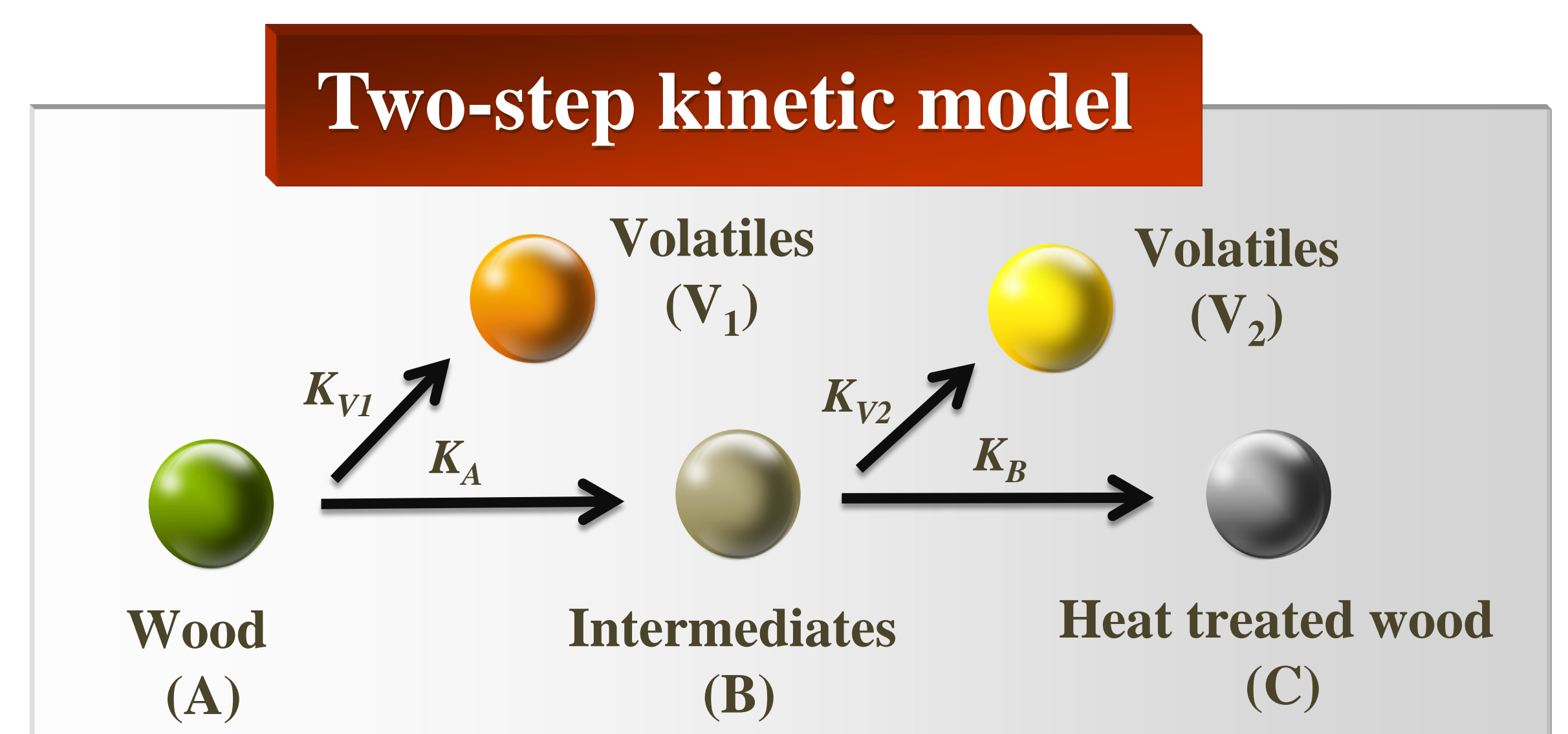
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## INTRODUCTION

In the present work, the thermal degradation of wood under vacuum condition is investigated. Two different wood species, poplar (*Populus nigra L.*) and fir (*Abies pectinate Lam.*), are examined in this study. The reaction system involved four subsystems: heat treatment, balance measurement, vacuum compressor, and data collection. The kinetic model is based on two-step kinetic method approach and the kinetic parameters are calculated from the experiment results. As a whole, the obtained results and developing model are conducive to performing the heat treatment of wood in industry. Moreover, the operating cost of wood heat treatment can be reduced.

## EXPERIMENTAL PROGRESS

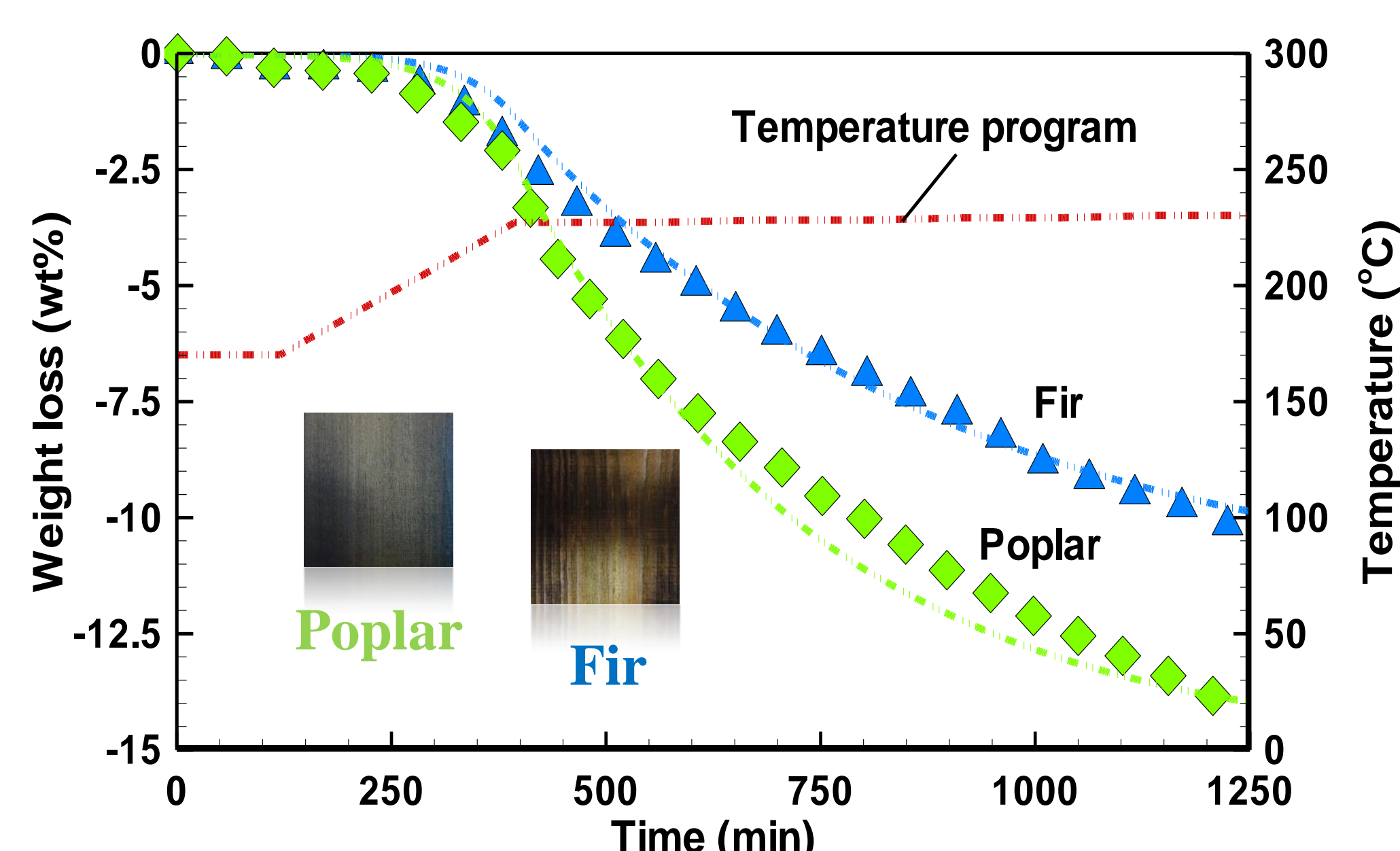
- 1 Sampling and drying**
  - Wood size: W 170, L 670, H 22 mm
  - Drying temperature: 103°C
- 2 Wood heat treatment under vacuum**
  - Pressure: 200 hPa
  - Temperature program (0.2°C min<sup>-1</sup>): 170°C for 2h, then 230°C for 14h
- 3 Establish heat treated wood kinetic model**
  - Calculation of weight loss
  - Calculation of kinetic parameters



## Kinetic parameters

	Poplar	Fir
$K_A$	$5.09 \times 10^5 \exp\left(\frac{-965120}{RT}\right)$	$3.53 \times 10^5 \exp\left(\frac{-96126}{RT}\right)$
$K_{V1}$	$2.04 \times 10^{11} \exp\left(\frac{-157160}{RT}\right)$	$1.62 \times 10^{11} \exp\left(\frac{-158810}{RT}\right)$
$K_B$	$1.35 \exp\left(\frac{-45959}{RT}\right)$	$1.35 \exp\left(\frac{-47216}{RT}\right)$
$K_{V2}$	$9.05 \times 10^8 \exp\left(\frac{-153900}{RT}\right)$	$7.25 \times 10^9 \exp\left(\frac{-164310}{RT}\right)$

## RESULTS



Predicted (lines) and experimental (symbols) curves for heat treatment of poplar (green) and fir (blue) under vacuum condition.

## CONCLUSIONS

The thermal degradation of poplar (*Populus nigra L.*) and fir (*Abies pectinate Lam.*) under vacuum is examined in this study. The results indicated that the weight loss of poplar (14.21 wt%) is higher than fir (10.45 wt%) at the heat treatment condition of 230°C for 14 hours. In addition, a two-step thermal kinetic model is developed, and the kinetic parameters ( $K_A$ ,  $K_{V1}$ ,  $K_B$ , and  $K_{V2}$ ) are calculated based on this model. The thermal degradation distribution from kinetic model is fit the experiment results well.

## ACKNOWLEDGEMENTS

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