

**PYROLYSIS OF PALM KERNEL SHELL BY USING TUBE FURNACE FOR  
CHAR PRODUCTION**

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## DECLARATION

"I hereby declare that this report is the result of my own work except for quotation and summaries which have been duly acknowledged."

  
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## ABSTRACT

An experimental study on pyrolysis for char production from Malaysian oil palm biomass (palm kernel shell (PKS)) was performed by using Tube Furnace. The tests were carried out under dynamic conditions at nitrogen flow rate in the range of 350 mL/min to 750 mL/min, heating rates in the range of 5 to 10°C/min, temperature range of 400°C to 700°C and residence time in the range of 30 to 60 min. Proximate analysis and ultimate analysis were done to determine the characteristics of PKS under specified conditions. The experiments were run with the help of response surface method (RSM). Analysis of resulting data was done using the Design Expert 6 (DX6) software where the effects of the four factors specified were obtained. The optimum pyrolysis conditions of PKS for the char yield were determined using central composite design (CCD) on the second model in RSM. Final pyrolysis temperature was the only factor that gives significant effect to the char yield. It can be clearly seen from analysis done that char yield decrease as the temperature increase from 400 to 700°C. The heating rate has less significant effect to the char yield. The other factors which are nitrogen flow rate and residence time has no effect to the pyrolysis product. The temperature was estimated to be the factor with most influence on the char yield (Y). The coefficient of the determination of Y was confirmed to be 0.93 which is good. The optimal values for the solid yield were calculated from the second regression formula. The optimal points of char yield were estimated to be 721.61 mL/min, 5°C/min, 400°C and 55.59 min for nitrogen flow rate, heating rate, temperature and residence time, respectively, and that char yield was estimated to be 2.5g.

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