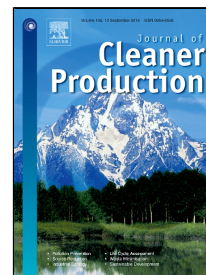


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Antagonistic, synergistic and interaction effects of process parameters during oxygen delignification of *Melia dubia* kraft pulp

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1 **Antagonistic, synergistic and interaction effects of process parameters during**
2 **oxygen delignification of *Melia dubia* kraft pulp**

3
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11
12 **Abstract**

13
14 *Melia dubia* is a recently identified hardwood for papermaking. This paper reports oxygen
15 delignification of its kraft pulp. Modeling of O₂ delignification was done implementing central
16 composite design taking temperature, time and NaOH charge as process parameters while pulp
17 yield, kappa number, viscosity and brightness were the process outputs. The high precision
18 quadratic models developed for O₂ delignification revealed antagonistic, synergistic and
19 significant interaction effects between temperature, time and NaOH charge. The optimum values
20 of process parameters estimated were 90 °C, 90 min and 1.39% respectively which gave yield
21 96.64%, total kappa number 10.52, viscosity 628.54 cm³/g and brightness 42.52% which are
22 very much comparable to other papermaking raw materials. On the whole, the optimization
23 desirability obtained for O₂ delignification was 0.621. The overall O₂ delignification efficiency
24 based on the total kappa number and the true lignin kappa number is 30.33% and 38.23%
25 respectively. The O₂ delignification practiced in this investigation led to 10.42% increase in
26 brightness and 19.93% reduction in viscosity which could prove advantageous for subsequent
27 elemental and total chlorine free bleaching.

28
29 **Keywords:** Hardwood; Kraft pulping; oxygen delignification; response surface methodology;
30 pulp and paper

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