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Azadeh Yousefifar, Saeid Baroutian, Mohammed M. Farid, Daniel J. Gapes, Brent R. Young

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# Hydrothermal Processing of Cellulose: a Comparison between Oxidative and Non-Oxidative Processes

Azadeh Yousefifar <sup>a</sup>, Saeid Baroutian <sup>a\*</sup>, Mohammed M. Farid <sup>a\*</sup>, Daniel J. Gapes <sup>b</sup>,  
Brent R. Young <sup>a</sup>,

<sup>a</sup> *Department of Chemical and Materials Engineering, Faculty of Engineering, The University of Auckland,  
Auckland, New Zealand*

<sup>b</sup> *Scion, Te Papa Tipu Innovation Park, Rotorua, New Zealand*

## Abstract

This study investigates oxidative and non-oxidative hydrothermal processing of cellulose at five different temperatures (180-260 °C). Volatile fatty acids (VFAs) concentration, total suspended solid (TSS) degradation, dissolved organic carbon (DOC) and chemical oxygen demand (COD) were measured and compared in both processes. Moreover, the existence of hydrogen peroxide in both oxidative and non-oxidative processes was confirmed experimentally for the first time in literature. At temperatures  $\leq 220$  °C the amount of H<sub>2</sub>O<sub>2</sub> produced in the oxidative process was higher (50 fold) than that of in the non-oxidative while at higher temperatures ( $\geq 240$  °C) it was more for non-oxidative (3.5-5 fold). The concentration of VFAs in the non-oxidative process was lower than 10% of that in oxidative process. In both processes soluble COD increased with time and temperature, however at 260 °C after reaching a maximum, it decreased with time due to conversion of some soluble intermediates to CO<sub>2</sub> and water.

**Keywords:** Hydrogen peroxide, oxidative hydrothermal process, non-oxidative hydrothermal process, organic solid waste

\*Corresponding authors: [m.farid@auckland.ac.nz](mailto:m.farid@auckland.ac.nz), [s.baroutian@auckland.ac.nz](mailto:s.baroutian@auckland.ac.nz)

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