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# 1 Recycling cellulase towards industrial application of enzyme 2 treatment on hardwood kraft-based dissolving pulp

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9 **ABSTRACT:** Cost-effectiveness is vital for enzymatic treatment of dissolving pulp towards  
10 industrial application. The strategy of cellulase recycling with fresh cellulase addition was  
11 demonstrated in this work to activate the dissolving pulp, i.e. decreasing viscosity and increasing  
12 Fock reactivity. Results showed that 48.8-35.1% of cellulase activity can be recovered from the  
13 filtered liquor in five recycle rounds, which can be reused for enzymatic treatment of dissolving  
14 pulp. As a result, the recycling cellulase with addition fresh cellulase of 1 mg/g led to the pulp of  
15 viscosity 470 mL/g and Fock reactivity 80%, which is comparable with cellulase charge of 2  
16 mg/g. Other pulp properties such as alpha-cellulose, alkaline solubility and molecular weight  
17 distribution were also determined. Additionally, a zero-release of recycling cellulase treatment  
18 was proposed to integrate into the dissolving pulp production process.

19 **Keywords:** Dissolving pulp; Cellulase treatment; Recycling; Cost effectiveness.

## 20 21 1. Introduction

22 Holistic using lignocellulose is the ideal of biorefinery concept (van Heiningen 2006). Pre-  
23 hydrolysis kraft-based dissolving pulp production process is a well commercial practice that fits  
24 well into the concept by separating hemicelluloses, lignin and cellulose into different streams  
25 (Saadatmand et al., 2013; Yang et al., 2013; Miao et al., 2014). The final product known as

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