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# Alkali/Urea pretreatment of rice straw at low temperature for enhanced biological hydrogen production

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## Abstract

A pretreatment process using alkali/urea solution at low temperature was proposed for enhanced cellulosic biohydrogen production. Different alkaline solutions with both presence and absence of urea were studied. It can be found NaOH/Urea pretreatment exhibited excellent pretreatment performance at temperature from -8°C to -20°C. Microscopic structure observation combined FTIR analysis further demonstrated that NaOH/Urea pretreatment at low temperature could effectively disrupt the structure of rice straw and made more cellulose and hemicellulose available. The pretreated materials were then subjected for biohydrogen production by *Thermoanaerobacterium thermosaccharolyticum* M18. The maximum hydrogen production and energy conversion efficiency of 22.08 mmol/L and 9.76% were obtained from NaOH/Urea pretreated rice straw at low temperature. The results were 161.92% and 56.91% higher than the counterpart without pretreatment, respectively. This study provides a new direction to pretreat lignocellulose efficiently for enhanced biohydrogen production at cold climate region.

**Keywords:** Hydrogen production; *Thermoanaerobacterium thermosaccharolyticum* M18; Rice straw; Alkali/Urea pretreatment; Low temperature

## 1. Introduction

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