

**2010年臺灣國際科學展覽會  
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**國家： South Korea**

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**作品名稱**

**Bio-Conversion of TiO<sub>2</sub>/UV System Pretreated Rice Straw  
to Ethanol**

**得獎獎項**

**Environmental Science First Award**

**作者姓名**

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## Abstract

### Contents of Abstract: (maximum 500 words) include

#### 1. Purpose of the research :

One of the greatest challenges for 21st century society is to meet the growing energy demand for transportation, heating and industrial processes. U.S. and Brazil are currently converting corn starch and sugarcane juice into ethanol; however, these are edible products. To stop global warming and poverty, we tried to determine to develop new pretreatment method to produce biofuel using non-edible parts of agricultural products.

#### 2. Procedures :

For our research purpose, we conducted 'Preparation of Rice straw - Powder', 'Pretreatment Method of Rice Straw and Statistical Optimization Using Response Surface Methodology', 'Enzymatic Hydrolysis for Saccharification of Pre-treated Rice Straw', 'Analyses of Pretreatment Efficiency and Production of Glucose and Xylose Using HPLC & TLC', 'Ethanol Fermentation and Recovery', 'Strain Improvement for *Pichia*'.

#### 3. Data :

For the first time, rice straw was pretreated in a novel manner using hypochlorite-hydrogen peroxide (Ox-B) solution. The optimum pretreatment condition was analyzed by response surface methodology and the pretreated rice straw was hydrolyzed using two kinds of enzymes. Following hydrolysis, *Saccharomyces cerevisiae* and *Pichia stipitis* were inoculated for ethanol

production. The optimum condition was 60 min pretreatment using Ox-B solution containing 0.6% hypochlorite and 25% hydrogen peroxide for 1 g rice straw in 240 ml total reaction volume. The Ox-B solution treatment was an essential step for efficient hemicellulose hydrolysis. Under these conditions, 406.8 mg glucose and 224.0 mg xylose were obtained from 1 g rice straw. The structural change of rice straw after pretreatment and enzyme hydrolysis was examined by scanning electron microscopy. With the 10% initial sugar concentration, the final ethanol concentration was about 3.46%, which is 90.5 % of stoichiometric and fermentation efficiency yield.

#### **4. Conclusions :**

Rice straw was pretreated in a novel mean by using an Ox-B solution broadly used in potable water treatment. Pretreatment modified the structures of lignocelluloses. The Ox-B solution treatment was an essential step for efficient hemicellulose hydrolysis. Pretreatment modified the structures of cell wall. Further optimization studies of the fermentation process and strain improvement research (for derepressed mutant) are in progress. In the future, I hope to see cultivators to move by the ethanol produced from rice straw and agricultural wastes.

Two copies of the "Abstract of Exhibit" (in English) should be sent to the National Taiwan Science Education Center or email to [fung@mail.ntsec.gov.tw](mailto:fung@mail.ntsec.gov.tw) or [yuonne@mail.ntsec.gov.tw](mailto:yuonne@mail.ntsec.gov.tw) before December 31,