

## 당 생산을 위한 카놀라 부산물의 암모니아 침지 전처리 공정의 최적화

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### Optimization of soaking in aqueous ammonia pretreatment of canola residues for sugar production

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Bioenergy production from lignocellulosic biomass and agriculture wastes have been attracted because of its sustainable and non-edible source. Especially, canola is considered as one of the best feedstock for renewable fuel production. Oil extracted canola and its agriculture residues are reuseable for bioethanol production. However, a pretreatment step is required before enzymatic hydrolysis to disrupt recalcitrant lignocellulosic matrix. To increase the sugar conversion, more efficient pretreatment process was necessary for removal of saccharification barriers such as lignin. Alkaline pretreatment makes the lignocellulose swollen through solvation and induces more porous structure for enzyme access. In our previous work, aqueous ammonia (1~20%) was utilized for alkaline reagent to increase the crystallinity of canola residues pretreatment. In this study, significant factors for efficient soaking in aqueous ammonia pretreatment on canola residues was optimized by using the response surface method (RSM). Based on the fundamental experiments, the real values of factors at the center (0) were determined as follows; 70 °C of temperature, 17.5% of ammonia concentration and 18 h of reaction time in the experiment design using central composition design (CCD). A statistical model predicted that the highest removal yield of lignin was 54% at the following optimized reaction conditions: 72.68 °C of temperature, 18.30% of ammonia concentration and 18.30 h of reaction time. Finally, maximum theoretical yields of soaking in aqueous ammonia pretreatment were 42.23% of glucose and 22.68% of xylose.

**Key words** : Biomass pretreatment(바이오매스 전처리), Canola residues(카놀라 부산물), Ammonia pretreatment(암모니아 전처리), Response surface method(반응표면분석)

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## Miscanthus로부터 furfural 생산과 잔여물의 활용에 관한 연구

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### Furfural production from miscanthus and utilization of miscanthus residues

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Furfural is a versatile derivative. It can be utilized for a building-block of furfuryl alcohol production and a component of fuels or liquid alkanes. But in bio-process, furfural is a critical compound because it inhibits cell growth and metabolism. Furfural could be converted from xylose and usually produced from biomass in which hemicellulose is abundant.

In this study, furfural production from miscanthus was performed and utilization of miscanthus residue was consequently conducted. At first, hydrolysis for investigation of miscanthus composition and furfural production was performed using sulfuric acid. Previously, we optimized dilute acid pretreatment condition for miscanthus pretreatment and the condition was found to be about 15 min of reaction time, 1.5% of acid concentration and about 140°C of temperature and 60% (about 7 g/L) of xylose was solubilized from miscanthus. Using the xylose, furfural production was conducted as second step. Approximately 160~200°C of temperature was accompanied with the hydrolysis for pyrolysis of biomass. When the investigated condition; 180°C of temperature, 20 min of reaction time and 2% of acid concentration was operated for furfural production, furfural productivity was reached to be 77% of theoretical maximum. After reaction, residue of miscanthus was utilized as feedstock of ethanol fermentation. Residue was well washed using water and saccharified using hydrolysis enzymes. Hydrolysate (glucose) from saccharification was utilized for the carbon source of *Saccharomyces cerevisiae* K35.

**Key words** : Furfural, hydrolysis, pyrolysis, biomass

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