

# Microwave assisted acid hydrolysis of rice husk and characterization

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## Abstract

This study demonstrated that microwave heating is a fast and efficient way to produce sugars and can be potentially used as a feedstock for bioethanol.

## Introduction

The use of lignocellulosic agro-industrial waste for the purposes of the biotechnological production of ethanol has become increasingly important.<sup>1</sup> Due to the heterogeneous structure of lignocellulose, bioethanol production from lignocellulosic biomass requires pretreatment in order to degrade the lignocellulose composition. These pretreatments may be achieved by chemical or enzymatic hydrolysis, for the lignocellulose to be bioconverted into smaller sugars (xilose, arabinose, glucose, mannose, galactose and others).<sup>2</sup> The objective of this study was to combine the use of microwave CEM Discover<sup>®</sup> and H<sub>2</sub>SO<sub>4</sub> to accelerate and optimize the process of the hydrolysis of the sugars present in rice husks, using cellulose as a standard conversion.

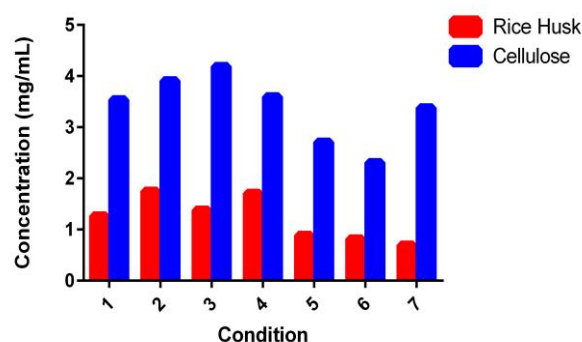
## Results and discussion

Acid hydrolysis was carried out in a CEM Discover<sup>®</sup> Microwave reactor, using 5 mL of H<sub>2</sub>SO<sub>4</sub> 5% and 30 mg of cellulose or rice husk. The study used type 2<sup>3</sup> statistical planning, varying the temperature, time and potency, in order to measure and optimize of the method (see Table 1).

**Table 1.** Biomass trials

#	Temp. (°C)	Time (min)	Potency (W)
1	120	10	100
2	120	10	300
3	120	30	100
4	120	30	300
5	170	10	100
6	170	10	300
7	170	30	100
8	170	30	300
9	145	20	200

After conducting acid hydrolysis in the microwave, the samples were centrifuged, filtered and analyzed by HPLC (Figure 1).



**Figure 1:** HPLC quantification of glucose

The best results were obtained under conditions 2, 3 and 4, for both the cellulose and the rice husk. No conversion was observed under conditions 6 and 8. Higher values were obtained from the acid hydrolysis of cellulose, since this is a long chain polymer composed only of glucose monomers as rice husk is formed, besides this and other monomers.

## Conclusions

In conclusion, the waste from rice husk was successfully used as a raw material for obtaining lower sugars such as glucose. The reaction in microwaves, through acid hydrolysis, proved to be a fast and efficient method. Furthermore, the results achieved to date are promising, especially in the reduction of the environmental impacts from rice waste. However, more studies will be conducted, mainly involving the effectiveness of the method, identifying other sugars and bioethanol production.

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<sup>1</sup> Hickert, L. R. *Mestrado em Microbiologia Ambiental e Agrícola, UFRGS, 2010*

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