Ash and Moisture Analysis with prepASH® 340 Series for Ash in Sugarcane Fibre

prepASH® 340 Series

🔥 Burning	🌡️ High Temperature	🔒 Improved Safety	⚖️ Weighing Samples

Nowadays there is an intensive search for clean and renewable energy sources to replace part of fossil energy.

In Brazil the sugarcane appears as the best option for a renewable source of energy. Sugarcane can supply energy through two products: biomass and ethanol. The biggest source of biomass as a source of energy is the bagasse of the sugarcane, which is directly burnt in boilers, in the so-called system co-generation.

When the sugarcane is delivered to the factory it goes through a series of analysis before going to the production. The quality (amount of sucrose and purity) of the raw material is the key for the monetary evaluation. The ash content in the sugarcane fibers remaining after the liquid extraction is analyzed to determine mineral impurities.

Metrological Study of Determination of Ash in Sugarcane Fiber as a Replacement of the Conventional Muffle Furnace

Patrícia Fiscarelli[1,2], Ossamu Hojo[3], Fernando Luis Fertonani[4]

[1] Departamento de Pós-Graduação em Engenharia Mecânica, Faculdade de Engenharia de Guaratinguetá, UNESP, patricia.fiscarelli@pensalab.com.br, Av. Dr. Ariberto Pereira da Cunha, Guaratinguetá‑SP

[2] Pensalab Equipamentos Industriais Ltda., Rua Dr. Homem de Melo 644‑Cj 22, São Paulo - SP

[3] Bioquímica e Biotecnologia, Instituto de Química, UNESP, R. Francisco Degni, s/n, Araraquara - SP

[4] Departamento de Química e Ciências Ambientais, Instituto de Biociências, Letras e Ciências Exatas, UNESP, Rua Cristóvão Colombo, 2265 - São José do Rio Preto‑SP

Abstract - The proposal of this work is a new methodology that could be used as a standard for the characterization of the sugarcane fiber as a replacement of the conventional method. The instrument used for this development is an automatic furnace and the results were compared to a conventional muffle furnace.

Despite the fact that the amount of sample for the automatic furnace was about 12.5% of the amount used in the conventional muffle furnace, the results could be considered reproductive, and the sampling was representative. Ten samples from different fronts were compared and the results with the automatic

Ash and Moisture Analysis with prepASH® 340 Series for Ash in Sugarcane Fibre

prepASH® 340 Series

furnace showed a time reduction of up to 50%. These results show that the ash content of the sugarcane fiber can be optimized through the new methodology presented in this work. This new technique can offer higher laboratory productivity with reliable results.

Methods

prepASH®: Automated Furnace Method with 29 samples per run	Conventional Method
The prepASH records the mass of each crucible during the running analysis and shows for each sample the graph of mass in function of the time. 5 grams of sample were added in each crucible and the program started. Heating Parameters: heating up to 800°C within an hour. Hold the temperature for 1h 10 min	Each crucible is individually weighted, and its mass is recorded. 40 g of sample were weighted and added to each crucible. The crucibles were heated at 800 °C for 3 hours. The samples were cooled to 500 °C and then placed in a desiccator where they were kept in a vacuum until cooled to room temperature. After that, their masses were continuously recorded until a constant mass is achieved.

Results

The average of the obtained results with the automated furnace and the conventional method are presented in the table.

Table: Comparison between the automated furnace and conventional furnace methods

Average (automated furnace)	SD (automated furnace)	Ash (conventional method)	T-test value
1,47	0,05	1,57	-0,595
1,53	0,08	1,55	-0,097
1,09	0,05	1,08	0,059
1,11	0,09	1,08	0,135
1,325	0,06	,35	-0,140
0,76	0,11	0,55	0,883

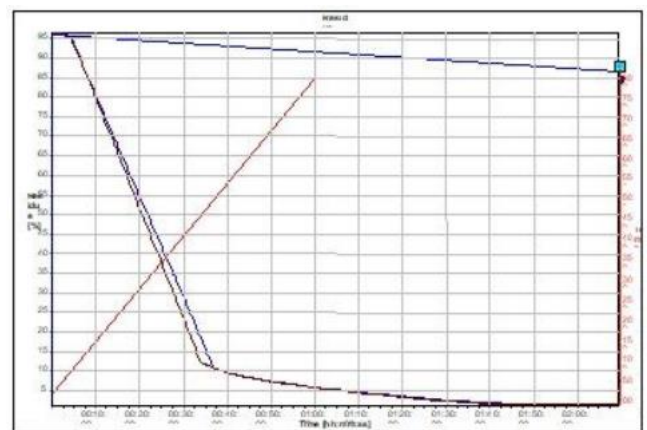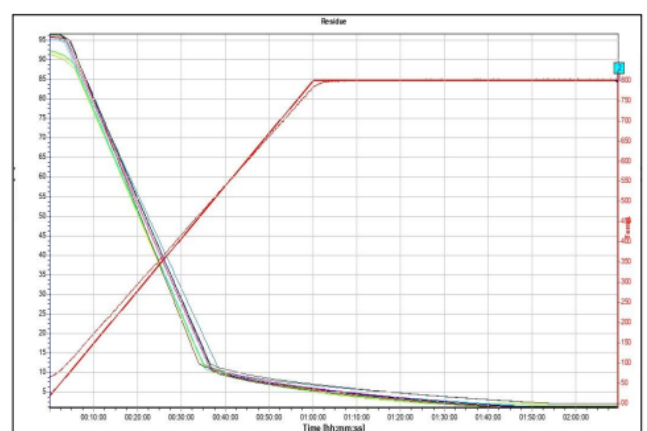The t-test values are smaller than the established limits, showing that the accuracy of the proposed

method is equivalent to the conventional muffle furnace.

Graphical output

Red: Time/temperature curve

Weight/time curves

Sample weight during the run for each individual sample

Discussion and Conclusion

The goal of proposed method is to achieve better labour conditions and increase the laboratory productivity and simplify the ash analysis of sugar cane fibers. One of the biggest concerns involves the sample representability, as the mass for the automated method was 5 grams instead of the 40 grams used in the conventional method. The results show that, within the 95% confidence level, the results were statistically equivalent. The automated furnace can reduce the room needed for ash analysis and also offers an energy saving due to the smaller dissipation loss and in some cases, a reduction of the time of the analysis.

The automated method is an alternative method to the conventional muffle furnace, giving equivalent results with the advantage of the automated system providing

Ash and Moisture Analysis with prepASH® 340 Series for Ash in Sugarcane Fibre

prepASH® 340 Series

results that can be more reliable (no recording errors) and offering a productivity increase.

Acknowledgements

We gratefully acknowledge Usina São Martinho for supplying the samples and the reference results.

prepASH – optimal solution to determine ash in sugarcane analysis

● Reduced time and effort

prepASH is a fully automatic drying and ashing machine, so no multiple weighing back after time consuming cooling down in the desiccator but automatic calculation of results.

Working in groups of similar samples in a single run will rise efficiency of and optimise time of analysis.

● Improved safety and efficiency

No more dangerous analysis with the open flame.

With prepASH Analyses can be done in time slots unused or hardly ever used so far, e.g., at night.

● Increased quality

Up to 20% of each ash determination has to be re-analysed because of faulty/undefined results. prepASH is highly repeatable and reliable!

● Detailed analysis reports.

Due to the permanent recording of measurements during the entire process and the automatic saving of the final results, all data are retrievable at any moment.

Fore more information, please contact us at:

Precisa Gravimetrics AG

Moosmattstrasse 32

CH-8953 Dietikon

+41 44 744 28 28

info@precisa.ch

www.precisa.com

Standard Method with Oven	Vs.	prepASH
Heating out crucibles for constant weight before		Possibility to pre-define "burning off" crucibles
Measuring tare of crucible one by one		AUTOMATIC PROCEDURE
Sampling	Dry Matter	Sampling
Weighing + documentation of each crucible		AUTOMATIC + sample addition by operator
Samples in drying oven + START		START PROGRAM
Removing samples from oven + cool down		RESULTS (moisture)
Back weighing samples, calculation (moisture)		
Pre-ashing with rapid incinerator or hot plate		RESULTS (ash)
Samples in muffle furnace		
Removing samples + cooling down in exicator	ASH	
Back weighing for		
Calculation and documentation (ash)		