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Preliminary assessment of temperature as a relevant factor in the pyrolysis process, for the valorization of corn-cob waste (*Zea mays*).

Juliana Puello-Mendez[a], Jorgelina C. Pasqualino[b] , Debora A. Nabarlatz[c], Ildefonso Baldiris-Navarro[d], Henry A. Lambis-Miranda[e*]

[a]GICI Research Group, Chemical Engineering Department, Universidad de San Buenaventura Cartagena, Diag. 32 # 30- 966, Cartagena, Colombia. jpuello@usbctg.edu.co. ORCID: 0000-0003-0185-1053

[b]GISAH Research Group, Environmental Engineering Program, Universidad Tecnológica de Bolívar, Campus Tecnológico, km 1 vía Turbaco Cartagena, Cartagena, Colombia.. jpasqualino@utb.edu.co ORCID: 0000-0002-8731-762X

[c] Interfase, Chemical Engineering School, Universidad Industrial de Santander, Bucaramanga, Colombia. dnabarla@uis.edu.co ORCID: 0000-0001-9075-4081

[d]Universidad de Cartagena, Departamento de Ing. Química. Campus Piedra de Bolivar, Cartagena. ibaldiris@gmail.com ORCID: 0000-0001-9189-3710

[e*]Processes and Systems program, CIPTEC Research Group, Fundación Universitaria Tecnológico Comfenalco, Cartagena, Colombia. hlambis@tecnocomfenalco.edu.co ORCID: 0000-0002-6261-4062.

INTRODUCTION & AIM

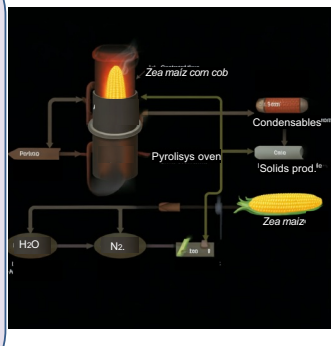
Corncobs, a readily available lignocellulosic agricultural residue, offer substantial potential for vaporization through thermochemical processes such as pyrolysis. By subjecting this biomass to thermal decomposition within a temperature range of 400-500 °C under inert nitrogen conditions, oxygen-free degradation occurs, yielding a spectrum of value-added products.

This thermochemical conversion of corncobs presents a promising avenue for mitigating environmental concerns associated with agricultural waste disposal, reducing landfill burden, and promoting a circular bioeconomy cantered on the utilization of renewable resources. (Hernandez-Fernandez et al., 2023; Paulauskas et al., 2014)

METHODS

The biomass sample undergoes a rigorous preparation process prior to pyrolysis analysis. This includes drying to remove excess moisture (45°C, for 12 h), followed by milling and sieving to ensure uniform particle size (ASTM E 11/95) .

An initial TGA analysis characterizes the raw material. Subsequently, the sample is pyrolyzed under a nitrogen (N_2) atmosphere at various temperatures (500-600 °C). The solid residue from pyrolysis is further analyzed using TGA and FTIR (Shimadzu® IR Tracer-100) to assess the impact of temperature on the final product's composition.



RESULTS & DISCUSSION

Pyrolysis of corncob waste was conducted under a nitrogen atmosphere at temperatures of 500, 550, and 600 °C to investigate the influence of temperature on the characteristics of the resulting solid products.

To assess thermal stability, thermogravimetric analysis (TGA) was performed on each solid product obtained at the specified temperatures. The results indicated that the maximum weight loss occurred at 550 °C, although similar weight loss values were observed at 500 and 600 °C. To maintain a gradual weight loss profile, a temperature of 600 °C was selected for further analysis.

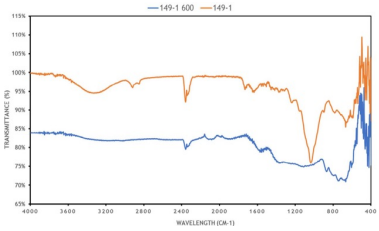


Figure 1. Comparison of FTIR spectra of the sample before (149-1) and after pyrolysis (149-1 600°C)

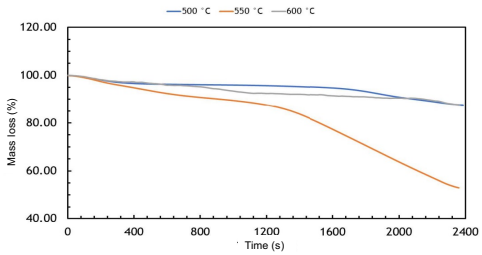


Figure 2. Comparison of percentage mass loss of corncob waste.

CONCLUSION

Thermogravimetric Analysis (TGA) was employed to assess the thermal stability and degradation behaviour of corn husks. The results indicated that temperatures exceeding 240 °C should be avoided, as significant mass loss (approximately 50%) was observed beyond this point. This mass loss is attributed to the removal of residual moisture from the drying process and the degradation of low-molecular-weight aromatic compounds.

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FUTURE WORK / REFERENCES

- Hernandez-Fernandez, J., Lambis, H., & Reyes, R. V. (2023). Application of Pyrolysis for the Evaluation of Organic Compounds in Medical Plastic Waste Generated in the City of Cartagena-Colombia Applying TG-GC/MS. *International Journal of Molecular Sciences*, *24*(6). https://doi.org/10.3390/ijms24065397
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