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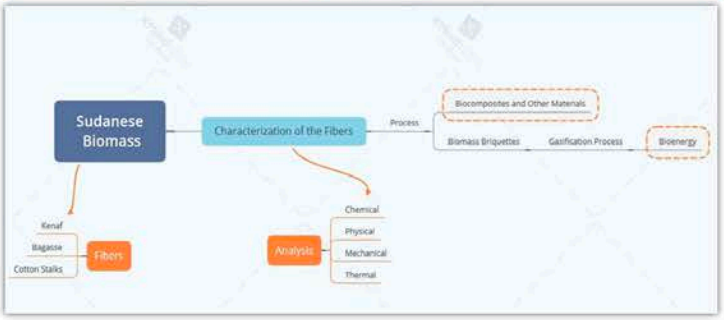
Thermal and Chemical Analysis of Sudanese Biomass for Energy and Materials Production

MOHAMMED Wadah[1, 2], CABARET Thomas[1], OSMAN Zeinab[2], CHARRIER Bertrand[1]
[1]CNRS / University of Pau & Pays de l'Adour, Institute of Analytical Sciences and Physico-Chemistry for the Environment and Materials - Xylomat, UMR5254, 40004, Mont de Marsan, France
[2]Institute of Engineering Research and Materials Technology (IERMT). National Center for Research (NCR). Ministry of Higher Education and Scientific Research. P.O. Box 2404, Khartoum, Sudan.
Mohammed.wadah@univ-pau.fr

1. Introduction



2. Objectives

This project will initially examine opportunities for valorization of Sudanese biomass for energy and production materials at several different scales. This could be done by assessing the thermal, physical and Chemical properties of natural fibers.

3. Materials

The Sudanese fibers that used in this study are:


Bagasse


Kenaf


Cotton Stalks

4. Methods

Thermal analysis

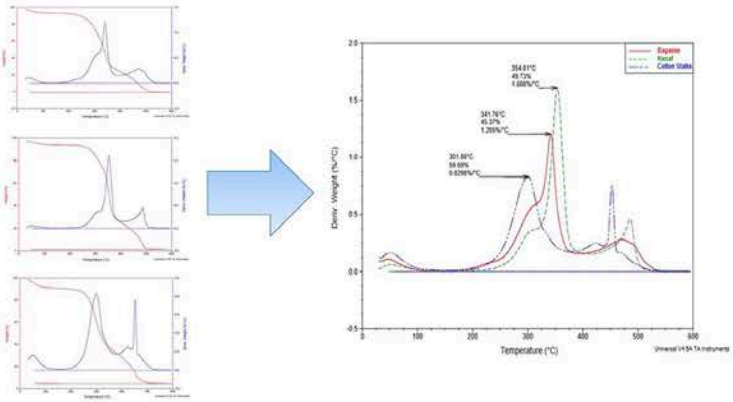
- ✓ Weight of sample = 10 mg
- ✓ Temperature = (30 to 600) °C
- ✓ Heating rate = 10 °C/min
- ✓ Conducted under air with a flux of 60 ml/min
- ✓ The test was repeated 3 times for each sample

Chemical analysis

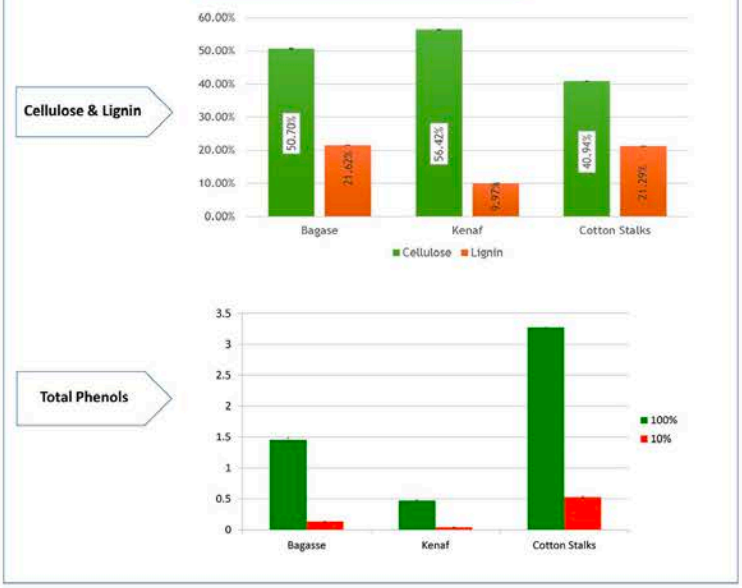
No	Test	Conditions	Method
1	Moisture content(%)	105 °C for 24h00	TAPPI T208
2	Ash(%)	575 °C furnace for 3h00	TAPPI T211
3	Solubility in hot/cold water (%)	160 ml distilled water	TAPPI T207
4	Extraction by NaOH (%)	NaOH (1%)+Acetic Acid(10%) concentration	TAPPI T212
5	Extraction by organic solvent (%)	Ethanol + n-hexane	TAPPI T204
6	Cellulose(%)	Ethanol + Nitric acid with 4:1 ratio	TAPPI T17
7	Lignin(%)	Sulfuric acid with 72% concentration	TAPPI T222
8	Total Phenols	500 ml of sample + 2.5 ml of Folin + 2 ml of Na2CO3 10H2O	Folin-Ciocalteu method

5. Results and Discussion

Thermal analysis



Chemical analysis



6. Conclusion

- ❖ The analysis of TG & DTG curves shows that the fibers are stable below 200 °C, above 200 °C Kenaf fibers are more stable than bagasse and cotton stalks, while bagasse is more stable than cotton stalks.
- ❖ The chemical analysis for the fibers shown the percentage of cellulose and lignin is 50.70 % and 21.62 % for bagasse respectively, 56.42 % and 9.97 % for kenaf and 40.94 % and 21.29 % for cotton stalks.
- ❖ The results of the total phenols showed that the fiber with the highest phenolic concentration is cotton stalks (3.270) followed by Bagasse (1.451) and Kenaf (0.473).
- ❖ All these results permit us to give a better understanding of the potential use of Sudanese fibers in the future.

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