SUSTAINABLE ENVIRONMENT

SYNTHESIS OF NANOCELLULOSE FILM FROM SUGARCANE BAGASSE AND WASTE PAPER FOOD CONTAINERS

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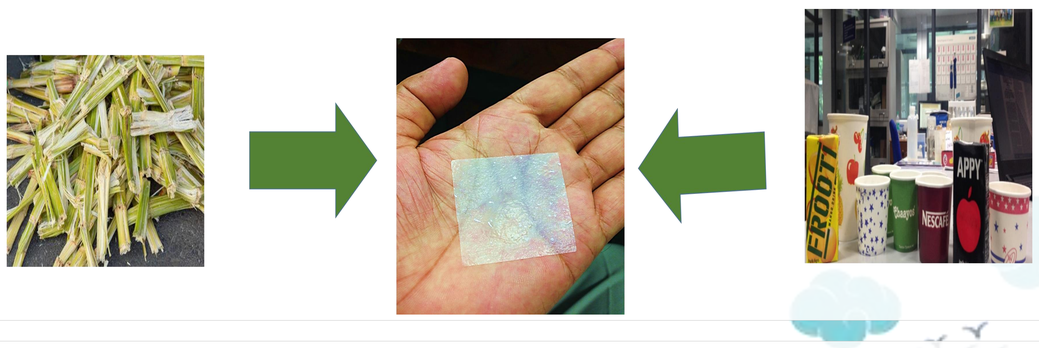
Abstract

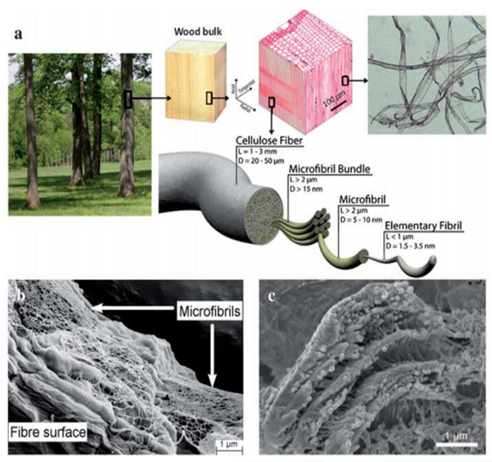


Introduction

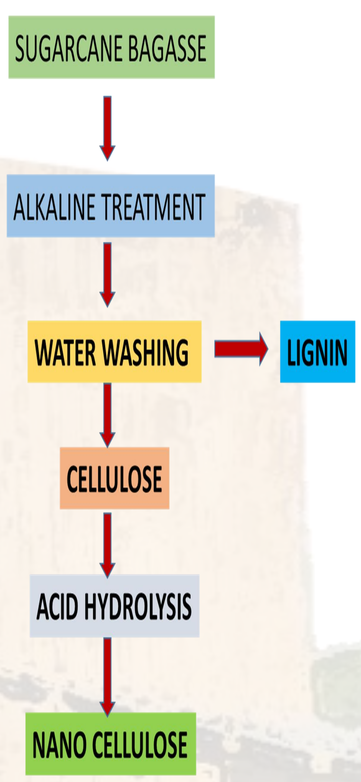
Statistical Data:

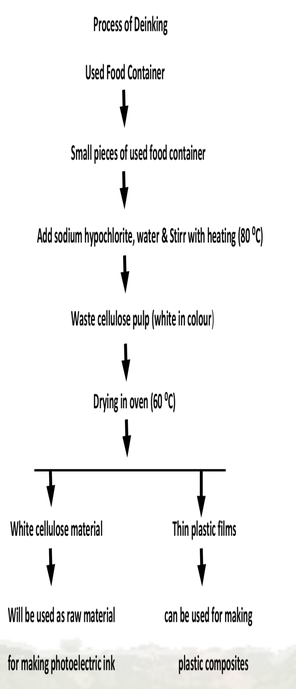
- Wt. of single tea cup – 5 gm (avg.)
- No. of cups used per tea outlet at IITD Cafeteria – 500
- No. of outlets -6 - 3000 cups daily tea consumption.
- Total Wt. of waste tea cups – 15000 gms = 15Kg Monthly - 450 Kg
- Yearly – 5400 Kg of waste generate annually. This can be a truck full (5 tonns almost)

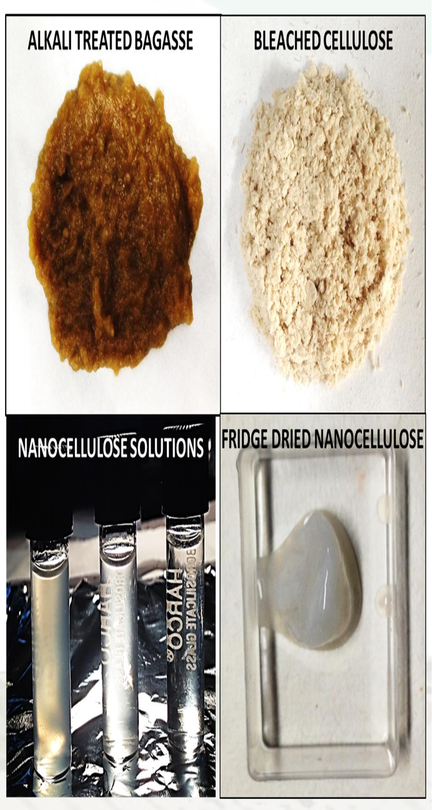
  This raw material which is easily available can be utilized for making good quality paper,nanocellulose.



Materials and Methods

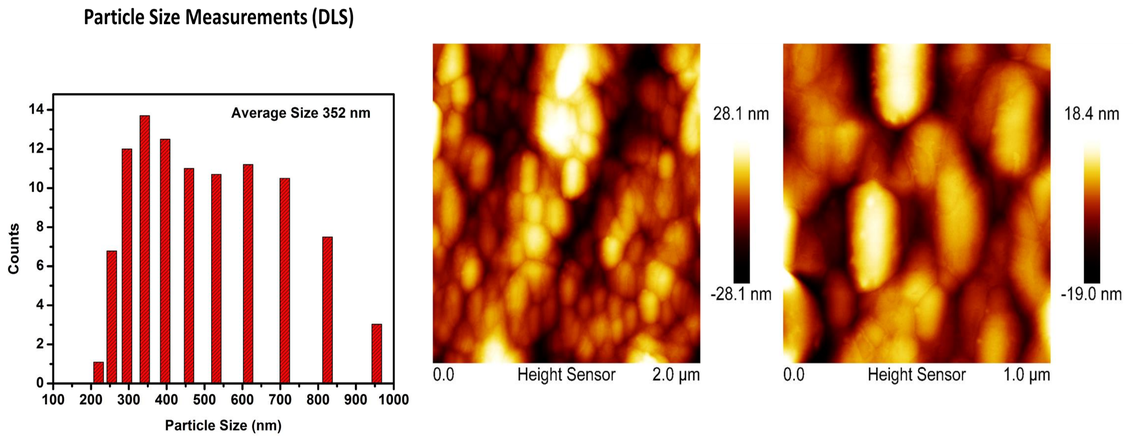




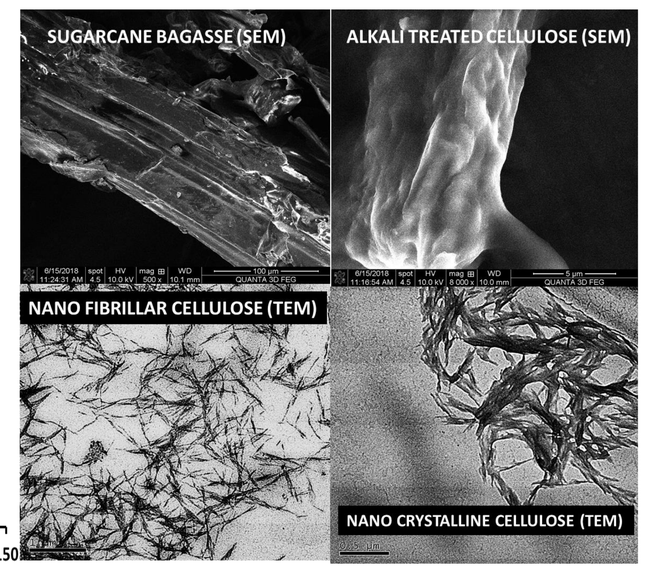


Result

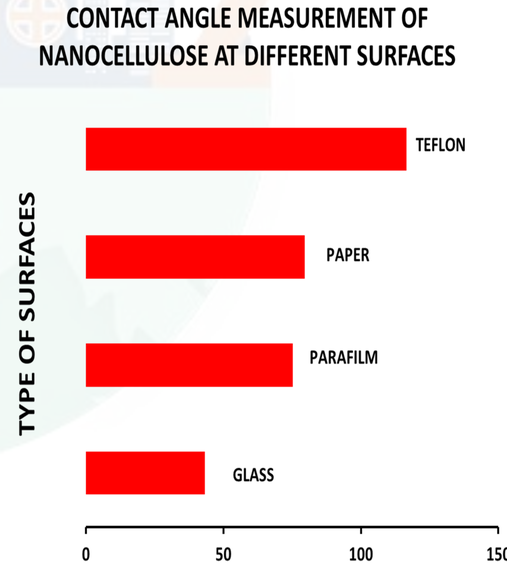
AFM IMAGES OF NANOCELLULOSE FILM



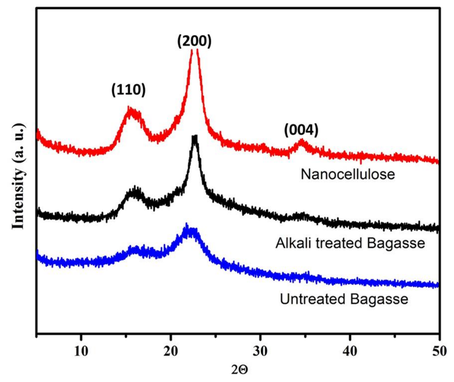
SEM/TEM IMAGES



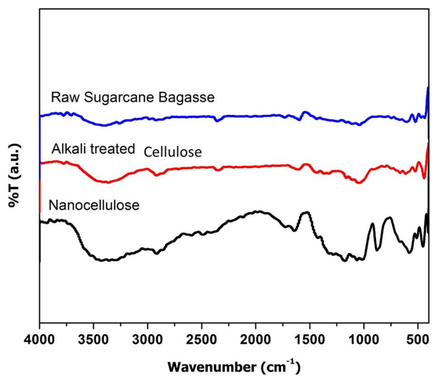
CONTACT ANGLE MEASUREMENT OF NANOCELLULOSE AT DIFFERENT SURFACES



X-RAY DIFFRACTOGRAM



FT-IR SPECTRA



Conclusions:

1) Transparent Nanocellulose film having thickness of 0.5 mm was prepared from waste sugarcane bagasse and used paper based food containers.
2) The size obtained of the nanocellulose fiber from Transmission electron microscopic (TEM) images and DLS measurements was 750-50 nm.
3) Fourier transformation infrared (FTIR) spectroscopy for cellulose, microfibrilated cellulose (MFC), nanocellulose (NC) shows the characteristic peaks of O-H, C-H, C-O-C bonds near to 3500 cm-1, 3000cm-1, 1200cm-1 respectively
4) X-ray diffraction (XRD) gives all the characterestic peaks for cellulose, microfibrilated cellulose(MFC) and nanocellulose of (110) at 18.5^{o}, (200) at 21.5^{o} and (400) at 36^{o} respectively

Industrial Significance

5400 Kg of waste generate annually at IIT-D cafeterias. This can be a truck full (5 tonn almost). This raw material can be utilized for making good quality paper, nanocellulose.

Technology Readiness Level:

Technology is ready for pilot scale testing.

References

1) Besbes, I., Alila, S., & Boufi,S. (2011), Nanofibrilated cellulose from TEMPO oxidized eucalyptus fibers effect of carboxyl content, Carbohydrate Polymers, 84(3), 975-983.
2) Mandal, A., & Chakrabarty, D. (2011). Isolation of nanocellulose from waste sugarcane bagasse (SCB) and its characterization, *Carbohydrate Polymers*, *86*(3), 1291-1299.
3) Lee, H. V., Hamid, S. B. A., & Zain, S. K. (2014). Conversion of lignocellulosic biomass to nanocellulose: structure and chemical process. *The Scientific World Journal*, *2014*.
4) Liu, D. Y., Sui, G. X., & Bhattacharyya, D. (2014). Synthesis and characterisation of nanocellulose-based polyaniline conducting films. *Composites Science and Technology*, *99*, 31-36.

Acknowledgement

AKG and GBK thanks NRF-IITD for Research facility. GBK thanks UGC for financial support.

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