Recovering Value From Waste: Development of G-Nanocellulose Derived from *Ananas comosus* Leaves

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BACKGROUND

- Malaysia is known as one of the largest producers of pineapple in Asia, at the same time it created a large quantity of waste; Pineapple leave fibre (PALF) is the main waste of this industry.
- Due to lack of study in agricultural waste management, Normally, PALF is left on the plantation for nutrient cycling or being burnt, and this circumstance may lead to air pollution.
- PALF possess higher cellulose (81.27%) content; lower lignin (3.46%) content than other natural fibre.

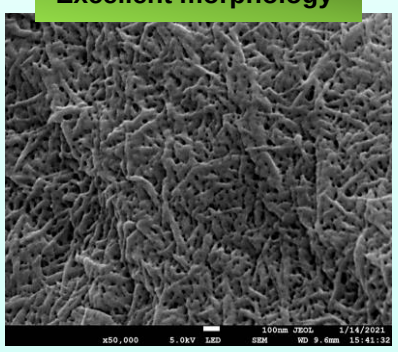
WASTE TO WEALTH

Attractive properties: very high elastic modulus, high aspect ratio, low thermal expansion, non-abrasive nature , non-toxic character (Khalil et al., 2014)

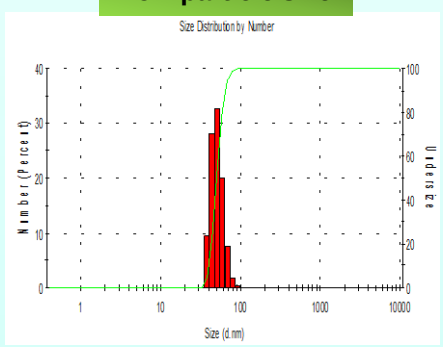
Therefore, in this invention PALF has been utilized to produce nanocellulose, due to its promising performance; abundance and inherent have a high content of cellulose among other natural fibres.

PRODUCT PROPERTIES

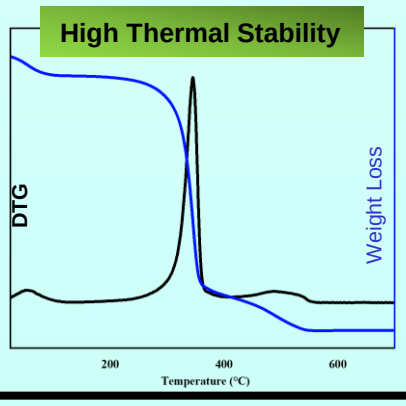
Excellent morphology



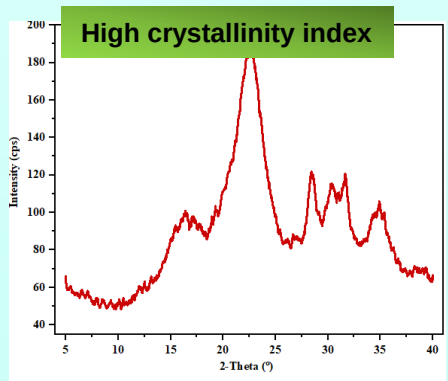
Low particle size



High Thermal Stability



High crystallinity index



PROCESS

PALF

SAC treatment

Bleaching

Cellulose

Milling

Nanocellulose

ECONOMIC POTENTIAL

Item	Cost
Commercial nanocellulose	RM 1,446 / g
PRODUCTION COST	
Raw material — pineappleleaves	RM 0.50 / 5 g
Chemicals	
1. Sodium hydroxide (NaOH)	RM 0.15 / 3 g
2. Sodium chlorite ($NaClO_2$)	RM 2.00 / 2 g
3. High Pressure steam (HPS) (86kWh)	RM 17.64 / 5 g
4. Milling	RM 50.00/ 1g
5. Acetic acid (CH_3COOH)	RM 1.50/ 5 mL
6. Solvents	RM 25.00/ 100ml
Utilities	RM 30.00
Others (equipment rental, etc.)	RM 50.00
TOTAL	RM 142 / g

87%

NOVELTY & ENVIRONMENTAL IMPACT

Low Cost

Low cost of raw materials

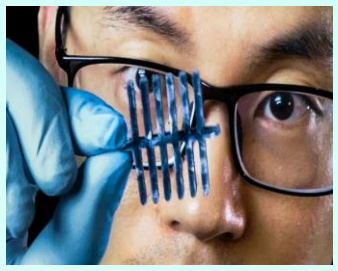
Waste-to-wealth concept and go green

Simple and easy method

TARGET CONSUMERS

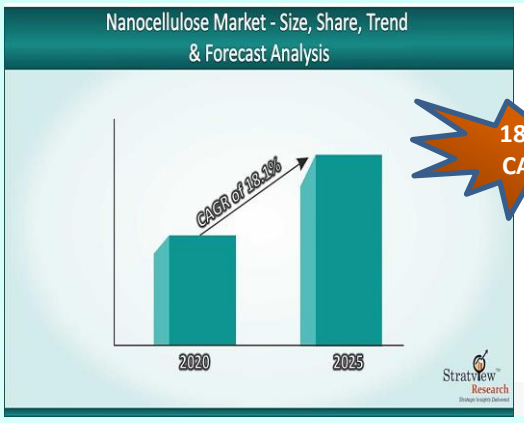
Insulation industry

Paint and coating industry

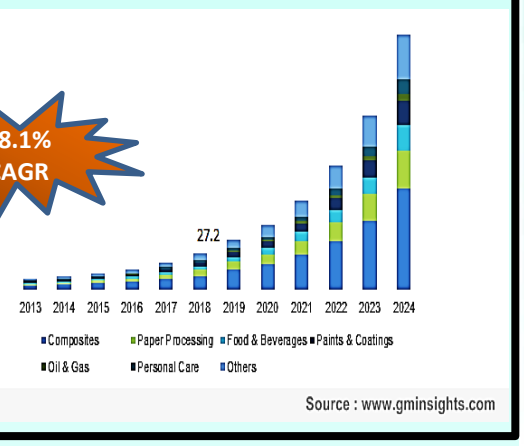


Electronic sensor

MARKETABILITY AND DEMANDS



18.1% CAGR



Source : www.gminsights.com

AWARDS AND PUBLICATION

- Silver Medal i-FINOG & IDEAS 2019
- Silver Medal CITREX 2019
- Production of cellulose and microcellulose from pineapple leaf fibre by chemical-mechanical treatment *IOP Conf. Ser. Mater. Sci. Eng.*, vol. 991, p. 012055, 2020
- Effect of Steam and Bleaching Treatment on the Characteristics of Pineapple Leaves Fibre Derived Cellulose," *Pertanika JST.*, vol. 28, pp. 135–148, 2020
- Best Paper Award For National Conference for Postgraduate Research, 2020

RELATED PROJECT WITH INDUSTRY

1. Development of nanocomposite from pineapples leaves fiber
2. Production of nanocellulose from pineapples leaves fiber

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