IIT MADRAS
Indian Institute of Technology Madras

Technology Transfer Office
TTO – IPM Cell

Industrial Consultancy & Sponsored Research (IC&SR)

GREEN PROCESS FOR PREPARING NANOFIBRILLATED CELLULOSE (NFC) AND NANOCRYSTALLINE CELLULOSE (NCC) FROM CELLULOSE PULP

IITM Technology Available for Licensing

Problem Statement

- High energy consumption and the use of hazardous chemicals in current methods for producing nanocellulose from cellulose pulp post-removal of lignin and hemicellulose.
- Costly post-processing treatments required for waste management in existing production processes of nanocellulose.
- Therefore there is a need for **a simpler, more environmentally friendly method using water-soluble organic acids**, with simplified purification and concentration/drying processes and lower energy consumption.

Intellectual Property

- IITM IDF Ref. **1756**
- **IN 493953 - Patent Granted**
- **NBA Approval - INBA3202203972**

Technology Category/ Market

Category - Sustainable Materials Processing
Applications - Packaging materials, biomedical fields, and environmental remediation
Industry - Sustainable packaging, Biomedical, and Environmental technology

Market - Global Nanocellulose market was valued at USD 0.4 billion in 2022 and is projected to reach USD 2.0 billion by 2030, growing at a CAGR 21.9% from 2022 to 2030.

TRL (Technology Readiness Level)

TRL-4, Technology validated in relevant envrironment.

Research Lab

Prof. R. Dhamodharan
Dept. of Chemistry

Technology

The present invention introduces **a method for deriving nanofibrillated cellulose (NFC) and nanocrystalline cellulose (NCC) from cellulose pulp** sourced from various raw materials. (Fig. 1a &b)

1. **The invention proposes a method for preparing nanofibrillated cellulose (NFC) and nanocrystalline cellulose (NCC) using water-soluble organic acids like citric acid, lactic acid, tartaric acid, etc., without the addition of any other additives or mechanical processes.**
2. **Various raw materials such as cotton, corn stover, sugarcane bagasse, etc., are utilized, with pretreatment applied to remove lignin and hemicellulose, except for sources like cotton, bleached wood pulp, and microcrystalline cellulose (MCC).**
3. **The process aims for environmental friendliness, as demonstrated by the use of citric acid as the preferred acid treatment, and additionally yields carbon dots (CD) as a byproduct, extracted from NCC, potentially broadening its applications.**

Key Features / Value Proposition

1. Green Process:

- Utilizes water-soluble organic acids like citric acid for environmentally friendly production of NFC/NCC, reducing the need for additives and mechanical processes.

2. Versatile Source Material:

- Can effectively utilize various cellulose sources including cotton, wood pulp, and agricultural waste like corn stover and sugarcane bagasse, enhancing resource efficiency.

3. Additional Product Yield:

- Generates valuable carbon dots (CD) as a byproduct during NCC preparation, offering added value and potential for diverse industrial applications.

CONTACT US
Dr. Dara Ajay, Head
Technology Transfer Office,
IPM Cell- IC&SR, IIT Madras

IITM TTO Website:
https://ipm.icsr.in/ipm/

Email: smipm-icsr@icsrpis.iitm.ac.in
sm-marketing@imail.iitm.ac.in
Phone: +91-44-2257 9756/ 9719

Images

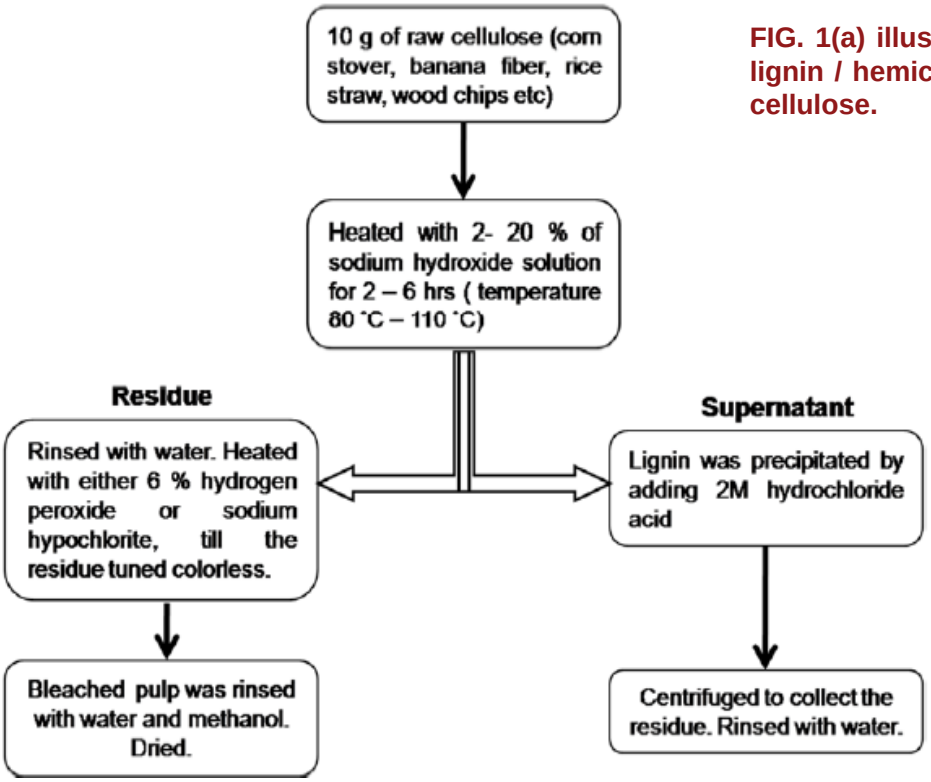

FIG. 1(a) illustrates the pre-treatment for lignin / hemicelluloses removal from raw cellulose.

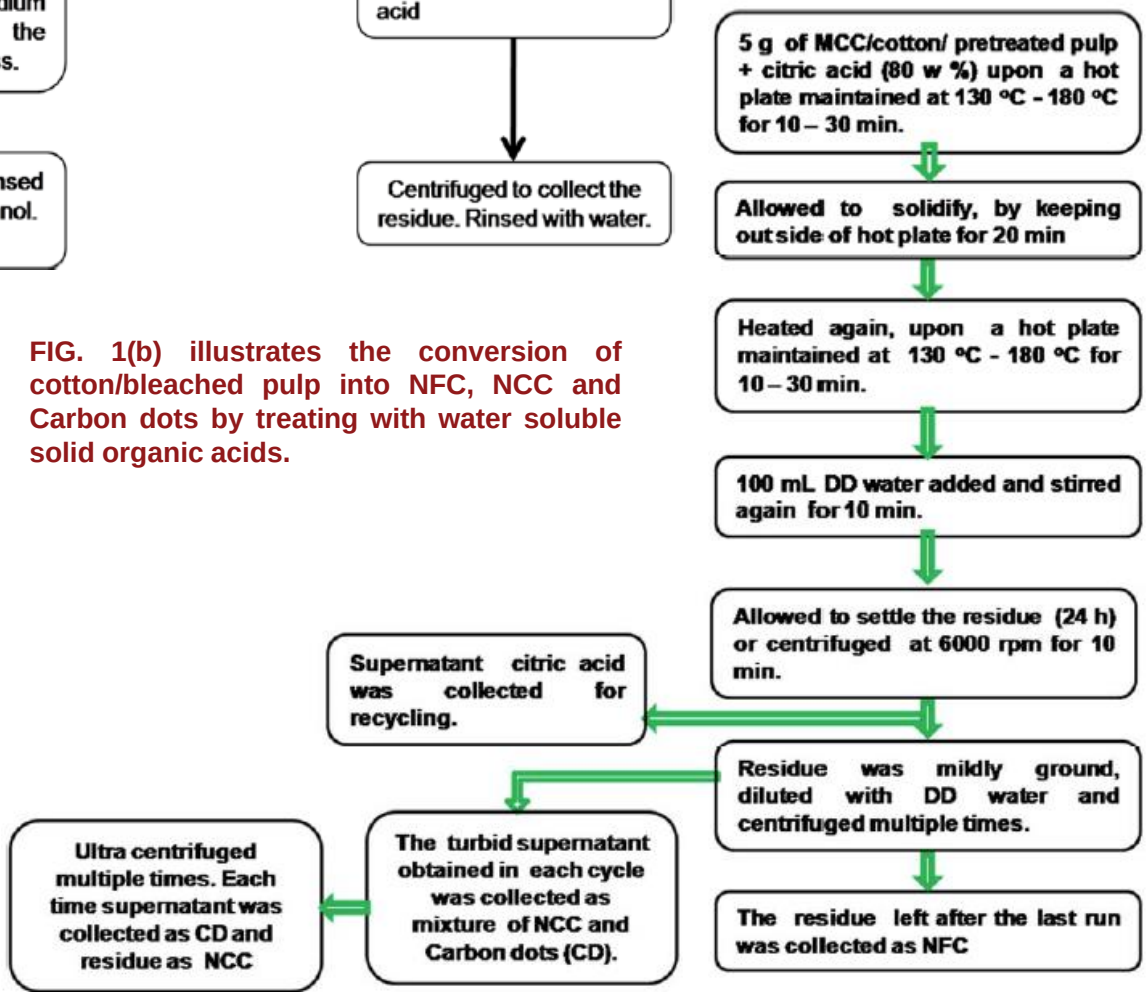

FIG. 1(b) illustrates the conversion of cotton/bleached pulp into NFC, NCC and Carbon dots by treating with water soluble solid organic acids.

CONTACT US
Dr. Dara Ajay, Head
Technology Transfer Office,
IPM Cell- IC&SR, IIT Madras

IITM TTO Website:
https://ipm.icsr.in/ipm/

Email: smipm-icsr@icsrpis.iitm.ac.in
sm-marketing@imail.iitm.ac.in
Phone: +91-44-2257 9756/ 9719