

# Plant protein waste based bio-battery



## Problem addressed

- Non renewable and non degradable battery components
- Low diffusion speed of artificial microtubules (MT)
- Low dispersal in complex and dynamic flow environments
- Very low electrical conductivity in the existing MT technology
- Conventional art with high conducting carbon loading loses its ionic conductivity as trade off.
- Reduced longevity and functionality of anode active material

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## Intellectual Property:

**Indian Patent**  
**202241033885**  
**(Under Examination)**

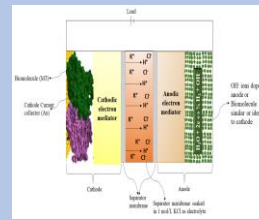
**PCTIN2023050561**

## Technology:

The current technology plant protein waste based **bio-battery** with non-enzymatic biodegradable electrochemical cathode comprising Microtubules (MTs) isolated from natural sources

The battery comprises of:

- Cathode:** A non-enzymatic biodegradable electrochemical material comprising Microtubules isolated from natural sources.
- An **Anode** made of carbon black (CB).
- Electrolyte:** 0.4 M KCl



Configuration of non-enzymatic biodegradable electrochemical half-cell

## Application

- Low power electronic device charging.
- Power banks.
- Bio-medical devices
- Powering Toys.

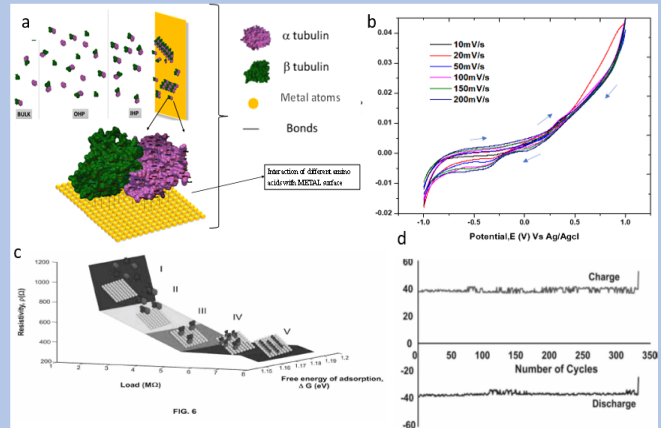


FIG. 6

Figures

- Illustration of the electrode/electrolyte interface and the interaction between the protein units and the metal surface.
- Cyclic voltammetry (CV) of MTs eluent in 0.4M KCl at different Scan rates
- Illustration of dynamic stability of MTs on Au surface
- Specific Capacity profile of non-enzymatic biodegradable electrochemical cell of configuration SS/MT//PP-1M KCl//EC/Al with 334 cycles @ 0.1 C rate.

## Category of the invention:

- Electrical
- Clean Energy
- Battery Technology
- Green Technology

## Advantage:

- At 0.1C rate of discharge, the initial specific capacity and specific capacitance of 63.2 mAh/g 173.65 F/g respectively during discharge with  $Dt = 90s$ ,  $I=1A$ ,  $m=0.5g$ ,  $DV = 0.214V$ .
- 42.48% capacity retention after 10000 cycles.
- Biodegradable, contributes towards environmental wellness.
- Utilization of non-toxic and plant source derived biodegradable cathode
- active material.
- No need of carbon coating of the cathode for electronic conductivity as the
- MT itself is semiconducting in nature.

## Potential Value:



## USP:

- Completely recyclable
- 42.48% capacity retention after 10000 cycle.
- Gravimetric Energy Density 13.53 Wh/kg
- Longevity 100 days @ 0.1 C
- electronic conductivity (2.89 mS/m) of the MT is close to semiconductor materials
- Specific Capacity of 63.2 mAh/g is highest so far obtained using organic materials without conducting carbon for electronic conductivity

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