Paper battery

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NEED FOR PAPER BATTERY

Due to various disadvantages of ordinary conventional batteries, we should prefer the paper battery. General disadvantages of ordinary batteries are:-

a) Limited life-time
b) Explosion, corrosion, leakage
c) High cost
d) Environmental hazards
e) High charging time
f) Weight and size
g) Lower specific power compared to fuels

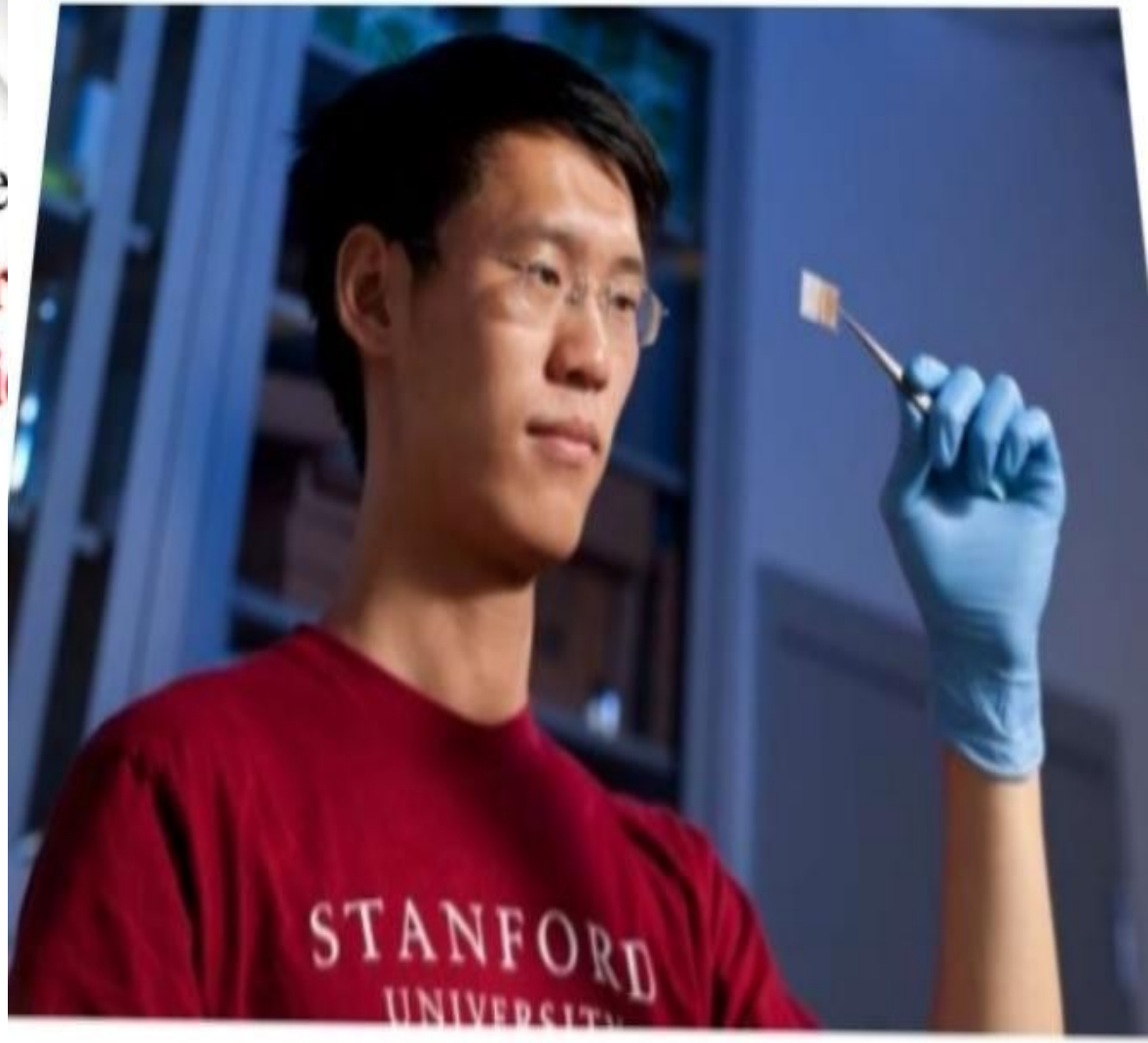
INTRODUCTION TO PAPER BATTERY

- A paper battery is a flexible, ultra-thin energy storage and production device formed by combining carbon nanotubes with a conventional sheet of cellulose-based paper.
- It can be bent and twisted, trimmed with scissors or molded into any needed shape.
- A paper battery acts as both a **high-energy battery**. This combination allows the battery to provide both long-term, steady power production and bursts of energy.
- It is non toxic, environment friendly and is everything that a conventional battery is not.

HISTORY

- The first and foremost method of constructing pape batteries was proposed and initiated by **Rober Linhardt**, a chemist at **Rensselaer Polytechni Institute** in Troy, New York.

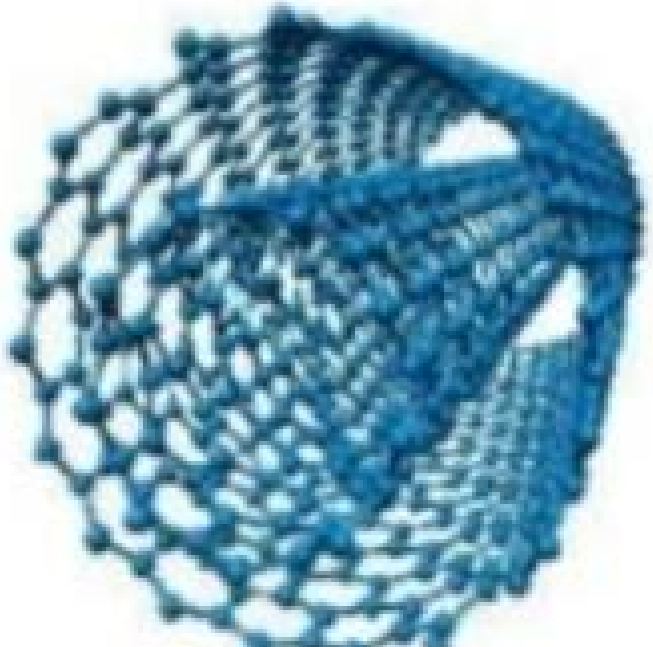
A solution was found by **Yi Cui**, a materials scientist *at* **Stanford University, Palo Alto (California).**



Carbon nano tubes can be characterized by their structure.

single-walled
arbon nanotube
(SWCNT)

double-walled
carbon nanotube
(DWCNT)



triple-walled
carbon nanotube
(TWCNT)

MANUFACTURING

- CNT thin films were coated onto stainless steel (SS) substrates with a solution based process.
- The concentration of CNT is 1.7 mg/mL.
- A dried film with a thickness of 2 micrometer was formed after drying the CNT ink on the SS substrate at 80 ° C for 5 min.This film is then peeled off from substrate.
- These films act as electrodes of paper battery.

  one film is pasted to electrolyte LTO ($Li_4Ti_5O_{12}$) and the other film is pasted to electrolyte LCO ($LiCoO_2$).
- Paper is sandwiched between two electrolytes LTO and LCO with PVDF(poly vinylidene fluoride) .

WORKING

- Batteries produce electrons through a chemical reaction between electrolyte and metal in the traditional battery.
- Chemical reaction in the paper battery is between electrolyte and carbon nanotubes.
- Electrons collect on the negative terminal of the battery and flow along a connected wire to the positive terminal.
- Electrons must flow from negative to the positive terminal for the chemical reaction to continue.

APPLICATION

- The paper-like quality of the battery combined with the structure of the nanotubes embedded within - light weight and low cost.
- Paper battery is set in iontophoresis patch. It helps to deliver functional drugs, local anesthesia, antichloristic, anodyne, etc into skin.
- In iontophoresis patch for whitening and wrinkless
- Medical path: paper battery is set in iontophoresis patch. It helps to deliver functional drug i.e., local anaesthesia, antichloristic, anodyne etc., into the skin.

FUTURE SCOPE

- A piece of paper can power a small light.
- Flexible paper battery could meet the energy demand of the next generation of gadgets.
- The paper battery is a glimpse into the future of power storage.
- The versatile paper, which stores energy like a conventional battery, can also double as capacitors of releasing sudden bursts for high power applications

CONCLUSION

- The life of battery is an important parameter which decides the area of application of battery.
- The batteries are rechargeable, and have reduced cost and weight which in itself may give birth to new applications.
- High energy storage leads to decrease the charging time, thus energy can be saved.
- They can be made in virtually any shape and size to meet the requirements of each application.

Thank you very much for watching….!