



## Low-cost Supercapacitor

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### Why in News

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Recently, scientists at the International Advanced Research Centre for Powder Metallurgy and New Materials (ARCI) have **developed a simple, low-cost, environment-friendly, and sustainable supercapacitor device.**

ARCI is an autonomous organization of the **Department of Science and Technology**, Government of India.

### Supercapacitor

- Supercapacitor is a next-generation **energy storage device**. They are also known as **ultracapacitors**.
- It has significant advantages such as **high power density, long durability, and ultrafast charging characteristics** as compared to conventional capacitors and **Lithium-Ion batteries (LIB)**.
- Main components of supercapacitors include **electrode, electrolyte, separator, and the current collector**.
- The electrode and electrolyte are the pivotal components, which directly determine the electrochemical behaviour of the supercapacitors.
  - The manufacturing cost of electrode materials, as well as electrolytes account for a major portion of the supercapacitor manufacturing cost.
  - An **electrode** is a solid electric conductor that is used to take an electric current to or from a source of power.
  - An **electrolyte** is a substance that produces an electrically conducting solution when dissolved in a polar solvent, such as water.

## Key Points



- **Supercapacitor Device:**

- The supercapacitor is developed from **industrial waste cotton based electrode & natural seawater electrolyte**.
- Industrial waste cotton was **converted into highly porous carbon fibers** by activation process and then utilised to make high-performance supercapacitor **electrodes**.
- **Natural seawater** was explored as an environment-friendly, cost-effective and alternative aqueous **electrolyte**.

- **Benefit:**

- This supercapacitor showed great potential for practical implementation.
- It exhibited **maximum capacitance, good durability** and **high efficiency**.
  - Capacitance is the ability of a system to store an electric charge.
  - Efficiency denotes the charge transfer in a system facilitating an electrochemical reaction.
- **When integrated with a solar cell**, the supercapacitor will become a low cost, eco-friendly, efficient and self-powering device.
  - It has a long life cycle and can be used as maintenance-free power supply.
  - It can also overcome the drawbacks of the intermittent nature of the solar irradiation.

- **Conclusion:**

The development is an excellent example of creative science for the sustainable, green processes embedding principles of **waste-to-wealth**.

**Source: PIB**