

Scientists Convert Tamarind and Cotton Waste to Supercapacitor Electrodes

August 26, 2020

Responding to the intense hunt for supercapacitor materials to meet the widespread demand for supercapacitors, scientists at the **International Advanced Research Centre for Powder Metallurgy & New Materials** (ARCI), an autonomous institute of the Department of Science and Technology (DST), Govt. of India, have developed a couple of **cost-effective electrode material for making affordable supercapacitor devices**, from waste biomass like tamarind seeds and industrial cotton waste. They have **converted the waste materials into highly porous carbon fibres by activation process and then utilised the porous carbon fibres to make high-performance supercapacitor electrodes.**

Tamarind and Cotton Waste as Supercapacitor Electrodes

Tamarind seeds and cotton waste may soon be used to make low-cost supercapacitors for energy storage and this can pave the way towards **affordable electric vehicles and hybrid vehicles** which bank on supercapacitors significantly for their **application in braking systems and start-stop cycles.** The electrode materials made from the biomass waste have been tested with the help of a rapid testing protocol developed by scientists at **Centre for Fuel Cell Technology, ARCI-Chennai** to evaluate different porous electrode materials for their suitability in supercapacitors.

The protocol involves **Electrochemical Impedance Spectroscopy** and **records the impedance** (a parameter used to measure the opposition that a circuit presents to a current when a voltage is applied) offered by a material under a small perturbation

and the capacitance (ratio of the change in electric charge of a system to the corresponding change in its electric potential) formed by the arrangement of electrolyte ions over the electrode surface, which is called as **double-layer capacitance**. The ARCI scientists used it to **test the pore characteristics and stability of the activated carbon material** prepared from tamarind seed and its suitability for supercapacitor application.

Supercapacitors **bridge the gap between conventional capacitors and rechargeable batteries**. They have the **highest available capacitance values per unit volume and the greatest energy density of all capacitors**. Also known as ultracapacitor or double-layer capacitor, it differs from a regular capacitor in that it has very high capacitance. The supercapacitor is used for energy storage undergoing frequent charge and discharge cycles at high current and short duration.