

New low-cost Polymer-based electrode

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In news— A study has revealed that a new low-cost, pristine, conducting polymer-based electrode/redox-active electrolyte combination can give enhanced electrochemical performance and cycling stability to supercapacitors, facilitating energy storage and powering in wearable integrated devices.

Key findings-

- **The Materials for Energy Storage and Optoelectronic Devices Group**, headed by Dr Sreekanth of the Physics Department of Sanatana Dharma College, Alappuzha, has found a strategy to improve the performance of polyaniline (PANI)-based supercapacitors and has achieved very high Specific Capacitance per unit of area or areal capacitance and prolonged cycle life.
- **They found that electrodes made from pristine, porous, conducting and high molecular-weight PANI synthesized by self-stabilized polymerization (SSDP)** when used with an electrolyte powered with an additive that boosts redox reactions (redox-additive) can drive these energy storage devices to deliver incredible performances.
- The lightweight symmetric supercapacitors fabricated using these electrodes outperform many new electrode materials.
- The conducting polymer-based electrode is lightweight and highly stable.
- **The supercapacitors' enhanced performance and long cycle life are attributed to the binder-free nature**, porosity, high and homogeneous molecular weight and appreciable conductivity of the electrode material and the electrode/redox-activated electrolyte combination.
- **The study was carried out using the instrumentation**

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Need for such devices-

- With energy demands of the modern world growing, the quest for novel methods and materials for renewable energy harvesting and storage has become a hot area of research.
- **Supercapacitors or ultracapacitors are one of the thrust areas in energy storage technology** as they combine the characteristics of conventional capacitors and batteries to **give a sudden kick-start to devices** by providing a large amount of power and sustained energy release.
- **The electrode materials of supercapacitors play a vital role in determining the performance and stability of these energy devices.**
- **Conducting polymers, like polyaniline and polypyrrole, are excellent candidates for electrode materials** owing to their flexibility, stability and tunable electrical and electrochemical properties.
- **They are also inexpensive, lightweight and can be synthesized easily.**
- **However, supercapacitors fabricated using these electrodes fail to sustain the initial electrochemical capacitance** after a few cycles of continuous operation. The **poor energy density of these devices** is another issue that limits the use of these devices in practical applications.