

DESIGN AND DEVELOPMENT OF A NOVEL HIGH ENERGY DENSITY AND HIGH-POWER NANO COMPOSITE BASED SUPER CAPACITOR FOR HIGH ENERGY STORAGE APPLICATIONS

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Introduction:

- Batteries and capacitors are known as energy storage systems. Batteries are preferred for applications with high energy density but with limited power output requiring long-term use of energy while capacitors are preferred in applications where energy is required to be delivered at high power.
- Several critical parameters need to be achieved by those alternative energy storage devices, including high energy density, high power density, long lifecycle, environmental safety, and low cost.
- Both batteries and capacitors are insufficient for applications requiring high energy and power density. This leads to an intensive investigation of new types of energy storage systems known as electrochemical capacitors, supercapacitors or ultra-capacitors.
- The power and energy density comparison between capacitors, supercapacitors, battery and fuel cells as shown in the graph in Fig1.

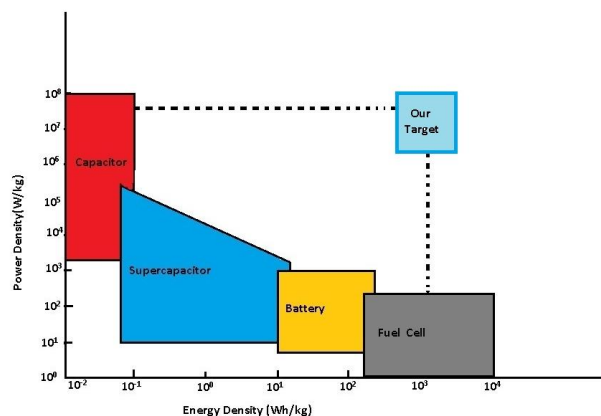


Fig1. Graph of power density vs energy density

Objectives:

1. Design and Development of a Novel Nano composite based super capacitor
2. Fabrication of novel electrodes for the supercapacitor
3. Development of the suitable electrolyte/s
4. Development of energy storage device and characterization of device.
5. Performance evaluation of the developed device

Methodology:

The development of supercapacitor involves the fabrications of efficient electrodes and a suitable electrolyte. In the present work, the electrodes will be developed indigenously by using graphene sheet and carbon Nano tube. Carbon Nanotubes are synthesised by chemical vapour deposition technique .The catalyst for CVD is prepared from appropriate ratio of Ammonium hexamolybdate, ferrous sulphate and alumina. Suitable conductive ink is used as an adhesive agent. Aqueous solutions such as KOH/Na₂SO₄/H₂SO₄ composites are used as electrolyte. Suitable porous separators such as coffee filter paper/kapton paper/tissue paper. The structure of the proposed supercapacitor has been presented in the Fig 2.

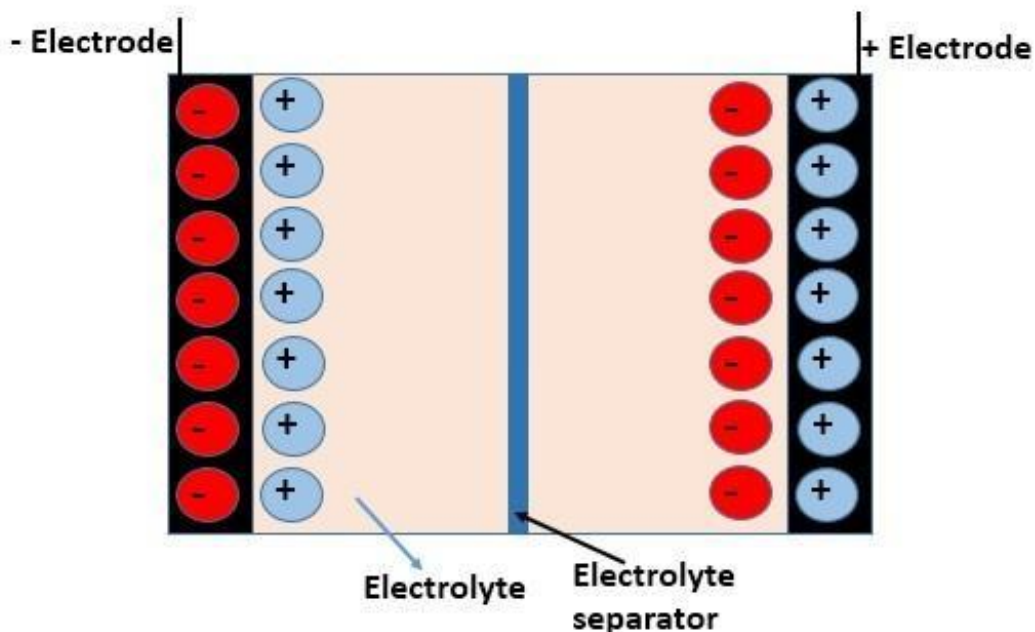


Fig 2. The structure of the proposed supercapacitor

Conclusion:

1. A novel indigenous high energy density and high power supercapacitor will be designed and fabricated for energy storage applications.
2. The outcome of the work will be published/patented.

Scope for future work:

The supercapacitor mainly used in the following applications:

1. Digital cameras for flashing of light.
2. Electric vehicles and the regenerative braking mechanism is used for charging the supercapacitor. The regenerative braking helps to charge in a very short time.
3. As defibrillators to shock the human heart.
4. To provide power back up to the low power devices like PC Cards, automated meter reading equipment.
5. Recently in many electrical and electronic tools.
6. Several portable gadgets and devices.