



Super capacitors

Super capacitors stores renewable energy with high energy density and high power capacity

Super capacitors also known as ultra-capacitors

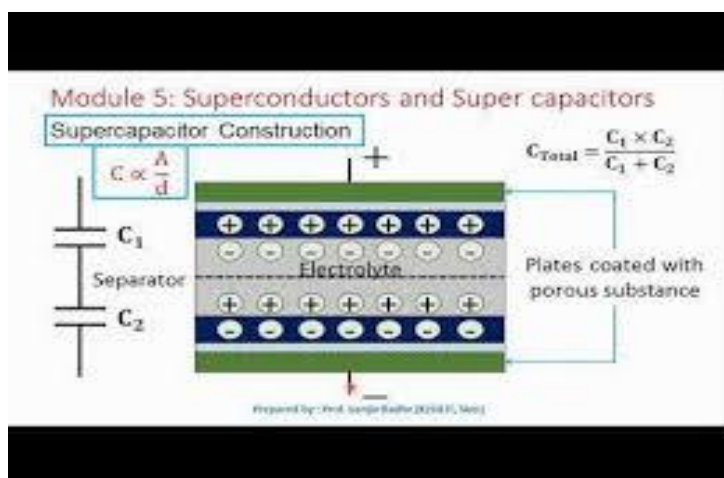
- It can have capacitance value from a few milli farads to ten's of farads in a very small size.
- Much more electrical energy can be stored between the conducting plates.
- Liquid or wet electrolyte can be used between the conducting plates
- It is a electrochemical device but no chemical reactions are involved for storing electrical energy

Construction

Capacitance of the capacitor increases with increasing area of the conducting plates, Capacitance also increases with decrease in distance between the plates.

To construct a super capacitor, the area of the conducting plates should be increased and the distance between the two plates should be decreased..

Conducting plates are made up of metal coated with porous substance such as powdery activated charcoal



Both these plates are soaked in an electrolyte and separated by a very thin insulator; this separator is used to provide the insulation to the electrode in order to prevent the short circuit.



The electrolyte contains positively charged ion and negatively charged ion, when we apply voltage across the plates, one of the plates gets positively charged and other plate gets negatively charged. due to the electrostatic attraction negatively charged ion attracted by the positively charged electrode positively charged ion gets attracted by the negatively charged electrodes. This ions form a very thin layer around the plates, thin layer of positively charged ions formed around the negatively charged plates. Thin layer of negatively charged ion formed around the positively charged plate.

This result in the formation of electrostatic double layer with the series circuit of 2 capacitors C1 and C2. Upper layer can be treated as C1 with the very small value of d the separation. The lower layer can be treated as C2 with the very small value of d

Total capacitance due to this series combination of C1 and C2 is given by

$$C_{\text{Total}} = \frac{C1 \times C2}{C1 + C2}$$

Such a super capacitor can store large amount of charge and these capacitance will be very high they are also called as electrostatic double layer capacitor.

Advantages of Super capacitors

- High efficiency
- High energy and power density
- High-performance reliability with higher charging rates
- Super capacitors can easily be connected in series like batteries to provide bigger voltages used in power-demanding equipment
- Super capacitors are developed in small sizes and lightweight which makes them easily installed in small areas.
- Super capacitors have a longer cycling time as compared to the battery and higher service life.

Disadvantages of Super capacitors

- Super capacitors have high self-discharge rates.



- Super capacitors have low voltage limits which demand serial connections to produce high voltage.

Uses of Super capacitors

- Super capacitors are used in hybrid buses in the field of transportation as they combine with the battery to increase battery life and decrease the size.
- Memory devices in laptops, smart phones, tablets etc., are developed using super capacitors. These are also used in LED Flash units.
- Super capacitors are even used in the field of renewable energy such as in wind energy to supply power to the pitch control of blades.
- Super capacitors are consistently being used in other fields such as industry, military, medical, transpiration, music etc.

