Progressive Education Society's
Modern College of Engineering, Pune-411005
Department of Electrical Engineering
B.E. - 2022-23

Project Group No: 11
In-house

Project Title: Study and analysis of shape of electrode implemented in supercapacitor with focus on design and fabrication for application in load.

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Objective:
1. To create the super capacitors of different shapes and of different materials.
2. Obtaining highest capacitance using various shapes of Super capacitors.

Methodology:

1. Design of super capacitor using various shapes of electrode viz. rectangular, Square, triangular, semi-circular.
2. Shape selection of electrode to obtain maximum specific capacitance.
3. Fabrication of super capacitor as per the calculation of maximum specific capacitance
4. Finding out specific capacitance through experimental setup.

Block Diagram:

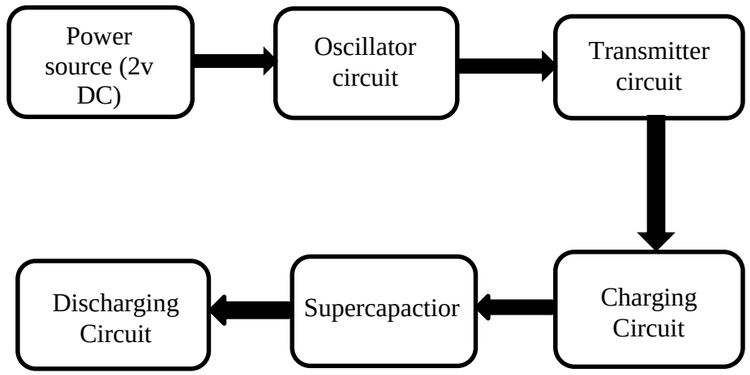


Fig. Block diagram of supercapactior circuit

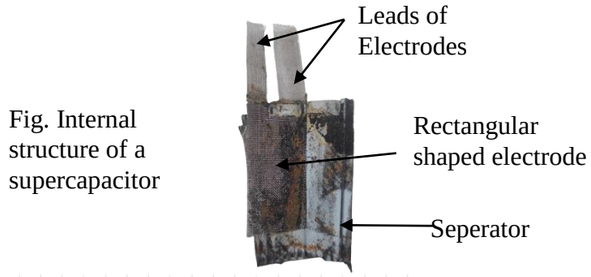
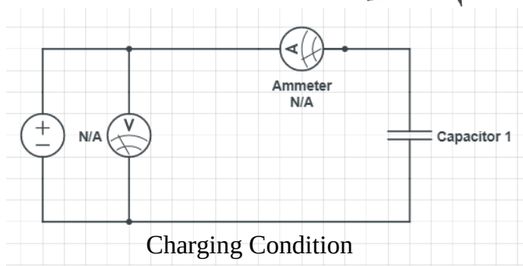
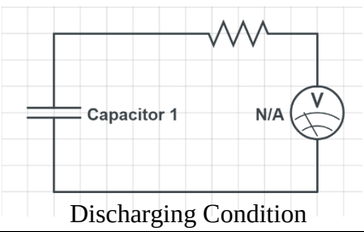


Fig. Internal structure of a supercapacitor



Charging Condition



Discharging Condition

Testing:

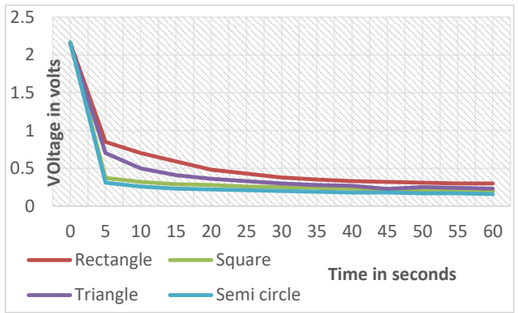
By charging and draining the supercapacitor, one may test supercapacitors. The supercapacitor is submerged in a solution of K2SO4 and then charged in the real setup for supercapacitor charging and discharging. The supercapacitor is completely submerged in K2SO4 solution for 3 minutes before being connected to the dc source to begin charging. Two volts from a direct current source are used to charge the supercapacitor for one minute. By connecting a voltmeter to the supercapacitor after it has been fully charged, it is then discharged. The discharging current is measured as the supercapacitor is discharged.

Specifications / Features:

1. Capable of storing large amount of energy.
2. Bridge the gap between conventional capacitors and rechargeable batteries.
3. Handle very high current rates.
4. Charge time of device is about 1-10 sec.
5. Used for energy storage undergoing frequent charge and discharge cycles at high current and short duration.

Results:

Time	Voltage (in volts)			
in seconds	Rectangle	Square	Triangle	Semi circle
0	2.16	2.16	2.15	2.17
5	0.85	0.37	0.7	0.31
10	0.7	0.32	0.5	0.26
15	0.59	0.29	0.41	0.23
20	0.48	0.28	0.36	0.22
25	0.43	0.26	0.33	0.21
30	0.38	0.25	0.3	0.2
35	0.35	0.24	0.28	0.19
40	0.33	0.23	0.27	0.18
45	0.32	0.22	0.226	0.18
50	0.31	0.21	0.25	0.17
55	0.3	0.21	0.24	0.17
60	0.3	0.2	0.23	0.16



Conclusion:

As energy consumption grows, it is necessary to develop supplemental energy sources like batteries and supercapacitors. Supercapacitors are used in a wide variety of electrical devices, including amplifiers, oscillating circuits, filters, etc. The primary benefit of a supercapacitor is that its shape may be changed depending on the application. With numerous tests on various electrode shapes, we discovered that the rectangular electrode shape has the maximum energy density and could store the highest capacitance in comparison to other shapes.