



SNS COLLEGE OF TECHNOLOGY

Vazhiampalayam, Coimbatore-35

(An Autonomous institution)

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DEPARTMENT OF CHEMISTRY

COURSE NAME : 23CHT101- ENGINEERING CHEMISTRY

I YEAR / I SEMESTER

UNIT : 2. ELECTROCHEMICAL POWER SOURCES

TOPIC : SUPERCAPACITOR

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SUPERCAPACITOR



- A Supercapacitor is an electrochemical capacitor that has an very high power density as compared to common capacitors, about 100 times greater.
- Supercapacitor is also known as Electric Double Layer Capacitor(EDLC) or Ultracapacitor.
- The capacitance range is From 100 Farad to 5KFarad.

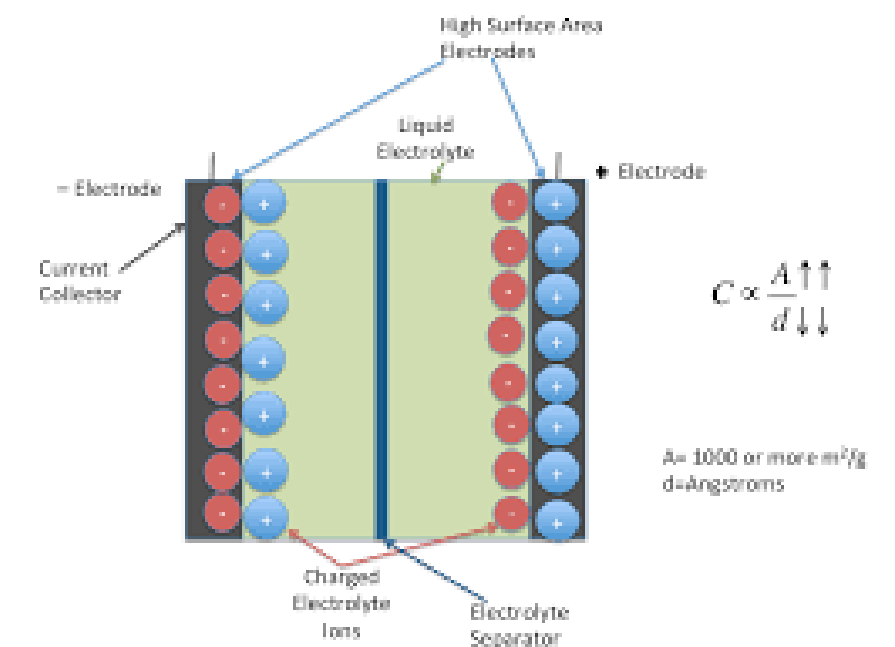




CONSTRUCTION



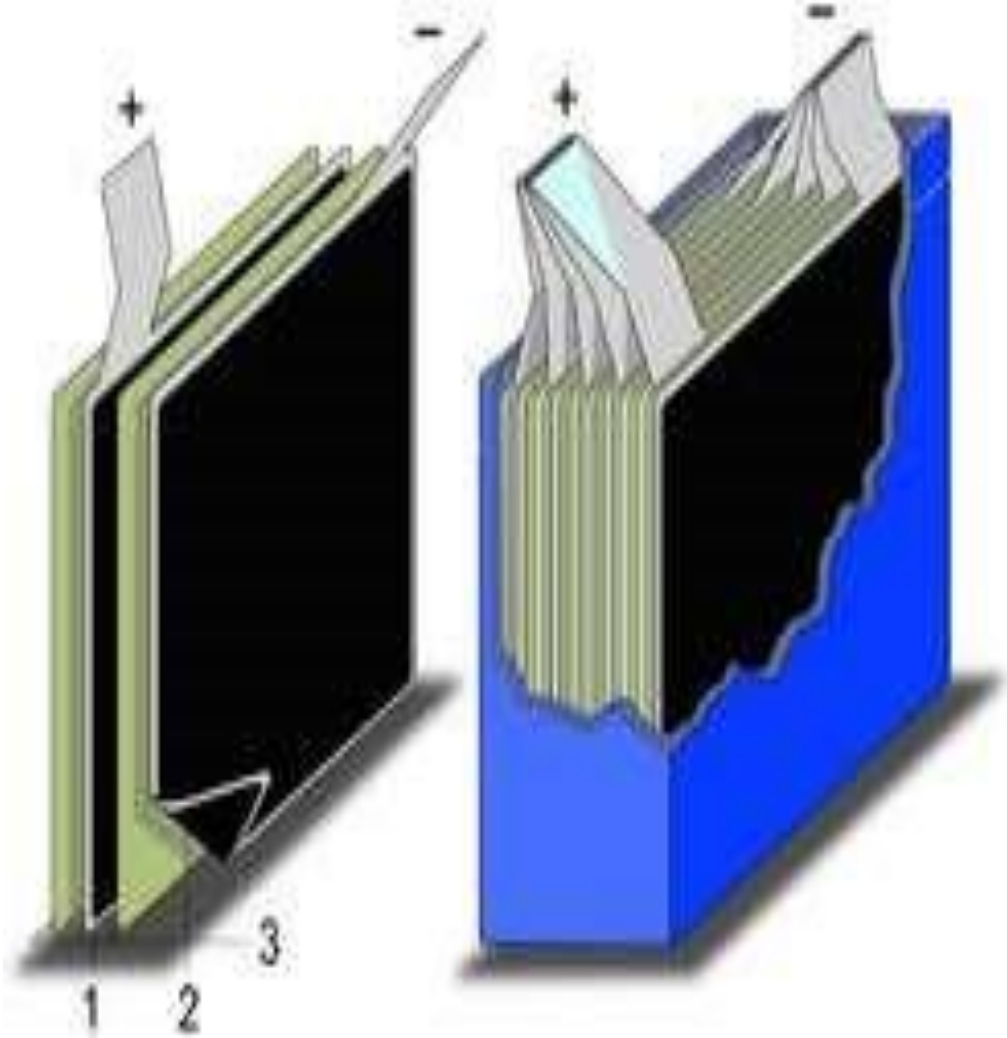
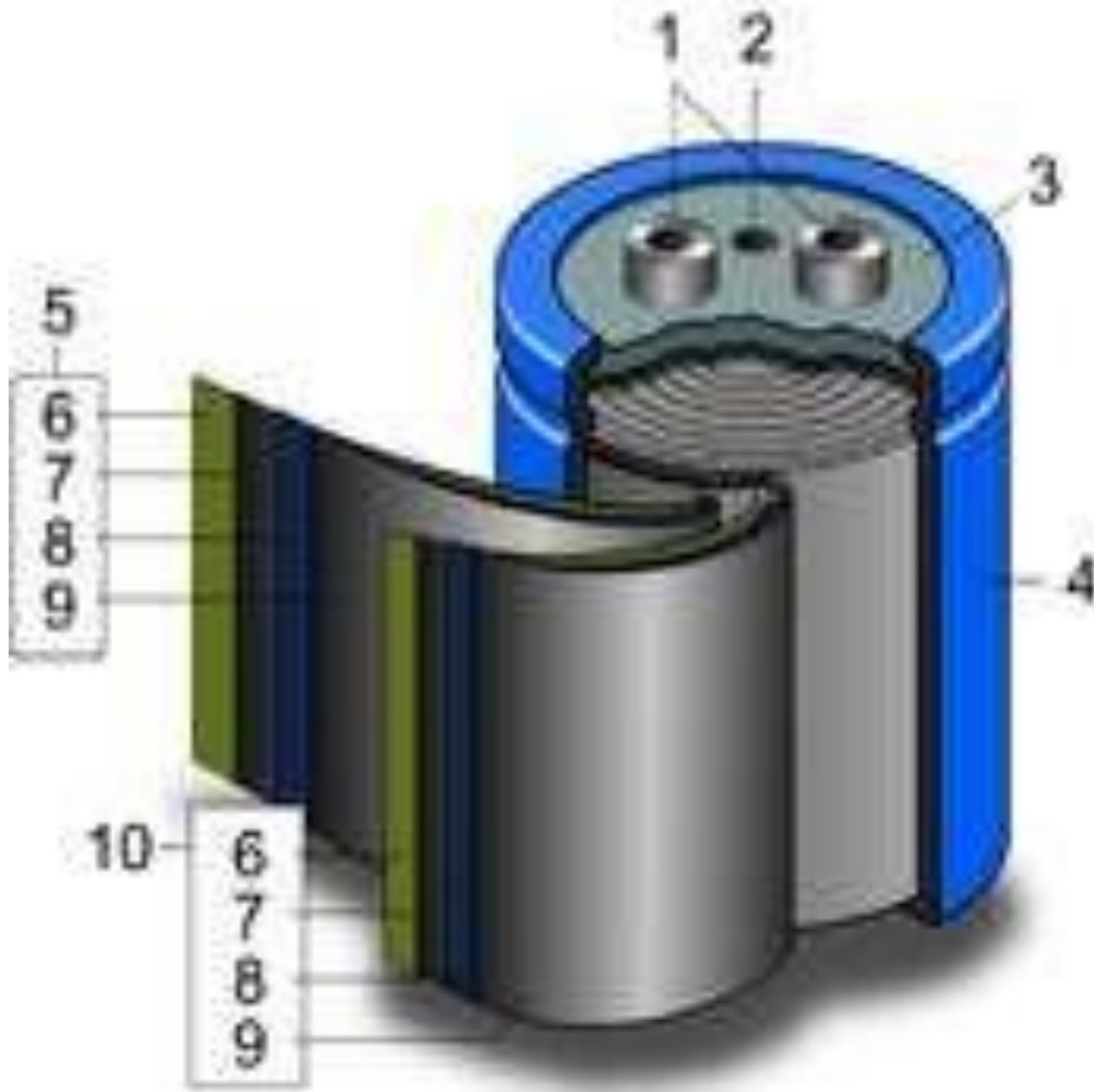
- Supercapacitors are constructed with two metal foils, each coated with an electrode material such as activated carbon.
- The electrodes are kept apart by an ionpermeable membrane (separator) used as an insulator to protect the electrodes against short circuits.
- The construction is subsequently rolled or folded into a cylindrical or rectangular shape and is packed in an aluminum can.





CONSTRUCTION

- 1. Positive electrode
- 2. Negative electrode
- 3. Separator
- 4. Aluminum can
- 5. Positive pole
- 6. Separator
- 7. Carbon electrode
- 8. Collector
- 9. Carbon electrode
- 10. Negative pole

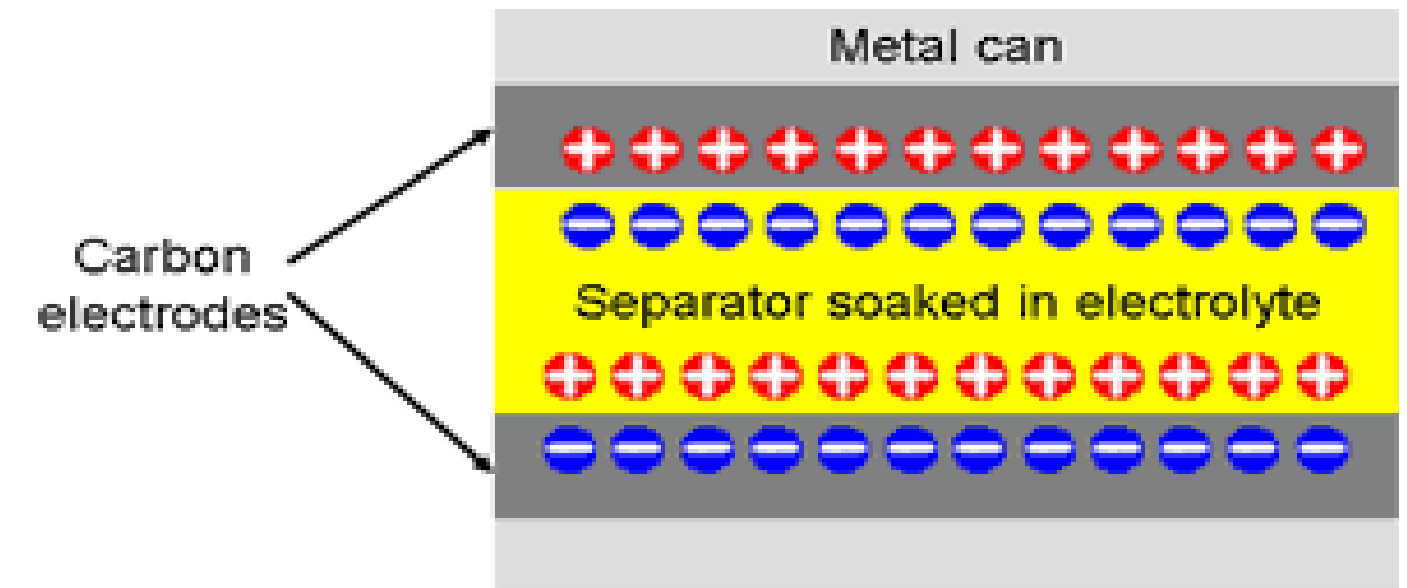




WORKING



- In a supercapacitor, there is no conventional dielectric. Both plates are soaked in an electrolyte and separated by a very thin insulator.
- When the plates are charged, an opposite charge forms on either side of the separator, creating what's called an electric **doublelayer**.
- This is why supercapacitors are often referred to as double-layer capacitors.



Double Layer Capacitor

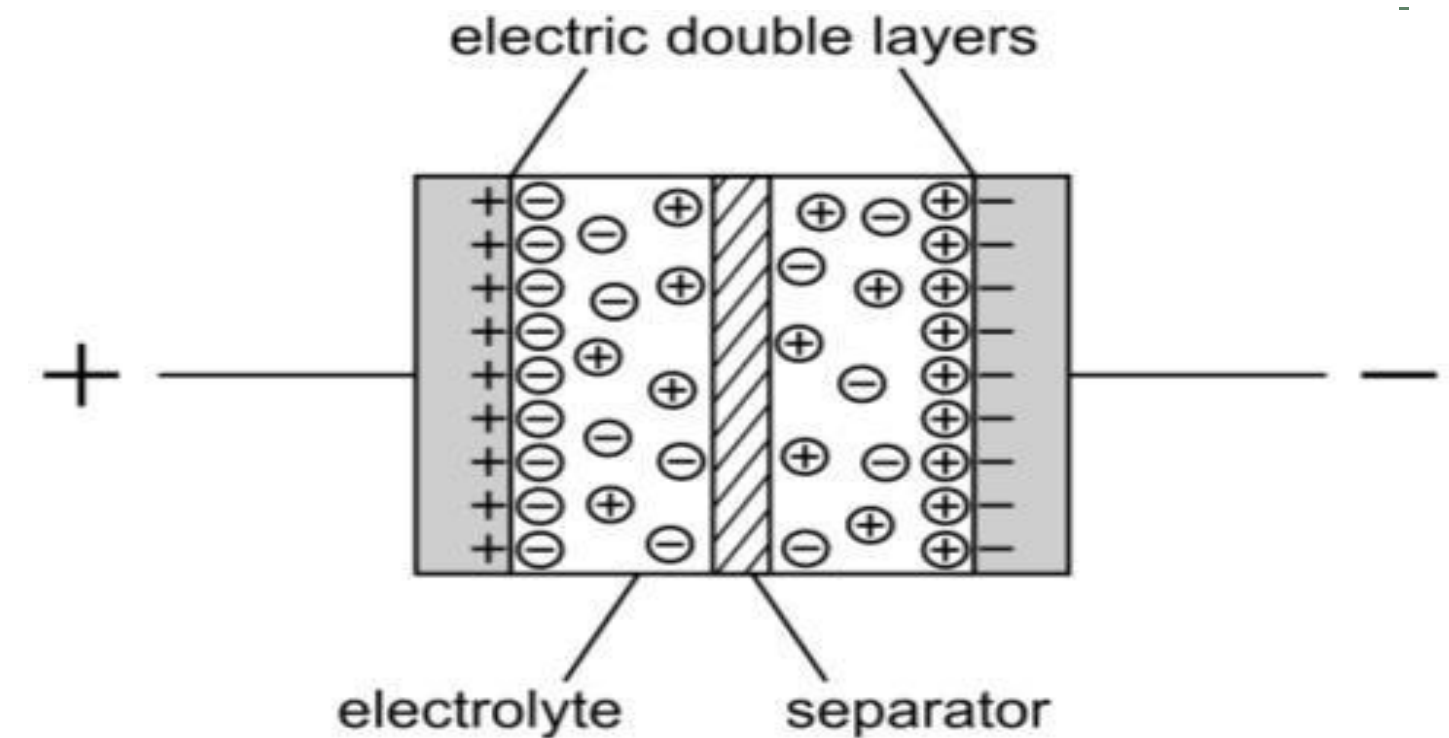




ELECTRICAL DOUBLE LAYER



- Electrochemical capacitor has two electrodes, separated by a separator, which are electrically connected to each other via the electrolyte.
- When voltage is applied, and plates get charged, an opposite charge forms on the either side of the separator creating a electric double layer





CHARACATERISTICS



- Stores high amount of energy.
- Have high capacitance.
- High rates of charge and discharge.
- Low toxicity.
- High cycle efficiency (95%)

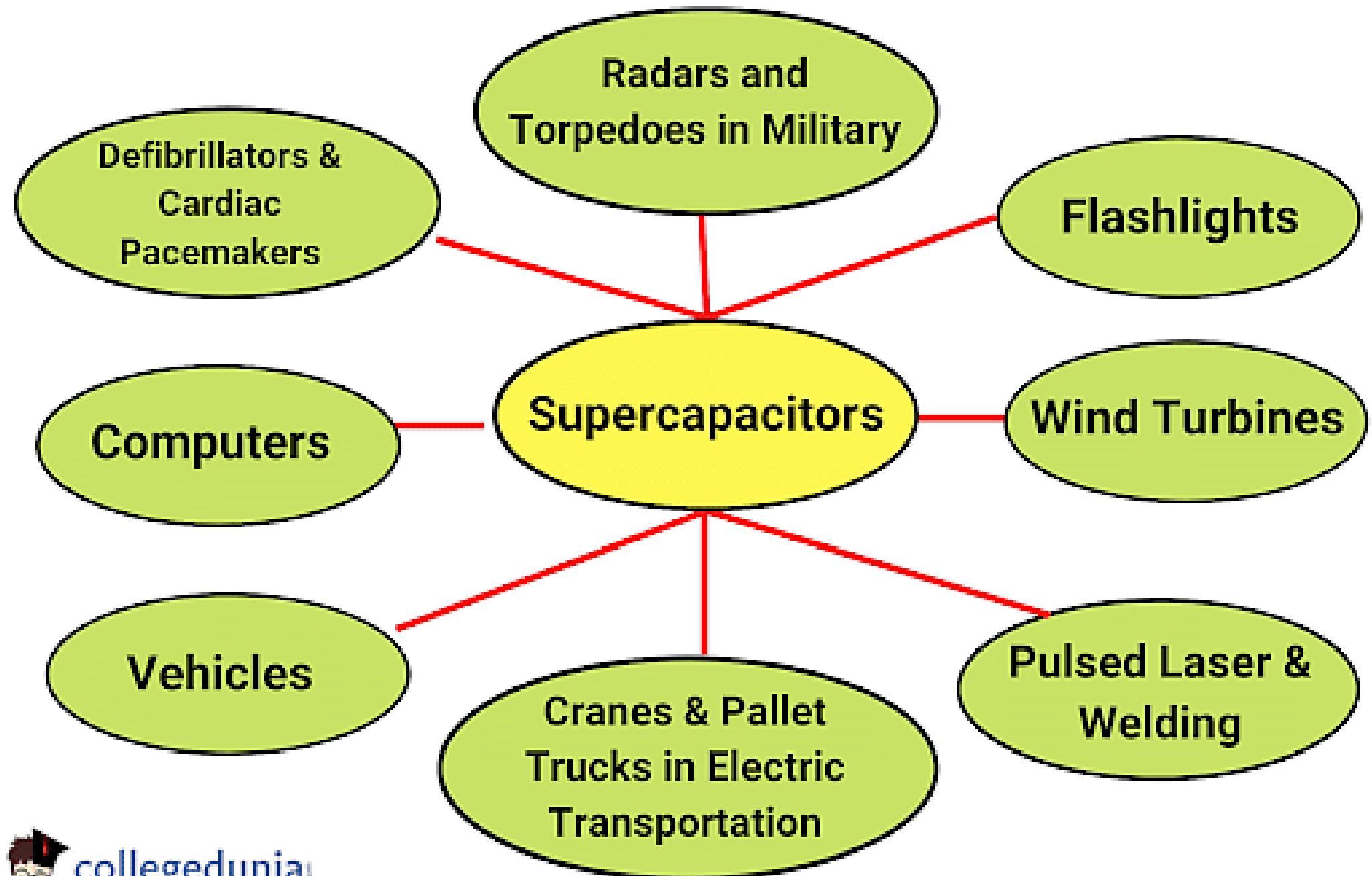


APPLICATIONS



In start up mechanism for Automobiles.

- Used in Diesel engine start up in submarines & tanks.
- Backup power system in missiles.
- Power source for laptops, flash in cameras.
- Voltage stabilizer.

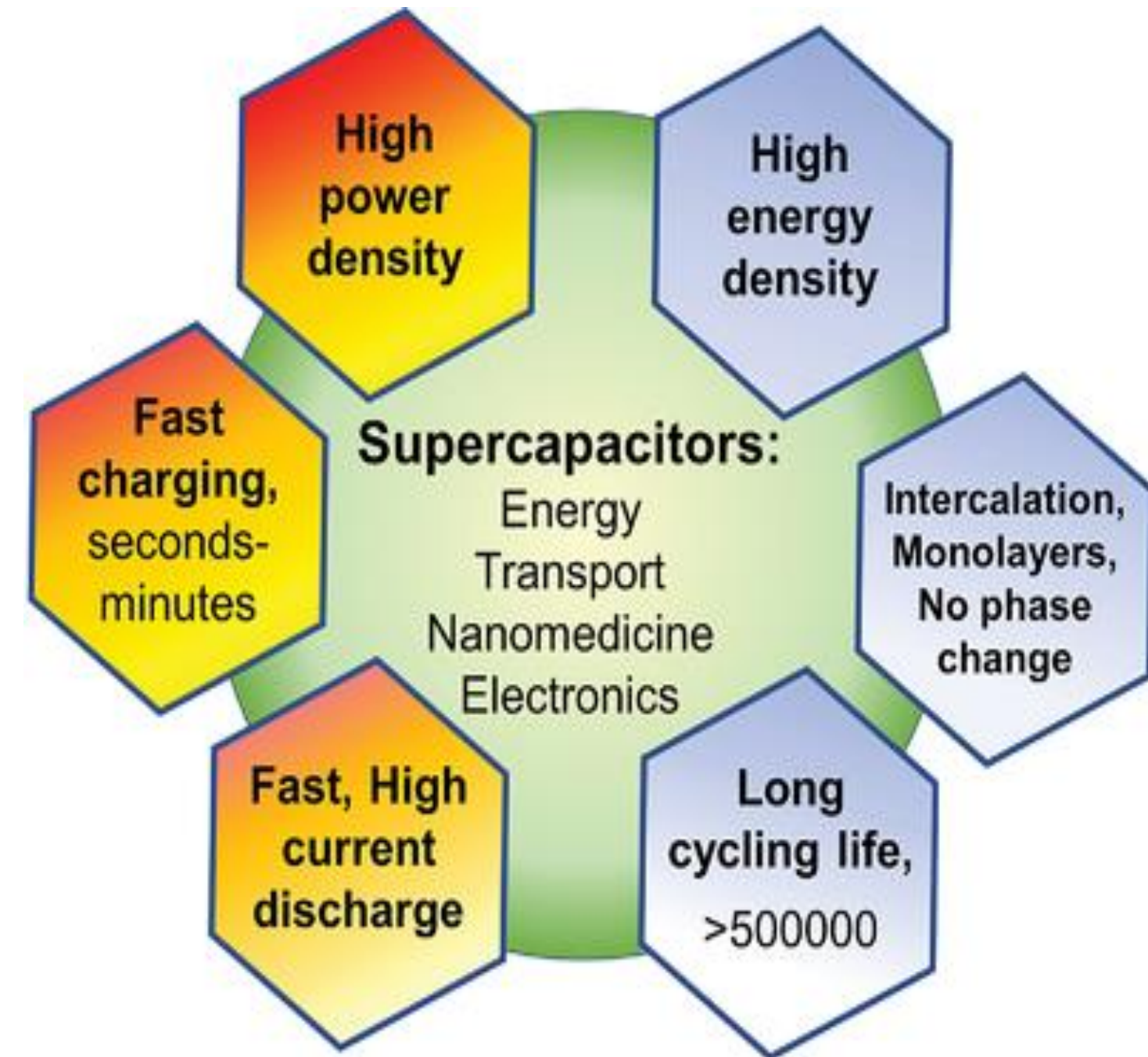




ADVANTAGES



- High energy storage.
- Wide working temperature(-40⁰c to 60⁰c).
- Eco-friendly.
- Quick charging time.
- Maximum life cycle.
- High cycle efficiency (95%).
- High specific power up to 17 kW/kg.
- Extremely low internal resistance.
- Safe.





DISADVANTAGES

- Low energy density.
- The voltage varies with the energy stored.
- Have high self-discharge rate.
- Requires expert electronic control.
- Cannot be used in AC and high frequency circuits.
- High cost.



SUMMARY



REFERENCES

1. Dr. V. Veeraiyan, "Engineering Chemistry-II" VRB Pub. Co. Ltd, Chennai. 2016..
2. Wiley, "Engineering Chemistry", John Wiley & Sons. InC, USA.
3. P.C. Jain & Monicka Jain, "Engineering Chemistry", Dhanapat Rai Publishing Company Pvt. Ltd. 2017.

THANK YOU