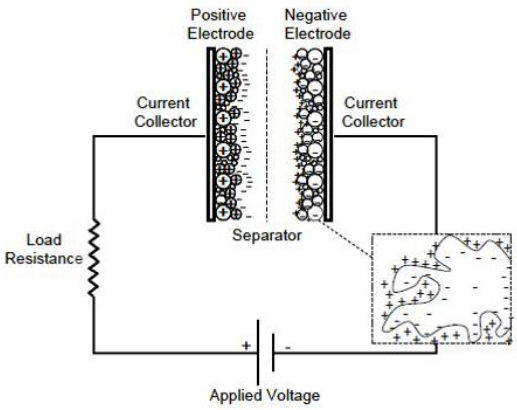
Biochar Use in Supercapacitors

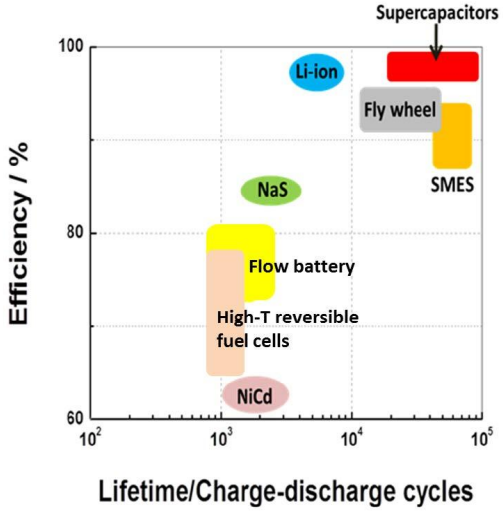
A capacitor is a passive two-terminal electrical component used to store energy in an electric field. A supercapacitor is an electrochemical capacitor with relatively high energy density (~100x denser than a capacitor). Supercapacitor is a general term for electric double-layer capacitor (EDLC) and is also known as a supercondenser, electrochemical double layer capacitor, or ultracapacitor. They are found in variety of products such as cameras, flashlights, portable media players, cars, buses, airplanes, and windmills.

ISTC researchers are investigating the use of biochar in supercapacitors. Many supercapacitors today use activated carbon, a fossil fuel-derived product that is much more expensive than biochar. The chemicals used to wash impurities out of biochar are also more environmentally friendly than those needed to increase surface area in activated carbon.



Supercapacitor

ISTC (Illinois Sustainable Technology Center) researchers have systematically investigated a wide range of biochars for supercapacitor electrodes using surface characterizations and electrochemical techniques. They successfully demonstrated biochar's high performance and high durability at both half-cell and single-cell levels. Their progress suggests that biochar supercapacitors could be a promising technology. Some potential biochar feedstocks for the supercapapcitors include wood and corn cobs.



Potential Applications – Water Purification

Capacitive deionization (CDI) has emerged over the years as a robust, energy-efficient and cost-effective technology for desalination of water with a low or moderate salt content. The key issue limiting market penetration of the CDI (Capacitive deionization) technology is related to the cost of electrode materials. Because it can be made at a considerably lower cost than conventional activated carbons, the use of low-cost biochar in the supercapacitors has the potential to substantially reduce the cost of electrode materials. ISTC researchers have examined the use of biochar supercapacitors to see if they can be used to effectively decrease salt concentration of a dilute saltwater. Further studies are planned.

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