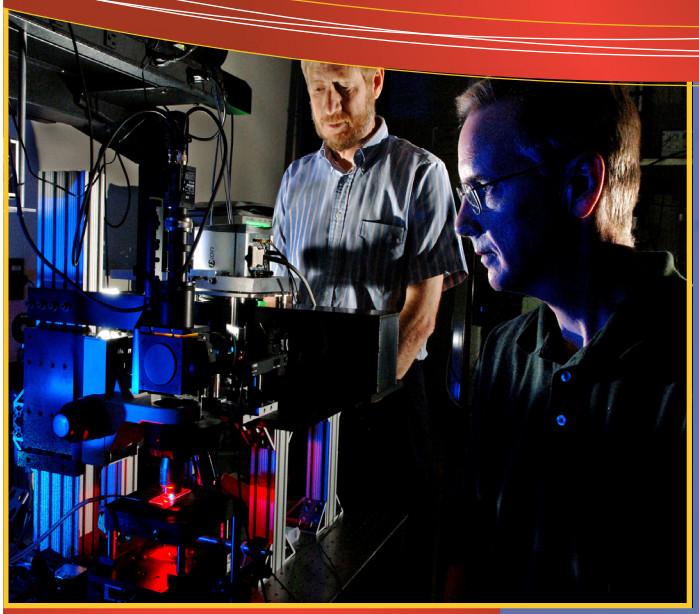
Sandia National Laboratories

Carbon Activation Process



TECHNOLOGY SUMMARY

Double layer capacitors have been in commercial use in the electronics and computer industries and are now under development as a hybrid power source for electric vehicles. Because of its large surface area, many double layer capacitors use activated carbon as electrode material. The goal is to maximize the surface area in order to achieve high capacitance and energy density while maintaining the structure of the carbon. Previous methods can generate more surface area but have caused the quality of the carbon electrodes to deteriorate, due to it weakening the structure of the carbon. Sandia has developed a process for increasing the available surface area of carbon electrodes for double layer capacitors, while storing high levels of electrical energy in the smallest possible volume.

The new process uses the same operating principles as previous activations, however they have been modified to produce different results. Previous methods utilized high temperatures, where the new process uses lower temperatures and oxidation followed by gasification of the carbon-oxygen compound at high temperatures, allowing the oxidant to penetrate the depth of the micropores without being prematurely consumed. The micropores are then allowed to participate in the oxidation reaction. This allows them to grow more in size and for the surface to become more accessible for double layer information.

BENEFITS

Capacitance of 300 farads per cubic centimeter can be achieved and densities within the range of 0.6 to 1.2 g/cm^3 can be obtained

Carbon films have a high degree of molecular directionality.

Increases the available surface of carbon electrodes

INTELLECTUAL PROPERTY

US PATENT #6,299,850
SD# 5937

POTENTIAL MARKET APPLICATIONS

Electronics

Computers

Electric Vehicles

Alternative Energy

TECHNOLOGY READINESS LEVEL

Sandia estimates this technology at TRL 4. Key elements have been demonstrated in laboratory environment.

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National Nuclear Security Administration

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