МІНІСТЕРСТВО ОСВІТИ І НАУКИ УКРАЇНИ
СУМСЬКИЙ ДЕРЖАВНИЙ УНІВЕРСИТЕТ
КАФЕДРА ІНОЗЕМНИХ МОВ
ЛІНГВІСТИЧНИЙ НАВЧАЛЬНО-МЕТОДИЧНИЙ ЦЕНТР

МАТЕРІАЛИ
X ВСЕУКРАЇНСЬКОЇ НАУКОВО-ПРАКТИЧНОЇ КОНФЕРЕНЦІЇ СТУДЕНТІВ, АСПІРАНТІВ ТА ВИКЛАДАЧІВ ЛІНГВІСТИЧНОГО НАВЧАЛЬНО-МЕТОДИЧНОГО ЦЕНТРУ КАФЕДРИ ІНОЗЕМНИХ МОВ

"WITH FOREIGN LANGUAGES TO MUTUAL UNDERSTANDING, BETTER TECHNOLOGIES AND ECOLOGICALLY SAFER ENVIRONMENT"

(Суми, 24 березня 2016 року)
The tenth all Ukrainian scientific practical student`s, postgraduate's and teacher's conference

SECTION 2 ECOLOGYCALLY SAFER ENVIRONMENT

SUPERCAPACITORS COULD BE KEY TO A GREEN ENERGY FUTURE

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Nowadays there are innovations that bring benefits in terms of reducing the energy consumption and of protecting the natural environment, the atmosphere people live. One of them is a supercapacitor also known as ultracapacitor or double-layer capacitor, is a high-capacity electrochemical capacitor with capacitance values much higher than other capacitors (but lower voltage limits) that bridge the gap between electrolytic capacitors and rechargeable batteries.

It is technically possible to use supercapacitor instead of lithium-ion batteries in cell phones, with some serious benefits: people never have to replace the supercapacitor and the phone would recharge very quickly (even if it does not stay charged for very long). For the moment, the supercapacitor may be effective at accepting or delivering a sudden flow of energy when connected to lithium-ion batteries in an electric car, where an supercapacitor could provide the power needed for acceleration while a battery provides range and recharges the supercapacitor between surges. A capacitor stores energy by means of a static charge as opposed to an electrochemical reaction and applying a voltage differential on the positive and negative plate charges the capacitor.

Supercapacitors have the following advantages:

- High power density. According to test by the Institute of Transportation Studies, Davis, California USA, the specific power of electric double-layer capacitors can exceed 6 kW/kg at 95% efficiency;
- Very low cost per Farad – unit of capacitance;
- Long lifetime, which reduces maintenance costs; they lose about 80% of their storage capacity after 10 years, with a lifetime estimated to be 20 years;
- Can be charged and discharged almost an unlimited number of times – certainly millions;

- Can discharge in matters of milliseconds or as long as tens of seconds or several minutes;
- Can be charged in seconds to minutes – far faster than most batteries;
- Do not release any thermal heat during discharge;
- High efficiency – 97-98%;
- Improved safety over batteries and electrolytic capacitors. For example, there is no danger of overcharging; when fully charged it simply stops accepting a charge and reversing polarity will not cause fire or explosion;
- Not affected by deep discharges as are chemical batteries;
- Operating temperature range can be -50C to 85C. Capacity increases as temperature decreases below the rating temperature, unlike a battery;
- They do not release any hazardous substances that can damage the environment;
- No disposable parts during the whole operating life of the device, which makes the device environmentally friendly unlike many batteries;
- At end of life, there are no hazardous materials for disposal unlike many batteries.

Supercapacitors have the following disadvantages:

- High cost ;
- Low energy density;
- High self-discharge the rate is considerably higher than that of an electrochemical battery;
- Linear voltage versus charge. As a capacitor discharges, its voltage decreases to 0V (chemical batteries have much more stable output voltages, for example lithium ion batteries run from about 3-4V).

The supercapacitors are used in different activity areas: renewable energy, public sector, medicine, military, etc. They are important for the future. Supercapacitors are a key of engineering because they provide an economical, quiet and pollution-free alternative to diesel terminal tractors.