

- **Organization:**  
Science&Educational Centre “Nanomaterials in Accumulation and Generation Energy Devices” at the Vasyl Stefanyk PreCarpathian National University
- **Legal status** legal entity – University
- **FP’s experience** -

FP7 Research Area  
Energy, NMP

Keywords  
Carbon Electrochemical Sources, Renewable Energy Devices, Nanotechnology.

Title of the proposed projec]  
Supercondenser and Electrode Materials for Their Fabrication

Project description

**Description**

The hydro-thermal method for porous carbon material reception at high pressure and technology modes their treatment, as thermal, chemical, and laser modification are development. This invention give perspective material for new generation of condensers. Cheap and ecology plant materials with surface > 1000 m<sup>2</sup>/g are used. The parameters of got supercondensers are higher than best world samples, and on 3-4 times is cheaper with carbon materials of famous world productions.

**Main properties:**

For improvement of supercondensers characteristics it was spent additional activation of received material (chemical, laser, thermal). The way of chemical updating for electrochemical condensers had been spent processing by nitric acid that has given the chance to raise specific capacity of condensers on 5-20 % through clearing of material surface from different sort of not supervised impurity, and also through to occurrence of superficial functional groups which improve contact carbon/electrolyte. It has been received, that the capacity essentially depends on modes thermal annealing and reaches the maximum at annealing temperature 773 K and time of endurance 80 minutes at application of water electrolyte) and 873 K at time of endurance 90 minutes for organic electrolyte. It testifies that at the specified parameters of process (time, temperature) of high-temperature annealing is formed porous system with an optimum parity between volume parts of different diameter both for water, and for organic electrolytes.

**Table 1.**

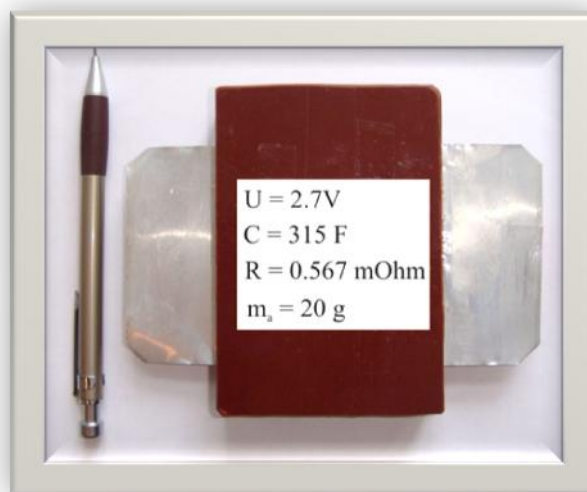
Supercondenser parameters (water-base electrolyte)

<b>1.</b>	<b>Specific capacity (F/g)</b>	<b>190</b>
<b>2.</b>	Specific internal resistance, (Ohm·cm <sup>-2</sup> )	0.1
<b>3.</b>	Specific energy of device (Wt*hour/kg)	4.6
<b>4.</b>	Self-recharge, V	0.18
<b>5.</b>	Voltage (V)	1.0
<b>6.</b>	Coulomb effectivity (>10 <sup>5</sup> cycles)	0.96

**Table 2.**

Supercondenser parameters (non-water- electrolyte)

<b>1.</b>	<b>Specific capacity (F/g)</b>	<b>56</b>
<b>2.</b>	Specific internal resistance, (Ohm·cm <sup>-2</sup> )	1.1
<b>3.</b>	Specific energy of device (Wt*hour/kg)	18.0
<b>4.</b>	Voltage (V)	2.7

**Areas of Application**

Parameters of the supercondensers generated on the basis of received porous carbon material from raw materials of phyto-genesis, correspond the best world samples. Thus received material is in 3-4 times more cheaply in comparison with carbon materials of leading world firms.

**Stage of Development**

Patents of Ukraine on Inventions:

N 80761 Sources of electrical current.

N 80764 Supercondenser.

N 81673 Lithium-Ionic Sources of electrical current.

N 85677 Galvanic element and reception method for their electrode materials.

Patents of Ukraine on Utility Models:

N 24159 Storage of electrical energy.

N 34215 Electrode materials for Lithium electro-chemical Sources of current and method of their reception.

N 37278 Modification method by high laser irradiation of nano-porous carbon.

**Budget estimation (EUR)****550 000 EUR****Key partners already involved**

Heijlundzjanj Technical University (Harbin, China)

Lublin Technical University (Lublin, Poland)

National University 'Lviv Polytechnica' (Lviv, Ukraine)

G.V. Kurdyumov Institute of Physics of Metals NAS of Ukraine (Kyiv, Ukraine)

**Profile of a partner**

Type of organization

- + [Research organization]
- + [University (High School)]
- + [Industry]
- + [SME]
- [Regional authority]
- [Other]

Partner's role in the project

1) [Administrative Coordinator] or  
[Scientific Coordinator] or  
[Partner]

2) [Research]  
[Technology development]  
[Training]  
[Demonstration]  
[Dissemination]

[Country preferred]

EU (MS or AS)

### Contact person

[Mr / Ms / Dr / Prof]

**Prof.**

First Name / Family Name

**Ivan Budzulyak**

[Organisation]

**Vasyl Stefanyk PreCarpathian National University**

[Position]

**Director of Science&Educational Centre**

tel./fax.: Tel.: +(380)-342-596179, Fax: +(380)-3422-31574

e-mail: [sec\\_nano@pu.if.ua](mailto:sec_nano@pu.if.ua)

address: 57, Shevchenko Str., Ivano-Frankivsk, 76018, Ukraine

web-site: <http://www.pu.if.ua/depart/noc/www2/index.html>