

Photo gallery: Peoples, Equipments, Laboratory



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PreCarpathian National University
Science & Educational Centre
**“NANOMATERIALS IN
THE ENERGY GENERATION
AND ACCUMULATION DEVICES”**

by support:

- CRDF (USA)
- USAID (USA)
- Ministry of Education and Science of Ukraine
- Vasyl Stefanyk PreCarpathian National University (Ukraine)



SEC Address:

SEC "Nanomaterials in the energy generation and accumulation devices"

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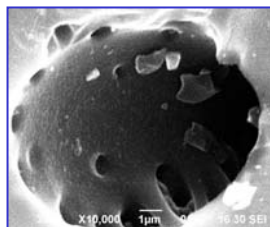
University Rector:

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Research directions "Porous carbon materials"

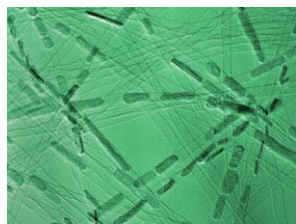
Main objectives

- The obtaining and physical-chemical investigation of nanoporous carbon (NC) as supercapacitor's electrode materials.
- The optimization of obtaining technology of NC based on the base of plant raw material.
- The development of new technologies of NC modification with the aim of supercapacitor's specific energy characteristics increasing.
- Complex investigations of structure and electrochemistry compounds materials on the base of NC.



"Electrode materials for lithium power sources in oxides, hydroxides, solts structures bases on metals and metalloids"

Main objectives



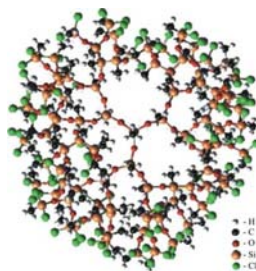
- The optimization of obtaining technology of nanosized TiO₂, H₂TiO₃, Mg(OH)₂ materials.
- The increasing of characteristics of lithium power sources on their bases.
- The obtaining of cathode powder materials on the base of metal and metalloids sulfides and fluorides and development of lithium power sources

with superhigh specific energy characteristics.

"Magnetic nanomaterials & Dye Sensitized Solar Cell"

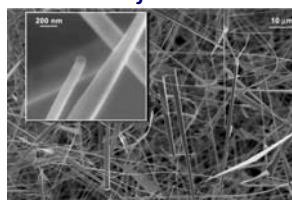
Main objectives

- The development of new methods of nanomaterials synthesis on the base of Fe oxides- hydroxides and Fe,Cr,Mn,V-doped TiO₂.
- Testing of obtained compound as electrode materials for secondary lithium power sources.
- The elaboration of electrode materials for low-cost and effective photoelectrochemical devices-dye sensitized solar cells.
- Electrochemical devices based on the photointercalation Li⁺.



"Cathode materials for lithium power sources on the base of spinel and rutile structures"

Main objectives



- The development of cathode materials on the base of Mg-modified spinel and rutile structures.
- The cathode materials of lithium power sources on the base of nano- and microdispersed forms of Fe₃O₄.
- The investigation of intercalation/ deintercalation properties of Li-Fe spinels as function of synthesis conditions, doping, morphology.

Expected results of Project realization

Scientific activity

The general strategy development of novel nanomaterial obtaining with foreseen modification their physical&chemical properties for their optimal usage in engineering of energy generation and accumulation devices

- optimal conditions determination of receipt and structural modification nanodispersive materials on the basis of oxides Ti, Si, Mg, Zn and carbon;
- Time- and temperature-stable values of specific-capacitance lithium electric energy sources up to 2000 W h/kg;
- Primary lithium cell with the specific energy up to 3400 mA·h/g;
- High efficient and low-cost secondary lithium-ion cell.

Fundamental study the process of electrochemical intercalation of nanodispersed powder materials by the lithium ions

- detailed investigations of crystalline, electronic, magnetic structure changes, phase composition and morphology of nanodispersive oxides Ti, Si, Mg, Zn, spinel compositions;
- Large-scale researches of physical and chemical properties of intercalates compounds;
- study the kinetics and thermodynamics of processes of intercalation;
- Photointercalation phenomena.

Optimization the conditions and regimes of getting and proper modification nanoporous carbon as base material for forming electric energy accumulator of superhigh capacity

- research electron-ion processes in supercapacitors on boundaries of electrode/electrolyte and influence of surface morphology, porosity of material on the value of energetic parameters of supercapacitors;
- Supercapacitors with the specific capacity up to 210 F/g ;
- Technical documentation on the industrial making of the PCM.

Educational activity

- Integration scientific and educational sectors of work SEC through adaptation the programs of the special educational courses which will be thought for the students of «Physics»& «Applied Physics» specialties at preparation of specialists and master's degrees in directions «Physical materials science», «Radio electronic materials science» to the scientific program of Project;
- Edition of the special educational-methodical materials ;
- The realization on a base SEC of master's, bachelor's, PhD dissertation's researches within the framework of implementation the scientific projects ;
- The implementation of the project's results in educational-scientific activity of students.

International activity

- Creation new connections with international organizations, which give grant support for the realization the scientific researches, exchange researchers, students ;
- A campaign will be realized for this purpose, related to the management of the got scientific and technical production, which also will include preparation technical documentation, development of business plan.