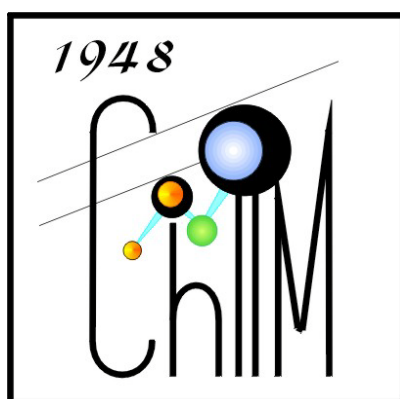


FACULTY OF INDUSTRIAL CHEMISTRY AND ENVIRONMENTAL ENGINEERING



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RESEARCH CENTRE PROTECTION AND DEPOLLUTION WATER ENGINEERING AND ENVIRONMENTAL ANALYSIS OF INDUSTRIAL PROCESSES - P.D.W.E.E.A.I.P.

GENERAL PRESENTATION

This research centre is a CNCSIS accredited, type C, research centre reapproved by CNCSIS in 12.09.2006, according to CNCSIS certificate nr. 28. The director of the Center is **Assoc. prof. dr. eng. Petru Negrea**.

MAIN ACTIVITIES

The Centre accomplishes research and design in the following topics:

- Environmental analysis of industrial processes
- Drinking and industrial water treatment
- Wastewater treatment
- Process control equipments for research plants in chemical industry
- Control systems using computers for researching plants and low tonnage plants in chemical industry
- Intensive methods for the exoneration of soil from radioactive minerals exploitation and processing areas in the condition of natural disasters or entropic accidents
- Mathematical modeling and numerical simulation of environmental pollution and depollution processes
- Modeling, simulation and process control
- Heat transfer organic agents
- Unit processes
- Magnetic Fluids: Preparation, Characterization and Applications
- The Intensification of Transfer Processes
- Rheological characterization of the substances
- Studies and projects for thermo-technical installations of the silicates industry
- Electrochemical processes
- Obtaining and characterization of oxide compounds

CONTACT

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RESEARCH FIELDS

- **Environmental analysis of industrial processes**

Keywords: environmental, pollution, waste

- **Drinking and industrial water treatment**

Keywords: water treatment, drinking water, industrial water

- **Wastewater Treatment**

Keywords: waste water treatment, pollution

- **Process control equipments for research plants in chemical industry**

Keywords: measuring, control devices

- **Control systems using computers for researching plants and low tonnage plants in chemical industry**

Keywords: process control, research and low tonnage plants

- **Intensive methods for the exoneration of soil from radioactive minerals exploitation and processing areas in the condition of natural disasters or entropic accidents**

Keywords: Climate changes, pollution, risk, sustainable chemistry, modeling

- **Mathematical modelling and numerical simulation of environmental pollution and depollution processes**

Keywords: modeling, simulation, environmental protection

- **Modelling, simulation and process control**

Keywords: modeling, simulation, optimization, process control, absorption-desorption with chemical reaction

- **Oily compounds extraction from waste waters using magnetic fluids**

Keywords: extraction, magnetic fluid

- **Coordinative compounds with organic ligands**

Keywords: coordinative compounds, heterocyclic compounds, hydroxycarboxylic acids, pharmaceutical substances, pigments, dyes

- **Synthesis of nanocomposites with controlled magnetic, optic and catalytic properties**

Keywords: nanoparticles, sol-gel, silica, magnetic, catalytic, polyols

- **Homo-and heteropolynuclear compounds with organic ligands**

Keywords: organic ligand, polinuclear compound, magnetic materials, catalysts, pigments, ferrites, chromites

➤ **Physical Chemistry. Chemically Active Species Grafted on Polymer-Supports**

Keywords: catalysis, homogeneous catalysts, heterogeneous catalysts, polymer-grafted catalysts, polymer-grafted reagents, polymer-support

➤ **Physical Chemistry. The obtaining and characterization of some oxide compounds**

Keywords: solid-state, oxide compounds, unconventional methods

➤ **Organic Electrochemistry**

Keywords: organic electro synthesis, organic electro reduction and oxidation

➤ **Electro catalysis**

Keywords: skeleton electrodes, thermal arc spraying, potentiometer sensors

➤ **Electroplating**

Keywords: copper, zinc, nickel electrodeposition, brighteners

➤ **Fuel Cells**

Keywords: fuel cells, skeleton electrodes, proton exchanges membrane, anion exchange membrane

➤ **Synthesis of ceramic materials through hydrosilicatic forerunners**

Keywords: ceramic, hydrosilicatic, synthesis

➤ **Semi conducting glasses. Fast ion-conducting glasses. Redox equilibrium in glasses. Low melting glasses for fusion type application**

Keywords: conducting, glasses, redox equilibrium, vitreous systems

➤ **Ceramic glazes. Synthesis and characterization of thermo resistant pigments**

Keywords: ceramic glazes, thermo resistant pigments, synthesis method

➤ **Chemistry and technology of building materials**

Keywords: cements, mineral binders
Mathematical modeling and numerical simulation of soil depollution processes.

Researches in WATER TREATMENT AND PURIFICATION

The activity intensifying and diversifying of the industrial processes leads to the quality degradation of water sources, with important implications for water supplies. In this context it is important to research and to elaborate some treatment and purification technologies, more efficient and at low costs. The research activity

was concerning with the majority of aspects involved by water chemistry and technology, as follows:

- physical and chemical characterization of water supplies and of wastewaters
- researches concerning water treatment for drinking and industrial purposes
- researches concerning the technologies of industrial and municipal wastewater treatment

Results of the research activity were published in journals of specialty and communicated at the national and international Symposia.

RESEARCH TEAM

Georgeta Burtica, Aurel Iovi, Petru Negrea, Rodica Pode, Ioan Ursoiu, Adina Negrea, Eugen Lungu, Marius Gheju, Florica Manea, Laura Coheci, Giannin Moșoarță, Lavinia Lupa, Camelia Podariu, Cristina Proca, Ramona Ghiga, Mihaela Ciopec.

Researches in INORGANIC CHEMICAL TECHNOLOGY

Different processes for obtaining of the new products, with superior qualities have been studied (chemical fertilizers with microelements, inorganic salts, etc.), for turning to good account of the native raw materials, industrial wastes and for the recovery of the useful compounds from wastewaters.

Researches in:

- mineral fertilizers: urea, ammonium nitrite, NP, NPK, fertilizers with microelements
- improving and modernizing of the technological processes
- Turning to good account of some native minerals zeolites for wastewaters treatment and for the obtaining and conditioning of the fertilizers with microelements.

The results of researches were applied in industry.

RESEARCH TEAM

Aurel Iovi, Petru Negrea, Georgeta Burtică, Rodica Pode, Laura Coheci, Lavinia Lupa, Mihaela Ciopec

Researches in PROCESS CONTROL EQUIPMENTS FOR RESEARCH PLANTS IN CHEMICAL INDUSTRY

Some specific control equipments for research plants from chemical industry (measurement and control of small and micro gas and liquid flows, gas and liquid compositions, pressure) using as information support low pressure signals (500-3000 N/m²).

Elaboration, design and realization of a high performance reference models.

Keywords: measuring, control devices

RESEARCH TEAM

Delia Perju, Marcel Suta, Carmen Rusnac, Raul Moldovan

Researches in CONTROL SYSTEMS USING COMPUTERS FOR RESEARCHING PLANTS AND LOW TONNAGE PLANTS IN CHEMICAL INDUSTRY

Realization of some specific control equipments using computers and process interfaces for automation of laboratory, research and low tonnage plants from chemical industry.

Elaboration, projecting and realization of control equipments using computers, process interfaces and proper software programs.

RESEARCH TEAM

Delia Perju, Marcel Suta, Carmen Rusnac, Raul Moldovan, Mirela Calisevici, Sorin Marinescu.

Researches in INTENSIVE METHODS FOR THE EXONERATION OF SOIL FROM RADIOACTIVE MINERALS EXPLOITATION AND PROCESSING AREAS IN THE CONDITION OF NATURAL DISASTERS OR ENTROPIC ACCIDENTS

Chemical decontamination of soil in the presence of ultra-sounds

Mathematical models and methods regarding the transfer mechanism in solid-liquid heterogeneous systems for the selection of optimal hydrodynamic parameters

Implementation of interface equipment in measurement devices

Keywords: Climate changes, pollution, risk, sustainable chemistry, modeling

RESEARCH TEAM

Delia Perju, Dana Silaghi – Perju, Carmen Rusnac, Raul Moldovan, Gabriela Alina Brusturean, Harieta Pirlea, Sorin Marinescu

Researches in MATHEMATICAL MODELING AND NUMERICAL SIMULATION OF ENVIRONMENTAL POLLUTION AND DEPOLLUTION PROCESSES

Mathematical modeling and numerical simulation of soil depollution processes

Elaboration of analytical and statistical models of air pollution phenomenon

Waste recycling process control and optimization

Keywords: modeling, simulation, environmental protection

RESEARCH TEAM

Delia Perju, Dana Silaghi Perju, Carmen Rusnac, Gabriela Alina Brusturean, Harieta Pirlea, Sorin Marinescu, Flavius Dobren.

Researches in MODELING, SIMULATION AND PROCESS CONTROL

Modeling and simulation of chemical processes using programming languages and software in process engineering: MATLAB, HYSIS, Aspen Plus, Aspen Custom Modeler;

Apply chemical reactor analysis, process modeling, simulation and optimization to chemical and petrochemical plants and find out solutions for industrial problems;

Modeling, simulation and process control of absorption-desorption with chemical reaction processes.

RESEARCH TEAM

Teodor Todinca, Carmen Rusnac, Alina Brusturean

Researches in OILY COMPOUNDS EXTRACTION FROM WASTE WATERS USING MAGNETIC FLUIDS

It was studied the oily fraction recovery (especially oil products) from waste waters using magnetic fluids. The process is strongly influenced by the magnetic field presence; both the oily fraction and the magnetic phase could be recovered;

RESEARCH TEAM

Zeno Gropsian, Andra Tamas.

Researches in THE PERFORMANCE OF THE COLUMNS WITH STRUCTURED PACKINGS

The structured packing present a high efficiency by comparison with the random packing because of the very high specific surfaces. It was followed the knowledge of wettability degree influence in extraction or rectification processes. The aim of the future experiments is the increase of wettability degree through electrochemical or chemical activation

RESEARCH TEAM

Zeno Gropsian, Andra Tamas

Researches in CONDITIONING MODELS OF SEWAGE SLUDGE

The aim of this research consists in efficiency evaluation of chemical conditioning models by calculation of the sludge volume index (SVI), the specific resistance to filtration to improve sludge dewatering, as well as appropriation of a statistic mathematic model for the correlation of the obtained results.

RESEARCH TEAM

Vasile Pode, Andra Tamas

Researches in NANOCOMPOSITES WITH CONTROLLED MAGNETIC, OPTIC AND CATALYTIC PROPERTIES

Nanocomposites of type ferrite and ferrite/SiO₂ were synthesized trough two original methods: the thermal

decomposition of some heteropolynuclear complex compound (with hydroxocarboxylic anions as ligands) and a modified sol-gel methods.

The fine nature of the obtained nanoparticles gives to the synthesized nanocomposites special magnetic properties that can be used in potential applications. Studies have been made in order to establish the dependence between the synthesis conditions, the dimensions of nanoparticles and their properties.

Studies have been made for the synthesis of hybrid polyol-silica matrix, correlation between synthesis conditions and textural properties of the silica matrix, for its use as support for some catalysts.

Studies are going to be made for the synthesis of metallic nanoparticles in silica matrix, with special properties and for the use of these materials as thin films for biological and environmental applications.

RESEARCH TEAM

Mircea Ștefănescu, Marcela Stoia

Researches in HOMO - AND HETEROPOLYNUCLEAR COMPOUNDS WITH ORGANIC LIGANDS

Synthesis and characterization of some inorganic compounds in order to obtain simple and mixed oxides with catalytic, pigmental and magnetic properties

A new synthesis method has been carried out in order to obtain some homo - and heteropolynuclear compounds with hydroxocarboxylic acid anions as ligands. The simple and mixed oxides with special properties have been obtained by thermal conversion of some complex compounds

RESEARCH TEAM

Mircea Niculescu, Mircea Ștefănescu, Marcela Stoia, Raluca Dumitru, Ilie Julean

Researches in PHYSICAL CHEMISTRY OF SOLIDS. OBTAINING AND CHARACTERISATION OF SOME OXIDE COMPOUNDS

The properties of the oxide compounds formed by reactions in the solid state are significantly dependent on the synthesis method used, respectively on the initial state of the reactants.

For the obtaining of some oxide compounds, different synthesis methods have been used: a) the sol-gel method; b) thermal conversion of certain complex combinations; c) combustion synthesis; d) hydroxide co precipitation; e) annealing of salts and/or oxides mixtures. The

reactivity of the systems was studied comparatively for the different synthesis methods used.

RESEARCH TEAM

Cornelia Păcurariu, Dumitru Becherescu, Ioan Lazău, Radu Ioan Lazau, Zoltan Ecsedi, Robert Ianos, Marius Jurca

Researches in ORGANIC ELECTROCHEMISTRY

Electrochemistry represents today a very convenient method for the synthesis of a variety of important organic compounds, which in many cases have been extended to an industrial scale.

Since 1982 theoretical and practical investigations have been made upon electrode processes of organic electrochemistry. The synthesis of quinine, hydroquinone, and ethylene glycol has been analyzed, especially in undivided electrochemical reactors. Studies upon mediated reduction and oxidation of organic compounds have been undertaken.

RESEARCH TEAM

Nicolae Vaszilcsin, Andrea Kellenberger, Mircea Dan, Narcis Duțeanu

Researches in ELECTROCATALYSIS

Obtaining, characterization and application of the electrodes with catalytic activity.

Methods for the preparation of electrocatalytic films have been elaborated in our research team, based on the thermal decomposition of some complex compounds and through thermal arc spraying technique. These films have been characterized through scanning electron microscopy, X-ray diffraction and voltammetry. The practical applications refer to water electrolysis and to the synthesis of some organic compounds.

RESEARCH TEAM

Nicolae Vaszilcsin, Andrea Kellenberger, Mircea Dan, Narcis Duțeanu

Researches in ELECTROPLATING

Obtaining and characterization of metal coatings

Studies regarding the influence of the nature of the galvanic additives upon the quality of the metal deposition have been made. Metal layers have been characterized by X-Ray diffraction, scanning electron microscopy and energy dispersive X-ray microanalysis. The practical applications refer to the replacement of the cyanide galvanic baths with non-toxic ones.

RESEARCH TEAM

Nicolae Vaszilcsin, Andrea Kellenberger, Mircea Dan, Narcis Duțeanu, Radu Bănică

Researches in FUEL CELLS

The conventional energy systems are the main source of pollution on our planet. Considering the decreasing of

the Earth's resources of hydrocarbons, it is necessary to improve an alternative energy conversion technology such as the fuel cells. This technology offers many attractive possibilities for reducing the air pollution, diminishing climate changes and preserving our natural resources. Widespread application of this technology is still prohibitive because materials used to make electrodes are expensive.

The aim of our research is the reducing of the H₂-O₂ fuel cell costs by changing the Pt based electrodes with non-noble based electrode obtained using various methods (thermal decomposition, thermal spraying).

RESEARCH TEAM

Nicolae Vaszilcsin, Andrea Kellenberger, Mircea Dan, Narcis Duțeanu, Radu Bănică

Researches in *SYNTHESIS OF CERAMIC MATERIALS THROUGH HYDROSILICATE FORERUNNERS*

The use of hydrosilicatic forerunners from precipitate reactions to obtain at lower temperatures some high quality ceramic materials such as: wollastonite, enstatite, diopside, willemite, anortite, magnesium spinel and a multitude of oxidic pigments.

The studies in this field have been made at the "Politehnica" University of Timișoara since 1985. The researches have been materialized in a laboratory synthesis method of the materials involved. Verification of the behavior of some synthesized materials in industrial circumstances.

RESEARCH TEAM

Ioan Lazău, Dumitru Becherescu, Marius Jurca, Radu Ioan Lazău

Researches in *SEMICONDUCTING GLASSES. FAST ION CONDUCTING GLASSES. REDOX EQUILIBRIA IN GLASSES. LOW MELTING GLASSES FOR FUSION TYPE APPLICATION*

Studies regarding electrical conductivity in new molybdenum glass systems. Influence of different transitional ions upon conduction properties of glasses was studied. Synthesis and characterization of fast ion conducting glasses containing Ag⁺, Li⁺ and Cu⁺ ions. Glasses with optimal ion conductivity were design. New fast ion conducting glasses were obtained. The behavior of redox equilibrium Mn²⁺/Mn³⁺ was studied in the following binary systems: SiO₂-R₂O, P₂O₅-R₂O and B₂O₃-R₂O.

The influence of melting conditions (reducing-oxidizing) upon the presence of Ti⁴⁺ was studied, as well as its relationship with the iron present. The reciprocal influence of Ti⁴⁺ and other

different ions usually present as impurities upon the color in industrial glasses was studied.

Design, synthesis and characterization of low melting glasses for fusion type applications was studied. The reciprocal influence fusion glass-support glass was investigated using microscopic techniques.

RESEARCH TEAM

Adina Lația, Cosmin Vancea

Researches in *CERAMIC GLAZES. SYNTHESIS AND CHARACTERIZATION OF THERMORESISTANT PIGMENTS*

The research field extends over the conventional and unconventional synthesis methods for thermoresistant pigments designed to the ceramic industry (ceramic glazes and enamels), characterization of the obtained pigments from the point of view of crystallochemical structure and color. At the same time, the behavior of the synthesized pigments in the glass generating melt is being pursued.

RESEARCH TEAM

Ioan Lazău, Cornelia Păcurariu, Dumitru Becherescu, Radu Ioan Lazău, Zoltan Ecsedi, Robert Ianos

Researches in *CHEMISTRY AND TECHNOLOGY OF BUILDING MATERIALS*

Local waste materials are analyzed in order to use their potential resources in the field of building materials. Ecological and economical implications of waste or natural deposits especially from Romanian's regions: Transylvania and Banat, containing minerals with possible interest for buildings materials products and technology are investigated.

RESEARCH TEAM

Aurel Ștefan Todinca

RESEARCH PROJECTS

1. CNCSIS Grant No 226/14.09.2007, theme 7, code 337, type A: *H₂-O₂ (air) fuel cell with anion exchange membrane and non-noble metals electrodes*

Value: 33,000 RON

Director: Prof.dr.eng. Nicolae VASZILCSIN

Members: Prof.dr.eng. Corneliu DAVIDESCU
 Assoc.prof.dr.eng. Maria NEMEȘ
 Assoc.prof.dr.eng. Petru NEGREA
 Lect.dr.eng. A. KELLENBERGER
 Assist.eng. Mircea DAN
 PhD student Narcis DUȚEANU
 PhD student Radu BĂNICĂ
 PhD student Cristina PETRESCU

FIELD DESCRIPTION

Non-polluting energy sources, nanotechnologies.

ACTIVITIES AND RESULTS:

Study of the electrode processes on skeleton nickel based electrodes in alkaline media and the conception of a methanol-air fuel cell.

2. CNCSIS Grant No. A1/GR181/19.05.2007, theme 25, Code 714, type A : *New synthesis methods of some nanomaterials with customised properties*

Value: 13,000 RON

Director: Prof.dr.eng. Cornelia PĂCURARIU

Members: Prof.dr.eng. Dumitru BECHERESCU
Prof.dr.eng. Ioan LAZĂU
Prof.dr.eng. Corneliu DAVIDESCU
Lect.dr.eng. Cornelia MUNTEAN
Lect.dr. Mircea NICULESCU
Lect.dr.eng. Romul Marius JURCA
Assist. eng. Radu LAZAU
Assist. eng. Radu ARDELEAN
PhD student eng. Ianosev SILVANA
PhD student eng. Robert IANOȘ
Student Octavian MATEA
Student Buzatu DORU

FIELD DESCRIPTION:

Synthesis of some perovskites nanoparticles using the combustion reaction based on the exothermal redox reaction between the metal nitrate (oxidant reactant) and an appropriate fuel (reductive reactant).

ACTIVITIES AND RESULTS

Synthesis of the perovskites $\text{LaAl}_x\text{Cr}_{1-x}\text{O}_3$ ($x=0.90; 0.94; 0.96$) and $\text{La}_x\text{Sr}_{1-x}\text{CrO}_3$ ($x=0.40; 0.60; 0.80$) compounds using the combustion reaction between the metal nitrate and the fuels: urea, alanine, glycine. The effect of the oxidant to reductive ratio upon the structural properties of the synthesized compounds were also investigated.

3. CNCSIS Grant No. 58 GR/19.05.207, theme 13, Code 382, type A: *The strategies concerning the implementation of some physico-chemical treatment processes of municipal sludge in order to its environmental friendly reusing/disposal*

Value: 22,000 RON

Director: Prof.dr.eng. Rodica PODE

Members: Prof.dr.eng. Aurel IOVI
Prof.dr.eng. Georgeta BURTICĂ
Assoc.prof.dr.eng. Vasile PODE
Assoc.prof.dr.eng. Petru NEGREA
Lect.dr.eng. Florica MANEA
Assist.dr.eng. Marius GHEJU
Assist.eng. Laura COCHECI

FIELD DESCRIPTION

The objective of the project proposal is the development of physico-chemical methods for the treatment of sludges proceeded from

wastewater treatment plants, in order to reach the norms imposed by Romanian and European legislation. The theme justification is based on the great attention regarding complex problems of sludge management, environmental pollution sources, air contamination with pathogens agents. Also, in the treatment absence, the sludge deposition necessitates the large landfilling spaces. On the other hand, it is very well-known that the rehabilitation of environmental factors represent one of the global problem of humanity and this project can be have an important contribution at this problem solving. After entrance operation of European Directives: 91/156/CEE-Wastes and 91/271/CEE-Wastewater treatment, the problem of the reduction of the quantity of the sludge proceeded from wastewater plant and its re-using/deposition present high interest for EU countries and our country as well as, from the point of view of our county adhesion.

ACTIVITIES AND RESULTS

The physico-chemical properties of sewage sludge were monitorized during the year of 2006, January – July and a data base was created. Also, the informations of the sludge dewatering characteristics were obtained. The results will be used to identify the appropriate treatment technology, elaboration and development of new findings related to the conditioning models, with high importance for the treatment flow, as guarantee of sludge volume minimization.

4. CEEEX PROAQUA - 631/03.10.2007: *Promoting innovative and sustainable technologies for drinking water treatment*

Value: 30,000 RON

Director: Prof.dr.eng. Georgeta BURTICĂ

Members: Prof.dr.eng. Corneliu DAVIDESCU
Prof.dr.eng. Aurel IOVI
Prof.dr.eng. Rodica PODE
Assoc.prof.dr.eng. Petru NEGREA
Lect.dr.eng. Ioan URSOIU
Lect.dr. eng. Adina NEGREA
Lect.dr.eng. Florica MANEA
Lect.dr.eng. Giannin MOȘOARĂ
Assist.dr.eng. Marius GHEJU
Assist.eng. Laura COCHECI
PhD student eng. Corina ORHA
PhD student eng. Cristina PROCA
PhD student eng. Maria Ioana CORB
PhD student eng. Camelia PODARU
PhD student eng. Dan DANIELESCU
PhD student eng. Aniela Carmen POP
PhD student Adriana BEBEȘLEA

FIELD DESCRIPTION

The research fields are focused on new technologies of drinking water - Water supply and sanitation.

ACTIVITIES AND RESULTS

The studies were focused on the evaluation of drinking water, surface water and groundwater quality and on the investigation of the treatment process used in various

locations within the Timis-Bega and some hydrographical basins, situated in the North-West of Romania. The major non-conform indicators and the potential pollution for natural resources were established and the best available technologies in drinking water were presented.

5. CEEX RIWATECH - 62/03.10.2005: *Advanced treatment technologies for industrial effluents recycling*

Value: 23,789 RON

Director: Prof.dr.eng. Georgeta BURTICĂ

Members: Lect.dr.eng. Florica MANEA
PhD student eng. Cristina PROCA
PhD student eng. Maria Ioana CORB
PhD student eng. Dan DANIELESCU
PhD stud. eng. Adriana BEBEȘLEA

FIELD DESCRIPTION

The research fields are focused on new technologies of industrial wastewater.

ACTIVITIES AND RESULTS

It was presented the actual research level regarding advanced treatment for wastewater recycling process, having in view the technical, economical and the influencing factors of the advanced treatment selection process.

6. CEEX MATNANTECH - CD - 1/14981/2007: *Multifunctional porous oxidic materials for retaining and degradation of priority dangerous substances from waters*

Value: 76,000 RON

Director: Prof.dr.eng. Rodica PODE

Members: Assoc.prof.dr.eng. Vasile PODE
Assist.eng. Laura COCHECI

FIELD DESCRIPTION

Researches related to synthesis and certain post – synthesis treatments of the new micro – and mesoporous oxidic materials, with high efficiency in the retaining processes of the main priority dangerous pollutants from waters.

Synthesis of new multifunctional synthetic porous oxidic materials, with the same functionality as international ones

Studies concerning the water remediation by decreasing of the inorganic and organic load

ACTIVITIES AND RESULTS

The investigation of the influence of the Ni^{2+} and Zn^{2+} on physico-chemical properties of the synthetic hydrotalcite, specifying the M(II)/M(III) ratio influence on the sorption capacity, aiming at wastewater treatment optimization. Also, we make an attempt to point at the so called “memory effect”- the reconstruction of interlayer of LDHs by

rehydration reaction - and its use in phosphate and nitrate anions removal from wastewater.

Studies related to influence of Ni/Mg substitution ratio on the sorption characteristics of phosphate and thiocyanate anions on Mg/Ni-Al-type hydrotalcites.

Studies related to influence of Zn/Mg substitution ratio on the sorption characteristics of phosphate and thiocyanate anions on Mg/Ni-Al-type hydrotalcites.

7. CEEX RELANSIN - 4/2007: *Biotechnologies integrated with physico – chemical processes for the municipal wastewaters and the sewage sludge treatment in order to its reusing*

Value: 40,500 RON

Director: Prof.dr.eng. Rodica PODE

Members: Prof.dr.eng. Corneliu DAVIDESCU
Prof.dr.eng. Aurel IOVI
Assoc.prof.dr.eng. Petru NEGREA
Lect.dr.eng. Adina NEGREA
Lect.dr.eng. Florica MANEA
Assist.dr.eng. Marius GHEJU
Assist.eng. Laura COCHECI
Assist.eng. Lavinia LUPA

FIELD DESCRIPTION

Development of the innovative biotechnologies integrated with physico – chemical processes for the advanced treatment of the municipal effluents in order to recycling.

Development of the technologies for the sewage sludge treatment with the aim of agricultural, industrial and peisagistical reusing or ecological final deposition

8. CEEX-Module II - Research project of Human Resources for Research; Project type of Excellence Research for young researches (ET), 2973/2007, *Smart sensors for wastewater quality monitoring*

Value: 50,000 RON

Director: Lect.dr.eng. Florica MANEA

Members: PhD student eng. Maria Ioana CORB
PhD student eng. Cristina PROCA
PhD student Andreea CIORBA

FIELD DESCRIPTION

This research proposal addresses the urgent needs for providing enhanced timely monitoring of organic pollutants in wastewater streams through the development of a chemical sensor based on an array of copper-copper oxides and C-based composite materials.

The following device parameters, i.e., sensitivity, selectivity, detection limits, stability, and short response time will be studied in detail. In addition, issues related to disposable, re-usable, and renewable smart sensors are being addressed in this research project.

While this novel type of smart sensors is focused on innovative routes of monitoring important pollutants in wastewater streams, the research goal is to contribute to the achievement of a major impact on the protection of the quality of water and the removal of impurities.

9. CEEEX Project: PC-D04-PT04-259/2005, 2005-2007, *Obtaining of TiO₂ nanocrystals doped with metal ions through alternative methods. Study of their applications in health, biology and environmental fields.*

Value: 18,000 RON

Director: Assoc.prof.dr. Mircea ȘTEFĂNESCU

Members: Prof.dr.eng. Lucian Mircea RUSNAC
Assist.eng. Marcela STOIA

FIELD DESCRIPTION

Nanoscience and nanotechnologies; obtaining of new nanomaterials (TiO₂ nanocrystals doped with metal ions) with controlled properties through new technologies and study of their applications in different fields: health, biology, environmental.

ACTIVITIES AND RESULTS

Studies on the sol-gel synthesis of TiO₂ nanocrystals doped with metallic ions; studies on the microwave or sonochemical assisted hydrothermal synthesis of TiO₂ nanocrystals doped with metal ions; investigations on the photocatalytic and bactericide properties of the TiO₂ nanocrystals doped with metal ions; physico-chemical characterization of synthesized TiO₂ nanoparticles (BET, SEM, TEM, RX diffractometry); comparative study of the properties of TiO₂ nanocrystals synthesized through different methods.

10. CEEEX – CERES Program, 05-D11-38/2007, *Advanced structural materials for optoelectronics micro-systems*

Value: 225,455 RON

Director: Lect.dr.eng. Adina LAȚIA

Members: Assist.eng. Cosmin VANCEA

FIELD DESCRIPTION

Advanced materials and technologies

11. CEEEX MENESCO – 51/2007: *Oxide compounds synthesis using unconventional synthesis methods – elaboration of theoretical background and applications for induced properties materials*

Value: 659,950 RON

Director: Prof.dr.eng. Ioan LAZĂU

Members: Prof.dr.eng. Cornelia PĂCURARIU
Prof.dr.eng. Corneliu DAVIDESCU
Assoc.prof.dr.eng. Petru NEGREA
Lect.dr.eng. Marius JURCA
Lect.dr.eng. Cornelia MUNTEAN
Lect.dr.eng. Adina NEGREA
Assist.eng. Radu LAZĂU
Assist.eng. Laura COCHECI
Assist.eng. Raluca DUMITRU
Assist.eng. Radu ARDELEAN
PhD student eng. Zoltan ECSEDI

PhD student eng. Robert IANOȘ

PhD student eng. Silvana IANOȘEV

FIELD DESCRIPTION

The synthesis of oxide compounds using unconventional synthesis methods, represent the most modern solution for obtaining advanced ceramic materials: nanocrystalline powders, controlled porosity films, etc. The main advantages of these methods are: a significant decrease of the temperatures and/or the soaking time related to the annealing phase in order to obtain the designed compounds, high purity, advanced dispersion degree (nanoparticles) of the resulted powders and, the most important, wide possibilities of controlling the characteristics of the product due to the synthesis conditions.

ACTIVITIES AND RESULTS

The project deals with the establishment of a correlation between the synthesis method which has been used, the working conditions and the characteristics of the resulted product. In order to achieve this purpose, there was pursued:

- The nature of the used alcoxid, temperature, pH and influence of the drying conditions upon the shape and pore size of sol-gel Al₂O₃ ceramic films.

- A new synthesis method based upon the thermal conversion of heteropolynuclear complex combinations resulted from the oxidation of polyols (1, 2 – ethandiol; 1, 2, 3 - propantriol) with metallic nitrates.

- The advantages given by this method (concerning the synthesis temperature, particle size and morphology) in obtaining spinel, cordierite and mullite powders in the system MeO-R₂O₃ (Me = Zn, Co; R = Al, Cr). For comparison, the same powders were synthesized via combustion route. In this case, there was correlated the reactivity of various nitrates with the nature of the fuel (urea, glycine, alanine) in connection with the morphology and size of the resulted particles.

12. CEEEX CONSINJECT – 63/2007: *Researches concerning the ecosystems integrate protection on building materials stable development with the abidance of the European Recommendations 96/61/CE, 1999/30/EC, 2000/76 CE*

Value: 20,000 RON

Director: Prof.dr.eng. Ioan LAZĂU

Members: Prof.dr.eng. Cornelia PĂCURARIU
Assist.eng. Radu LAZĂU
PhD student eng. Zoltan ECSEDI
PhD student eng. Robert IANOȘ

FIELD DESCRIPTION

Injection is an important part of construction work in rock and soil and is primarily used to change or improve the physical properties of a material, such as permeability, durability, strength or deformation properties. The term injection covers a number of methods and materials for different purposes.

A common injection method is permeation grouting, where grout is pumped into a geological structure under

pressure, but without disturbing the formation, in order to tighten or strengthen the soil or the rock. Due to relatively low cost and good availability, most of the permeation grouting today is done with cement-based injection grouts.

ACTIVITIES AND RESULTS

Studies have revealed that difficulties arise during the injection of suspension grouts into soil due to their Rheological behavior and selective filtration attributed to physicochemical characteristics. Concepts from the fields of cement chemistry, colloid chemistry, rheology, and transport processes are being synthesized to better understand and interrelate the early age microstructure of grout to its injectability and deposition in the interparticle pore space. Injection experiments include laboratory tests that are bench-scale and full-scale and results are used to quantitatively assess influential characteristics of both the wet grout during the permeation process and the wet grout deposited within the soil pores.

13. CEEEX SIWMANET – 115/1.08.2006:
Sustainable and integrated water resources management network

Value: 20,000 RON
Director: Prof.dr.eng. Georgeta BURTICĂ
Members: Lect.dr.eng. Florica MANEA
PhD student eng. Aniela Carmen POP

FIELD DESCRIPTION

Preservation and sustainable management of natural and artificial resources

ACTIVITIES AND RESULTS

The main objective of the SIWMANET research project is the excellence research poles chain development in the sustainable and integrated water resources, a chain that can be capable to attract national and international programs cooperation. In this direction, a workshop was organized at the “Politehnica” University of Timisoara: “University – Research – Industry interaction development for clean water”.

14. CEEEX REMSOL – 4414/2007, *Innovative combined technologies for protection and in-situ remediation of the polluted soils with heavy metals in the purpose of their bio-availability*

Value: 20,000 RON
Director: Assoc.prof.dr.eng. Petru NEGREA
Members: Prof.dr.eng. Rodica PODE
Lect.dr.eng. Adina NEGREA
Lect.dr.eng. Giannin MOȘOARCĂ
Assist.dr.eng. Marius GHEJU
Assist.eng. Laura COCHECI
Assist. eng. Lavinia LUPA

PhD student Ramona GHIGA

FIELD DESCRIPTION

The characterization of some polluted soils and the comparative analyse regarding the sequential repartition of the metals on the soil main components. The project has the duty to resolve the sterile deflationation from the Moldova Noua area, by applying of some efficient solution of the sterile cover with materials which lead to the stratus forming which could offer live condition to some plants which will maintain the sterile mass in the respective location.

ACTIVITIES AND RESULTS

Was realized the sequential analyze of the soil sampling from the settling pond in two situations:

- Uncovered soil where appeared spontaneous vegetation; the analyze was made in the soil profile at two depths;
- Covered soil with 10 cm of vegetable soil, cultivated with 20 – 30 cm of three different plants.

From the sequential analyze was established the different repartition of all the heavy metals studied in all the types of soils; was established in which proportion they are under interchangeable form, and in which proportion they adsorb specific. Was established the fraction of the organic complexes.

15. CEEEX-Module I - CFN-DYE 703/2007,
Development of nanostructured photo-electrochemical cell based on TiO₂ and dyes

Value: 860,000 RON
Director: Prof.dr.eng. Nicolae VASZILCSIN
Members: Assoc.prof.dr.eng. MARIA NEMEȘ
Assoc.prof.dr.eng. PETRU NEGREA
Lect.dr.eng. A. KELLENBERGER
Assist.eng. Mircea DAN
PhD student Narcis DUȚEANU
PhD student Radu BĂNICĂ

FIELD DESCRIPTION

TiO₂ nanocrystals, Gratzel cell, charge transfer.

ACTIVITIES AND RESULTS

TiO₂ nanocrystals synthesis, study of interfacial charge transfer

16. CNCSIS research grant, NO. 26788/2005, theme 27/2007, code CNCSIS 625, type A – *Simulation and optimum operation with advanced processes control systems for research plants from chemical industry*

Value: 20,000 RON
Director: Prof.dr.eng. Delia PERJU
Members: Assoc.prof.dr.eng. Marcel ȘUTA
Assoc.prof.dr.eng. D. SILAGHI-PERJU
Lecturer.dr.eng. Carmen RUSNAC
Assist.dr.eng. Alina BRUSTUREAN
PhD student chem-fiz. Harieta PÎRLEA
PhD student eng. Raul MOLDOVAN
PhD student eng. Mirela CALISEVICI

FIELD DESCRIPTION

There have been studied problems regarding the choice and use of the right analogue-numeric interfaces and of programs having appropriate optimal process control, so that the research and laboratory plants that were designed and studied allow high performances and assure a good quality of the chemical processes.

ACTIVITIES

For the year 2007 the following scientific objectives have been set:

- The elaboration of a program package for the optimal process control of laboratory plants such as heat exchangers, and discontinuous batch reactors. As associated activities the testing stands have been built and the adequate interfaces equipments have been selected and put into practice.
- The programs for the optimal process control of these research plants have been built.
- The implementation of the optimal process control procedures for the pipe in pipe type heat exchangers and discontinuous batch reactors equipped with heating-cooling jacket.

17. CEEEX research grant, PII, No. 057/03.10.2005 Phase 2007: *Soil exoneration using intensive methods from radioactive minerals exploitation and processing areas in the condition of natural disasters or entropic accidents, acronym RESOLRAD*

Value: 8,000 RON

Director: Prof.Dr.eng. Delia PERJU

Members: Assoc.prof.dr.eng. D.SILAGHI-PERJU
Lecturer dr.eng. Carmen RUSNAC
Assist.dr.eng. Alina BRUSTUREAN
PhD student chim-fiz. Harieta PÎRLEA
PhD student eng. Raul MODOVAN
PhD student eng. Sorin MARINESCU

FIELD DESCRIPTION

Studies regarding chemical decontamination of soil in presence of ultra-sounds.

ACTIVITIES

Mathematical modeling and methods regarding the transfer mechanism in solid-liquid heterogeneous systems in order to establish the optimal hydrodynamic parameters Implementation of interface equipments in measurement devices

18. CEEEX Research grant: 36-CEEEX-103/10/10/2005, Phase 2007, *“Modern technology for ecological fuel ethers synthesis” (grant acronym: “TEMOSIE”)*

Value: 30,000 RON

Director: Prof.dr.eng. Teodor TODINCA

Members: Lect.dr.eng. Carmen RUSNAC

Assist.dr.eng. Alina BRUSTUREAN

FIELD DESCRIPTION: technology and catalysts for fuel ethers synthesis (TAME, ETBE, etc.)

ACTIVITIES: Thermodynamics and intrinsic kinetics of fuel ethers synthesis

19. CNCSIS Grant No58GR/19.05.2006, theme 14, code 361, type A: *Contributions to filtration and drying processes improvement of sewage sludge from the Wastewater Treatment Plants.*

Value: 22,000 RON

Director: Dr.eng. Vasile PODE

Members: Prof. Dr.eng. Aurel IOVI

Dr.eng. Geza BANDUR

Dr.eng. Marius GHEJU

Dr.eng. Andra TAMAS

FIELD DESCRIPTION AND ACTIVITIES

The aim of this research consists in efficiency evaluation of chemical conditioning models by calculation of the sludge volume index (SVI), the specific resistance to filtration to improve sludge dewatering, as well as appropriation of a statistic mathematic model for the correlation of the obtained results.

1. PN II grant No. 56 / 14.09.2007, acronym ZEONANO: *Synthesis of functionalized zeolite materials with doped titanium dioxide nanoparticles and testing in water potabilization pilot stations*

Value: 15,000 RON

Director: Prof.dr.eng. Georgeta BURTICA

Members: Lect.dr.eng. Florica Manea

PhD. student eng. Aniela Carmen POP

PhD. student eng. Adriana BEBESELEA

Ec. Rodica NEAGU

FIELD DESCRIPTION:

Studies over the doped TiO₂ nanocrystals getting through alternative methods, processing to the efficient solutions to get the modified zeolitic materials with TiO₂ nanocrystals doped with metallic/nonmetallic ions, like the characteristics of source and drinking water and a dinking water decontamination

ACTIVITIES AND RESULTS

The necessary activities for project goal accomplishment are very good correlated with the general and specific stages and objectives, conform the follow description. In a first project stage will be actualized the scientific information regarding to acquiring the doped TiO₂ nanoparticles, involve them in zeolites, also the source and drinking water quality and the drinking water decontamination methods (CO, P1, P2). On base to literature data and to anterior experience of the involved team project will be make the adaptation of the existent installations from

institute, of the methods and protocols for preliminary materials acquiring.

2. PN II grant, No. 26/2007: Complex researches regarding the obtaining and magnetic properties of the ferromagnetic nanoparticles systems of $\text{Co}_8\text{Fe}_{3-\delta}\text{O}_4$ surfactant/ unsurfactants and compatible with potential applications in cancer therapy

Value: 20,000 RON

Director: Prof.dr.eng. Mircea ȘTEFĂNESCU

Members: Assist. Dr. Eng. Marcela STOIA
Assist. Dr. Eng. Monika SIMON
PhD. Eng. Thomas DIPPONG

FIELD DESCRIPTION:

The research field in which is in framed this project is those of synthesis through unconventional methods (thermal decay of the carboxilate type precursor, co-precipitation method) of the cobalt ferrite type $\text{Co}_8\text{Fe}_{3-\delta}\text{O}_4$ ($\delta = 0,01; 0,02; 0,2; 0,8; 1,0; 1,1; 1,5$) under nanoparticles forms, which trough surfactare with specific surfactants become biocompatible magnetic nanoparticles, in the view of their use in malignant tumour treatment.

ACTIVITIES AND RESULTS

Research studies in the field of the surfactants and unsurfactants nanoparticles systems of the $\text{Co}_8\text{Fe}_{3-\delta}\text{O}_4$ ferrite.

Literature research in the field of synthesis through chemical methods of the $\text{Co}_8\text{Fe}_{3-\delta}\text{O}_4$ nanoparticles.

Research regarding the magnetic properties of the surfactants and unsurfactants nanoparticles systems of the $\text{Co}_8\text{Fe}_{3-\delta}\text{O}_4$ ferrite.

Reference material about the recent research regarding the obtaining and magnetic properties of ferrite nanoparticles of surfactants and unsurfactants of $\text{Co}_8\text{Fe}_{3-\delta}\text{O}_4$, biocompatible and biodegradable, and of the scientific and technique possibilities of their applying in cancer treatment. Study of the special literature regarding the most recent research and results in the field of chemical synthesis of $\text{Co}_8\text{Fe}_{3-\delta}\text{O}_4$ nanoparticles, with potential applying in biology and medicine.

Studies regarding the synthesis through co-precipitation method of Co ferrite nanoparticles, surfactants and unsurfactants, biocompatible and biodegradable.

3. MENER research grant, PNCDI, No.758/2007: Method and installation of chlorine producing and its use in drinkable water chlorination through direct injection in feeding pipe.

Value: 335,000 RON

Director: Prof.Ph.Eng. Nicolae VASZILCSIN

Members: Ph. Eng. Maria NEMEȘ
Ph. Eng. Petru NEGREA

Ph. Eng. Andrea KELLENBERGER

Phd. Eng. Mircea DAN

Ph. Eng. Narcis DUȚEANU

Phd. Radu BĂNICĂ

Eng. D-tru TUCU

Eng. D-tru MNERIE

Eng. Titus SLAVICI

FIELD DESCRIPTION

The research field of the project is in the frame of specified thematic area in the durable management of the natural and artificial resources, the drinkable water management occupy an important place through his special and direct impact on the human health.

ACTIVITIES

Research study about the method analysis and laboratory research of the chlorine and organochlorine products methods analysis, and also the identification, communication and publishing of the obtained results.

4. CEEEX – Modul III grant, No. 47/2007: The reinforcement and expanding of the partner ship at regional and European level regarding the electrochemical methods applying in water control and depollution.

Value: 9,025 RON

Director: Prof.Ph.Eng. Nicolae VASZILCSIN

Members: Ph. Eng. Andrea KELLENBERGER
Phd. Eng. Mircea DAN
Ph. Eng. Narcis DUȚEANU

FIELD DESCRIPTION

The general objectives of this project consist in international collaboration expanding in the field of the electrocatalytic processes of oxidation and reduction of some organic and inorganic compounds, which to constitute the scientific support for applying in environmental protection field.

ACTIVITIES

Activities support, of sustaining and promotion of activities and results, inclusive the dissemination of the information, education, scientific manifestations, international partnership motilities.

PhD RESEARCH ACTIVITIES

1. Prof.dr.eng. Ilie JULEAN, PhD supervisor in *Chemistry*

PhD students:

- Lucian Barbul: *Homo- and heteropolynuclear compounds with hydroxycarboxylic acid anions as ligands, used as precursors for oxidic systems*
- Eleonora Marian: *Complexes of transition elements with medicinal substances*
- Georgeta Ursulescu: *Studies concerning the accuracy and precision of some analysis techniques of biological materials*
- Marcela Bota: *Studies concerning some basic compounds used to obtain inorganic pigments*

- Thomas Dippong: *Investigations about the compounds obtained through complexing or precipitation reactions with transition metal ions*
 - Maria Ilici: *Studies about complexes of transition metals with heterocyclic compounds*
2. Prof.dr.eng. Aurel IOVI, PhD supervisor in *Chemical Engineering*
- PhD students:*
- Elena Laura Popescu: *Studies about the obtaining process of the complex combinations of the metals ions with spectral use*
 - Eugen Lungu: *The use of activated oxidants in the waters treatment domain*
 - Claudia Morgovan: *The reuse of the metals ions from galvanic industry wastes under fertilizers with microelements*
 - Dalila Marșavina: *The studies of the equilibriums from the undergrounds waters in the view of the use of these as drinkable waters*
 - Dan Roșu: *The behavior of the complex combinations with microelements in the obtaining process of the fertilizers*
 - Angela Magda: *Studies about some oxygenate compounds of boron with applied in fertilizers technologies with microelements*
 - Mihaela Gliga: *Technologies of reuse of some useful substances from wastes*
 - Monica Ihoș: *Unconventional technologies of elimination from water of some specific pollutants*
 - Cornel Bogatu: *Specific technologies in the water technology*
 - Laura Coheci: *Oxidative chemical processes for soil decontamination*
 - Daniela Micu: *The study of the toxic compounds elimination processes from rural waters sources*
 - Adrian Gheorghe Rus: *The study of the obtaining processes of the active principles from medicinal plants and their characterizations*
 - Mihaela Andoni: *Studies about the reduction processes of the environmental pollution from mercuric compounds*
 - Carmen Lău: *Studies regarding the characterizations and the use of some nano materials of type TiO_2 in the ambient environmental decontamination*
 - Ioan Macarie: *Contribution to the synthesis of some amino – organic – phosphoric with biological applied*
 - Valeria Rus: *Studies regarding the sludge treatment from the local purification plant in the view of put in good use or elimination*
- Mihaela Maria: *Studies regarding the control and effect of the exposure to hard metals in the professional and unprofessional medium*
 - Florina Popa: *Contributions to obtaining and using antiseptic agents based on synergetic mixture*
3. Prof.dr.eng. Georgeta BURTICĂ, PhD supervisor in *Chemical Engineering*
- PhD students:*
- Amalia Corina Macarie: *Contributions at the eco-technologies elaboration for the metallic ions recovery from the used electrolyte*
 - Petre Vili Furdui: *Studies regarding the monitoring and characterization of the drinking water resources from the Romania's west region*
 - Nicoleta Luminița Jurj: *Contributions regarding improvement of the municipal wastewater treatment technology for fall in with the European Normative*
 - Elena Gabriela Cical: *Studies concerning the improvement of drinking water quality results from accumulation lake*
 - Mihaela Toader: *Considerations regarding municipal wastewater treatment processes improvement*
 - Cristina Proca: *Water decontamination technologies used new composite materials based on inorganic salts*
 - Camelia Podaru: *Studies about obtaining chemically modified materials with an application in water quality cleaning and monitoring*
 - Ioana Maria Corb: *Studies regarding the production and the characterization of new alumina silicate materials with utilization in ecotechnologies*
 - Aniela Carmen Pop: *Studies regarding waters organic load monitoring using carbon in epoxy and polystyrene matrix composite electrodes*
 - Adriana Ioana Bebeșelea Sterp: *Studies regarding anodic oxidation treatment of cellulose and paper industry wastewaters*
 - Cristian Dan Danielescu: *Studies regarding cellulose and paper industry wastewaters advanced treatment*
 - Cornelia Elena Ratiu: *New materials in drinking water treatment technology*
 - Daniela Ronamina Sonea: *Drinking water treatment technology improvement*
4. Prof.dr.eng. Dumitru BECHERESCU
- PhD students:*
- Adriana Calapod: *Concrete as an immobilization factor for some polluting materials*
 - Călin Tașian: *Re-use of some furnace slugs as construction materials*
 - Marius Lupa: *Study of the milling process with a view of its optimization*
5. Prof.dr.eng. Ioan LAȘU, PhD supervisor in *Materials' Science and Engineering*
- PhD students:*

- Zoltán Ecsedi: *Using the unconventional methods in tailored-properties oxide materials synthesis*
 - Alexandru Orban: *Technological parameters optimization for obtaining super-aluminous products*
 - Robert Ianoş: *The synthesis of some oxides, oxide compounds and oxide solid solutions using low temperature combustion synthesis*
 - Silvana Ianoşev: *Using Unconventional methods in the synthesis of oxide compounds from $\text{SiO}_2\text{-Al}_2\text{O}_3\text{-M}_x\text{O}_y$ system*
6. Prof.dr.eng. Nicolae VASZILCSIN, PhD supervisor in *Chemical Engineering*
- PhD students:*
- Mircea Dan: *Metal removal from residual water in electrochemical reactor with vibrating electrodes*
 - Radu Nicolae Bnică: *Solar cells based on CuInS_2*
 - Mirela Ioana Iorga: *Contributions to the mass transfer intensification in electrochemical recovering of metal from solutions*
7. Prof.dr.eng. Zeno GROPSIAN
- PhD students:*
- Bors Nicu: *“The investigation of some chemical products influence on the improvement of liquids flow”*
 - Ciobotaru Leopold: *“Contributions to the filtering technology”*;
 - Frigura (Panescu) Mihaela: *“Contributions to the study of the solid-liquid separation processes”*;
 - Pop Nadia: *“Advanced methods for gases purification”*;
 - Rujan Dan: *“Fractals applications on describe and modelling of crystalline surfaces”*;
8. Prof.dr.eng. Delia Perju, PhD supervisor
- PhD students:*
- Harieta Pîrlea: *Contribution to the simulation and modeling of chemical processis for reduction of nitrogen dioxide emmissions*
 - Raul Moldovan: *Improvement of the Heat Boundary Layer Flowmeter Performances Using Analogue-Numerical Systems*
 - Calisevici Mirela: *Quality Performances Improvement of a Food Process Line Using Advanced Optimal Process Control*
 - Marinescu Sorin: *Contributions to the Optimization Possibilities of a Waste Incineration Plant*
 - Dancea Daniel: *Contributions to the Modeling, Simulation and Optimal Process Control of Heat Transfer Processes*
- Muşuroi Luci: *Contributions to the Performance Improvement of Low Pressure Equipments System*
 - David Ioana Elena: *Study Regarding the Process Control and Optimization Possibilities of Technological Processes Applied in Fibre Glass Technology*
 - Manea Adela: *Contributions to the Quality Improvement of Cosmetics Products*
 - Osiceanu Antoaneta: *Contributions to Optimisation of Asphaltic Cationic Emulsion Technology.*
 - Lal Astrid: *Contributions to the Elimination Process Improvement of Pollutants Resulted from Railway Units Activity*
 - Pamfiloiu Mirabela: *Contributions to the Improvement of an Electro thermal Gas Flow meter Performances Using Analogue-Numerical Systems*
 - Cicoare Eugeniu: *Contributions to the Implementation Possibilities of Low Pressure Equipments in Physical-Mechanical Test-Installations Used in the Chemical Technology of Leather*
 - Firczak Monica: *Contributions to the Study of Neural Networks Applied in Chemical Engineering*

PhD THESIS SUSTAINED

1. Tihamer Bartis: *New thermo resistant pigments and their behavior in glazes and ceramic Colorants*, PhD supervisor: prof. dr. ing. Dumitru Becherescu
2. Căta Adina: *Contributions to the study of the absorption-desorption processes with chemical reaction*, PhD supervisor; prof. dr. ing. Delia Perju
3. Glevitzky Mirel: *Contributions to the Quality Performances Improvement of Fruit Juices by Application of Optimization and Control Process Techniques in the Technological Installations*, PhD supervisor; prof. dr. ing. Delia Perju
4. Bragea Mihaela Gladiola: *Contributions to the Modelling and Simulation Phenomenon of Radio elements Migration in the Environment from the Uranium Industry Waste*, PhD supervisor; prof. dr. eng. Delia Perju
5. Marcela Stoia: *Contributions to nanoparticles obtaining with magnetic properties undispersed and dispersed in inorganic matrixes*, PhD supervisor: prof. Dr. Chim. Ilie Julean
6. Radu Ioan Lazău: *Studies regarding the parameters that influence the color of ceramic glazes with transitional ions*, PhD supervisor: prof. dr. eng. Dumitru Becherescu
7. Mihaela-Elvira Ciopec: *Studies regarding the obtaining and characterization of PK fertilizers with microelements*, PhD supervisor: prof. dr. eng. Aurel Iovi
8. Lavinia-Afrodita Lupa: *Studies regarding the zinc recovery and reuse from waste resulted from hot-*

dip galvanization process, PhD supervisor:
prof. dr. eng. Aurel Iovi

Calorimetry, vol. 88, 2007, nr.3, ISSN: 1388-6150,
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PUBLICATIONS

BOOKS

Negrea, A., Cocheci, L., Pode, R., *Integrated management of domestic solid wastes*, "Politehnica" Publishing House, Timișoara, 2007, ISBN 978-973-625-476-5, 235 pages (published in Romanian)

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RESEARCH CENTRE SYNTHESIS AND APPLICATIONS OF ORGANIC AND MACROMOLECULAR COMPOUNDS - S.A.O.M.C.

GENERAL PRESENTATION

Synthesis and Applications of Organic and Macromolecular Compounds (S.A.O.M.C.) is a research centre, type C, which has been evaluated and approved by CNCSIS. The Centre was created in 2002, in accordance with the CNCSIS certificate, nr. 47/4.12.2003. The director of the Centre is **Assoc.prof.dr.eng. Mihai Medeleanu**.

MAIN ACTIVITIES

The Center performs research activities in domains such as:

- BioNanoMaterials – obtaining, characterization and applications of the biocompounds and biosystems/cyclodextrins or liposomes nanoparticles
- Drug Design and Synthesis – molecular modeling, SAR, QSAR, virtual high throughput screening, docking, synthesis, analysis and applications of drugs
- New methods in organic synthesis
- Studies on structure-properties relationship using the topological model of organic molecules
- Structured packings and their applications in systems with chemical reaction
- Synthesis and characterization of PVC plasticizers
- Oligomers with functional groups
- Chemistry and technology of drugs and pesticides
- Chemistry and technology of dyestuffs, and textile auxiliaries
- Process control equipments for research plants in chemical industry
- Control systems using computers for researching plants and low tonnage plants in chemical industry
- Intensive methods for the exoneration of soil from radioactive minerals exploitation and processing areas in the condition of natural disasters or entropic accidents
- Mathematical modeling and numerical simulation of environmental pollution and depollution processes
- Modeling, simulation and process control
- Magnetic Fluids: Preparation, Characterization and Applications

- Heat transfer organic agents
- Unit processes
- The Intensification of Transfer Processes
- Rheological characterization of the substances

CONTACT

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RESEARCH FIELDS

- **BioNanoMaterials**

Keywords: bioactive compounds, drugs, natural compounds, nanoparticles, nanocapsules, cyclodextrins, liposomes, scanning electron microscopy, transmission electron microscopy, thermogravimetry, differential scanning calorimetry, preparative liquid chromatography

- **Drug Design and Synthesis**

Keywords: drugs, drug design, total synthesis, semi-synthesis, biosynthesis, quantitative structure-activity relationships, virtual high throughput screening, docking, gas chromatography, preparative liquid chromatography, high pressure liquid chromatography

- **New methods in organic synthesis**

Keywords: synthesis of organic compounds, carbonic acid derivatives, sterically hindered phenols with antioxidant activity, structure determination by NMR, biocatalysis of organic reactions

- **Studies on structure-properties relationship using the topological model of organic molecules**

Keywords: topology, graphs, structure-properties relationship (SAR), size and shape of molecules, van der Waals volume and surface

- **Structured packings and their applications in systems with chemical reaction**

Keywords: static mixers, motionless mixers

- **Plasticizers for polymers**

Keywords: plasticizer, plasticizing

- **Synthesis and characterization of PVC plasticizers**

Keywords: PVC-plasticizer

- **Oligomers with functional groups**

Keywords: oligomer, functional group, reactive oligomers

- **Chemistry and technology of drugs and pesticides**

Keywords: drug, pesticides, chemistry, technology, semi synthesis, agriculture

- **Chemistry and technology of dyestuffs, and textile auxiliaries**

Keywords: dyes, dye accelerators, dispersants, textile auxiliaries

- **Process control equipments for research plants in chemical industry**

Keywords: measuring, control devices

- **Control systems using computers for researching plants and low tonnage plants in chemical industry**

Keywords: process control, research and low tonnage plants

- **Intensive methods for the exoneration of soil from radioactive minerals exploitation and processing areas in the condition of natural disasters or entropic accidents**

Keywords: Climate changes, pollution, risk, sustainable chemistry, modeling

- **Mathematical modeling and numerical simulation of environmental pollution and depollution processes**

Keywords: modeling, simulation, environmental protection

- **Oily compounds extraction from waste waters using magnetic fluids**

Keywords: extraction, magnetic fluid

- **The Performance of Columns with Structured Packings**

Keywords: wet ability, specific surface

Researches in BIONANOMATERIALS

Obtaining and analyses methods on the bioactive compounds and systems/cyclodextrins and liposomes micro/nanoparticles. The bioactive compounds used for nanoencapsulation are: drugs, natural compounds with biological activity (*i.e.* alkaloids and flavonoids, volatile oils), perfumes and cosmetics, natural food additives (*i.e.* natural flavors, natural colorants). This products have excellent properties in comparison with the starting materials: oxidative, thermal stability, protective properties against radiations, controlled release of the bioactive compounds, hydrosolubilization of hydrophobic biocompounds, masking of the unpleasant taste and odors, easily handling of the powdery bionanomaterials.

The methods used for obtaining of the bionanomaterials are: crystallize from solution, spray-drying, spray-chilling, fluidized bed, by mixing or melting, by ultrasonication. The main methods of separation-purification and analyses are: preparative liquid chromatography (preparative

HPLC), scanning electron microscopy (SEM), transmission electron microscopy (TEM), thermogravimetry (TG), differential scanning calorimetry (DSC).

RESEARCH TEAM

Daniel Hădăruță, Geza Bandur, Gerlinde Rusu, Iulia Pînzaru, Volica Damșa

Researches in DRUG DESIGN and SYNTHESIS

Design of new compounds with potential drug properties and synthesis of hits. The methods used for drug design are: molecular modeling of the known compounds, qualitative and quantitative structure-activity relationship studies (SAR and QSAR), virtual high throughput screening (VHTS), molecular docking of the predicted drugs.

The hits selected by drug design are obtained by known methods (total synthesis, semi-synthesis, biosynthesis), separated and analyzed by modern methods (preparative liquid chromatography – preparative HPLC, liquid and gas chromatography – HPLC and GC, ¹H- and ¹³C-NMR, X ray diffraction, UV-VIS, IR, MS spectroscopy) and further evaluated as drugs.

RESEARCH TEAM

Constantin Dăescu, Daniel Hădăruță, Mihai Medeleanu, Geza Bandur, Gerlinde Rusu, Iulia Pînzaru, Volica Damșa

Researches in NEW METHODS IN ORGANIC SYNTHESIS

Synthesis of organic compounds (carbonic acid derivatives, phenolic antioxidants, amino acids and peptides) using new methods or reagents: single electron transfer reactions, triphosgene as a low toxic and easy to handle substitute of phosgene, isatoic anhydrides, enzymes obtained by biosynthesis or extraction (aminoacylase, protease, lipase).

The chemistry of organic derivatives of carbonic acid is the traditional field of our Department, pioneered by Professor Giorgio Ostrogovich. Studies in the field of synthesis of chlorocarbonates, carbonyl chlorides, carbamates, carbonates, ureas, aryl cyanates, isocyanides and heterocyclic as well as kinetics and mechanisms of reactions of carbonic acid derivatives were performed. Since 1980 synthesis of phenolic antioxidants, studies of biocatalytic processes in organic synthesis and structure determination of organic compounds by NMR spectroscopy were also investigated.

RESEARCH TEAM

Carol Csunderlik, Mihai Medeleanu, Marius Milea, Francisc Peter

Researches in STUDIES ON STRUCTURE-PROPERTIES RELATIONSHIP USING THE

TOPOLOGICAL MODEL OF ORGANIC MOLECULES

The topological model, as an application of graph theory in chemistry is a useful tool for quantification of molecular structure and has been largely used in the last years, due to its simplicity and good correlation results in studies concerning the shape and size of molecules and structure-properties relationship for many classes of compounds.

By applying the topological model to organic molecules, information's like the number of atoms and the connectivity's are compressed in numbers named topological indices. These can be correlated with physical and chemical properties and biological activities and are also used to describe the shape and size of molecules. Better correlation coefficients were obtained when certain heteroatom were included into topological model (halo derivatives, oxygen and sulphur derivatives and local anesthetics). Van der Waals surface and volume of organic molecules were also performed using the Monte Carlo algorithm.

RESEARCH TEAM

Mihai Medeleanu, Dan Hădăruță

Researches in STRUCTURED PACKINGS AND THEIR APPLICATIONS IN SYSTEMS WITH CHEMICAL REACTION

The structured packings (former name: static mixers or motionless mixers) increase the mixing efficiency in all flow regime, but any other device does not equalize their performances in the laminar flow regime. Their application in all types of reactive systems (homogeneous or heterogeneous) has started several years ago and is in a continuous expansion. Recently, catalysts supported on static mixers are commercially available.

Since 1986, different applications were developed (e.g. reactor for hydrogenation of fatty oils, CO₂ absorption in monoethanolamine solutions). Theoretical studies include: investigations concerning the mixing mechanism in columns equipped with Sulzer SMV type static mixers; influences of main parameters on the size and distribution of the droplets formed in column fitted with structured packings; analysis of gas holdup and solid distribution in three phase gas-liquid-solid reactors equipped with different motionless mixers in order to grow the liquid phase conversion in slurry bubble columns.

RESEARCH TEAM

Lucian Rusnac, Sabina Nițu, Carmen Rusnac

Researches in PLASTICIZERS FOR POLYMERS

The undertaken research aims to correlate the structure and the plasticizing properties, both permanent and temporary of certain polymers, belonging to new series of chemical compounds.

More than 100 new substances have been synthesized, described and assessed. Within the same framework of activity, there has been a practical and theoretical concern for the problems of both permanent and temporary plasticizing of polar polymers, thus enabling the drawing of conclusions with a view to industrial applications and to new correlation of the structure and the plasticizing properties. The research is represented by more than 60 scientific papers and research agreements.

RESEARCH TEAM

Ionel Manovicu, Geza Bandur, Gerlinde Rusu

Researches in *SYNTHESIS AND CHARACTERIZATION OF PVC PLASTICIZERS*

Many high molecular weight materials, organic and inorganic, are benefited by plasticizers, yet our major emphasis is on organic plasticizers for synthetic organic polymers and particularly for PVC.

Since 1970 we are concerned with the synthesis and characterization of some new ester type PVC plasticizers, namely "direct" plasticizers derived from a diacid and "reversed" plasticizers derived from a diol esterifies with monoacid. Taking into account the fundamental technological and theoretical parameters (as the Flory-Huggins interaction parameter χ and the Hildebrand solubility parameter δ) it becomes possible to correlate the structure of the models involved with their real effectiveness in PVC compounds.

RESEARCH TEAM

Liviu Mirci, Sorina Boran, Sergiu Curelea

Researches in *OLIGOMERS WITH FUNCTIONAL GROUPS*

Synthesis and characterization of some low-molecular polymers of different structure, containing two or several functional groups capable of undergoing some subsequent chemical transformations

Synthesis, characterization and application of dimethacrylates as reactive plasticizers for poly(vinyl-chloride). Synthesis and characterization of functional oligomers under non-stoichiometric conditions with a total conversion (α,ω -dihydroxy-polyesters). Chemical modification of polyethylene oligomers.

RESEARCH TEAM

Ionel Manovicu, Geza Bandur, Gerlinde Rusu

Researches in *CHEMISTRY AND TECHNOLOGY OF DRUGS AND PESTICIDES*

Synthesis, analysis and testing of total and semi synthetic drugs, odorants and pesticides for human use and agricultural applications

Studies in this field have been started since 1950 at the Faculty of Industrial Chemistry of Technical University Timisoara (former Polytechnic Institute of Timisoara). This activity was finalized in books, manuals, journal papers, patents and research programs for micro production and industry.

RESEARCH TEAM

Constantin Daescu, Alfa-Xenia Lupea, Mirabela Padure, Zlatimir Stanoiev, Daniel Hădărugă

Researches in *CHEMISTRY AND TECHNOLOGY OF DYESTUFFS, AND TEXTILE AUXILIARIES*

Synthesis of organic dyestuffs, dyeing accelerators and dispersants.

The researches undertaken have been concerned with the study of separating components in organic dyes synthesis. Synthesis of some new substantive cationic dyes used in finishing natural and synthetic yarns and fibers has been studied. Syntheses of some key intermediates for organic dye technologies have also been performed.

RESEARCH TEAM

Ioan Macarie, Simona Popa

Researches in *PHYSICAL CHEMISTRY. CHEMICALLY ACTIVE SPECIES GRAFTED ON POLYMER-SUPPORTS*

Preparation and investigation of chemically active species (catalysts, reagents, substrates, enzymes, polycationic biocides) grafted on polymer-supports (styrene-divinylbenzene copolymers, polyethylene glycol) acting as "hybrid-phase" systems. Studies on the structure-activity relationship. Synthesis and testing of multifunctional or multistep recyclable and reusable catalysts.

Since 1982 the research program in the field was focused on the synthesis of the new types of polymer ligand homologous of Schiff bases, hydrazones, oximes and azines by polymer-analogous reactions, synthesis of polymer-grafted tertiary heterocyclic amines acting as "hybrid-phase" biomimetic catalysts similar to chemotripsine and studies of the kinetics, mechanism and structure-activity relationship in a test reaction of activated esters hydrolysis. A new kinetic model of the nucleophile bimolecular substitution using phosphonium and/or ammonium salts grafted on polymer-supports as phase-transfer catalysts was proposed.

RESEARCH TEAM

Corneliu Davidescu, Erika Reisz, Radu Ardelean

RESEARCH PROJECTS

1. CNCSIS Grant 58GR/19.05.2006 theme 10, code 336, type A: *N,N'*-Disuccinimidylcarbonate, a Potential Reagent

in Fine Organic Synthesis of Unsymmetrical Reactive Carbonates Used in the Protection of Amino Group in Aminoacids for Peptide Synthesis

Value: 20,000 RON
Director: Lect. dr. Marius MILEA
Members: Prof. dr. Carol CSUNDERLIK
Assist. dr. Monika SIMON
Dr. Andreea TARTA
Ph.D student eng. Adina SEGNEANU
Ph.D student Beniamin PINTEA

FIELD DESCRIPTION

The goal of our studies is the replacement of chlorine-containing functional derivatives of carbonic acids like phosgene, diphosgene, triphosgene and carbonochloridates with other derivatives of carbonic acids, mostly carbonates whose reactivity would be comparable to that of the above-mentioned compounds. We intend to study the reactions of these reactive carbonates with nitrogen and oxygen nucleophiles, such as alcohols, amines, aminoacids, and to synthesize new unsymmetrical reactive carbonates starting from N,N'-disuccinimidylcarbonate, to be used later in the protection of amino function in amines and aminoacids, at the same time analyzing the advantages and disadvantages of the employed method relative to the ones found in the literature. We also intend to investigate the reactions of N,N'-disuccinimidylcarbonate with nitrogen and oxygen binucleofiles of the aliphatic and aromatic aminoacids-type in order to obtain mixed anhydrides of carbonic acids, i.e., compounds from the classes of oxazolidinediones and benzoxazinediones. The reactions will be monitored by FTIR spectroscopy. Finally, we want to study and achieve peptide syntheses starting from aminoacids N-protected with the synthesized reactive carbonates, with the goal of obtaining new compounds with biological activity.

ACTIVITIES

In the year 2007 the activities were centered on the following investigation topics:

- study by spectroscopic and chromatographic methods of the reactions of preparation of mixed reactive carbonates and of their reactions with nitrogen and oxygen nucleophiles and binucleophiles;
- optimization of the synthetic methods according to the reaction parameters;
- preparation of compounds with specific properties: compounds from the carbamate series, N-protected aminoacids, peptides, potentially biological active, and intermediates for the pharmaceutical industry from the classes of benzoxazindiones

2. CEEX CHIROMAR 2CEX06-11-30/25.07.2006: *Molecular Chirality:*

Determination of Enantiomeric Excess and Absolute Configuration by Nuclear Magnetic Resonance Spectroscopy (NMR) and Application to Bioactive Compounds and Intermediates in Fine Synthesis.

Value: 78,000 RON
Director: Prof. dr. Carol CSUNDERLIK
Members: Lect. dr. Vasile BERCEAN
Assoc. prof. dr. Francisc PETER
Assist.dr. Valentin BADEA
Assist. dr. Monika SIMON
Ph.D student Ana Cristina ZARCULA

FIELD DESCRIPTION

Preparation and Characterisation of Molecular Chirality of Some Intermediates and Bioactive Compounds by Magnetic Resonance Spectroscopy (NMR).

ACTIVITIES

Stereoselective Synthesis of Some Chirals Beta-aminoacids. Chiral separations.

- enantioselective acylation of secondary alcohols by sol-gel trapped lipases
- determination of enantiomeric ratio of chiral esters obtained by gas chromatography using a chiral column
- obtaining of chiral oxazolidinone as precursors for beta-aminoacids synthesis.

3. CEEX RMNSTAR 2CEX06-11-41/25.07.2006: *Adaptation of Sequences of NMR Pulses, Elaboration of Multicentre-type Tests and On-line Interconnecting of the Superconductive NMR Spectrometers in Romania.*

Value: 40,000 RON
Director: Prof. dr. Carol CSUNDERLIK
Members: Prof. d. Corneliu-Mircea DAVIDEASCU

Assoc. prof. dr. Mihai MEDELEANU
Assoc. prof. dr. Petru NEGREA
Assist.dr. Valentin BADEA
Assist. dr. Monika SIMON
Assist. Radu ARDELEAN
Assist. Narcis DUTEAN

ACTIVITIES

Elaboration of multicentre-type tests and on-line interconnecting of the superconductive NMR spectrometers in Romania.

4. PN-II IDEI Grant 268/01.10.2007: *New bioproducts by valorization of microbial hydroxyalkanoic acids*

Value: 83,104 RON
Director: Assoc.Prof.dr. Francisc PETER
Members: Prof.dr. Corneliu DAVIDESCU
Prof.dr. Carmen BOERIU
PhD student eng. Cristina ZARCULA

PhD student eng. Sandor Balazs
KAKASI-ZSURKA

FIELD DESCRIPTION

Industrial biobased products have an increasing potential in the chemical and material industries. The diversity of biomass feedstocks like sugars, oils, proteins, or lignocellulosics, combined with the numerous biochemical and thermochemical conversion technologies, can provide a diversity of products as polymers, lubricants, solvents, adhesives, herbicides, and pharmaceuticals. Polyhydroxyalkanoates (PHAs) are polyesters of various hydroxyalkanoates that are synthesized by many gram-positive and gram-negative bacteria from at least 75 different genera. These polymers are accumulated intracellularly to levels as high as 90% of the cell dry weight under conditions of metabolic stress due to a limited supply of an essential nutrient and the presence of an excess of a carbon source. They are stored as intracellular granules, and act as carbon and energy reserve. The objectives pursued by the fulfilling of this project are based on the current stage of knowledge on poly(hydroxyalkanoates) and their transformations. Considering the large interest for this field, it is presumable that soon a series of such products, obtained from either microorganisms or plants, will be available at reasonable prices and in large quantities (at least thousands of tons). In these conditions, the development of knowledge on this field and the broadening of the area of applications by the manufacture of new bioproducts will have a strong impact on the development of new technologies based on renewable materials. This project has an interdisciplinary character, as it aims both the investigation of biocatalytical processes and the optimization of the functionality of enzymes, and the synthesis of organic compounds and polymers and their physico-chemical characterization.

ACTIVITIES

In the year 2007 (first year of the project) the activities were centered on the following investigation topics:

- Review of the recent literature, concerning polyhydroxyalkanoates and their chemical and biochemical transformations
- Setting up of experimental methodologies to be used for PHAs hydrolysis reactions investigation.
- Screening of hydrolytic activities of several commercially available lipases.

5. CEEEX Project Code P-CD-18, Contr. No: 18/10.10.2005, *Nanocomposite / nanocrystal synthesis with applications in biotechnology, agriculture, food, health, and environment (NUSA)*

Value: 70,000 RON

Director: Lect.dr.eng. Daniel-Ioan HĂDĂRUGĂ
Members: Prof.dr.eng. Alfa X. LUPEA
Senior lect.dr.eng. Geza N. BANDUR
Lect.dr.eng. Mirabela PĂDURE
Researcher Volica DAMȘA

FIELD DESCRIPTION

In this project, the obtaining of the micro/nanoparticles and micro/nanocapsules (especially with bioactive compounds), isolation and purification of the studied biocompounds (from the *Allium*, *Chelidonium*, and *Nicotiana* species, especially), and the analysis and application of bioactive compounds and micro/nanoparticles and/or micro/nanocapsule will be studied. The most used encapsulation matrices are oligo- and polysaccharides, lipids, and synthetic polymers; in this project the cyclodextrins will be used as encapsulation matrices; they are composed especially by three cyclic oligosaccharides which are industrial produced: α -, β -, and γ -cyclodextrin, known as Schardinger dextrans, A/B/G-CD, C6-8A. The analysis of the micro/nanocapsules is realized by chromatographic methods (HPLC, TLC, GC for derivatized compounds), photometry, term analytical methods (thermogravimetry, differential scanning calorimetry, X ray diffraction, and electronic microscopy methods (SEM, TEM).

ACTIVITIES

- Obtaining of the raw extracts by steam-distillation, extraction with organic solvents; separation of the biocompounds;
- Purification of the biocompounds: aliiin, allicin, diallyl-disulfide, diallyl-trisulfide, chelidonin and related alkaloids, nicotine and related alkaloids will be attained by preparative HPLC;
- Analysis of biosystems and biocompounds: GC-FID, GC-MS, HPLC, FT-IR
- Obtaining of the nanoparticles/nanocapsules with cyclodextrins
- Analysis of nanoparticles/nanocapsules (TG, DSC, TEM, SEM)
- Applications of nanoparticles/nanocapsules in different areas (biotechnology, agriculture, food, health, environment)

6. PN2 PC-41-070 din 18.09.2007, *Stabilirea acțiunii și a efectelor stresprotectoare și/sau imunostimulatoare ale unor noi materiale biologic active (IMUNO-NANOMAT)*

Value: 5,000 RON

Director: Lect.dr.eng. Daniel-Ioan HĂDĂRUGĂ
Members: Assoc.prof.dr.eng. Geza N. BANDUR
Lect.dr.eng. Nicoleta G. HĂDĂRUGĂ
Teach.assist.eng. Iulia A. PÎNZARU
Tehn. Volica DAMȘA

FIELD DESCRIPTION

In this project, the obtaining, analysis and application of the titanium dioxide (undoped and doped with Au, Ag, Pt ions)/biocompatible matrices micro/nanoparticles and micro/nanocapsules will be studied. Cyclodextrins, liposomes and other similar natural compounds (systems) will be used as encapsulation matrices. The biocompatible nanoparticles will be obtained by spray-drying, spray-chilling, fluidized bed, or ultrasonic methods. The analysis of the micro/nanoparticles will be realized by microscopical methods (SEM, TEM), thermoanalytical methods (thermogravimetry, differential scanning calorimetry), X ray diffraction etc. The bionanomaterials will be evaluated from the stress-protecting and/or immuno-stimulating effects point of view.

ACTIVITIES

- Literature survey on the obtaining and characterization of micro/nanoparticles, especially containing metal oxides and metal ions;
- Experimental design of the micro/nanoencapsulation processes;
- Obtaining and characterization of the undoped TiO₂/biocompatible matrices micro/nanoparticles;
- Obtaining and characterization of the Au, Ag, Pt doped TiO₂/biocompatible matrices micro/nanoparticles;
- Optimization of the micro/nanoencapsulation processes.

7. CNCSIS Grant A1/GR181/19.05.2006 theme 10, code 135, type A: *Bis(o-Nitro phenyl) Carbonate, a Potential Reagent in Fine Organic Synthesis Included Combinatorial Chemistry and Asymmetric Synthesis (Carbonates, Polycarbonates, Carbonates, Oxazolidinones Synthesis*

Value: 14,400 RON

Director: Prof.dr. Carol CSUNDERLIK

Members: Assoc.prof.dr. Mihai MEDELEANU

Lect.dr. Marius MILEA

Assist.dr. Monika SIMON

Dr. Andreea TARTA

PhD student eng. Adina SEGNEANU

PhD student Maria TUROCZI

FIELD DESCRIPTION

The purpose of our studies is to find substitutes for phosgene from the carbonic acid functional derivatives, able to react efficiently with various nucleophiles for obtaining the same compounds like those resulted with phosgene and also new possible compounds. Moreover, we are interested in the study by x ray diffraction of the nanostructures for the new compounds which are going to be obtained. In the previous studies we were focused on the reactivity of some organic carbonates like N, N'-

disuccinimidyl carbonate, di-2-pyridyl carbonate, N,N'-diphthalimidyl carbonate, bis (p-nitro phenyl) carbonate and bis (o-nitro phenyl) carbonate. Further, we want to synthesize some new o-nitro phenyl carbonates and ureas using bis (o-nitro phenyl) carbonate and various amines. As we have already found out from previous studies, these kinds of reactions occur very fast in mild conditions. A study of intra- and inter-molecular hydrogen bonds by x ray diffraction is going to be made for the o-nitro phenyl carbonates resulted and which may be considered as model compounds for protein structure. Then, the reaction with oxygen nucleophiles, as alcohols, phenols, bisphenols, carboxylic acids, carbohydrates and also with binucleophiles as diamines, dialcohols, amino alcohols, amino acids are going to be studied taking into account the advantages of this method compared to those already published. From the reactions with binucleophiles a special interest present the obtaining of some oxazolidinones with importance in asymmetric synthesis where they are used as chiral auxiliary for the alkylation's of enolates or in asymmetric aldol reactions and Diels-Alder reactions. The monitoring of the reactions will be made by FT-IR spectroscopy using special manufactured IR silica-cells. Finally, the solid-support reactions study is going to be made by testing the carbonate efficiency in synthesis of some biological active compounds.

ACTIVITIES

In the year 2007 the activities were centered on the following investigation topics:

- The study of the reactions between bis (o-nitro phenyl) carbonate and various chiral amino alcohols by FTIR spectroscopy in order to find the optimal conditions for obtaining the desired products.
- Synthesis the new method of some chiral oxazolidin-2-ones useful in asymmetric synthesis

8. CEEEX research grant: 2-CEEEX06-11.57: *Modern Technology for Pyrazin-2,3-dicarboxylic acid synthesis – an intermediate for drug synthesis (3 years project)*

Value: 205,000 RON

Director: Assoc.prof.dr. Mihai MEDELEANU

Members: Prof.dr. Nicolae VASZILCZIN

Assoc.prof.dr. Francisc PETER

Lect.dr. A. KELLENBERGER

Assist. Zlatimir STANOIEV

Assist. Mircea DAN

PhD student Oana Raluca POP

FIELD DESCRIPTION

Studies concerning new electrochemical methods for synthesis of pyrazine dicarboxylic acid

ACTIVITIES

In the year 2007 the activities were centered on the following investigation topics. Building a data base for electrochemical oxydative methods applied in organic chemistry. Mn^{7+} based intermediate synthesis. Optimal reaction path analysis and kinetic studies. Stability of MnO_4^- / MnO_4^{2-} redox couple. Quinoxaline oxydation by the above intermediate. Methods for analysis. Technology setup.

9. CEEX research grant, No. 80-MCT/710-P3 / 04.09.2006 – *Computer aided technology for obtaining some metal processing oils, environmental friendly, used in automotive industry, acronym CUTOIL*

Value: 50,000 RON
Director: Prof.dr.eng. Liviu MIRCI
Members: Assoc.prof.dr.eng. Geza BANDUR
 Assist.eng. Sorina BORAN
 PhD student eng. Gerlinde RUSU
 PhD student eng. Sergiu CURELEA

FIELD DESCRIPTION

Control systems using computers for researching some metal processing oils used in automotive industry

ACTIVITIES

In the year 2007 the activities were centered on the following investigation topics. Realization of some specific control equipments using computers and process interfaces for automation of laboratory, research for obtaining some metal processing oils, environmental friendly, used in automotive industry.

10. CEEX research grant, No. 81-MCT/746-P3 / 04.09.2006 - *Technical solutions, alternatives for obtaining performing lubricants, based on renewable raw materials - at European competitiveness standards and environmental protection, acronym HQ-LUB*

Value: 16,000 RON
Director: Prof.dr.eng. Liviu MIRCI
Members: Assoc.prof.dr.eng. Geza BANDUR
 Assist.eng. Sorina BORAN
 PhD student eng. Gerlinde RUSU
 PhD student eng. Sergiu CURELEA

FIELD DESCRIPTION

Work deals with the synthesis and characterization of some polyfunctional derivatives built on the basis on renewable raw materials.

ACTIVITIES

In the year 2007 the activities were centered on the following investigation topics. The research done implied the following activities:

- Synthesis, purification and characterization of the special alcohols of alkyl-aryl structure;

- Synthesis and characterization on the basis of specific organic indices of the esters;
 - Evaluation of the representative characteristics of the realized products as polymer plasticizers and as tribological fluids.

11. CEEX-MATNANTECH Project, Contr. No: 82/2006, *Organic – inorganic hybrids derived from organo – phosphoric compounds with special properties*

Value: 20,000 RON
Director: Assoc.prof.dr.eng. Geza BANDUR
Members: Lect.dr.eng. Simona POPA
 PhD student eng. Gerlinde RUSU
 PhD student eng. Mihaela NECHITA

FIELD DESCRIPTION

Organic – inorganic hybrids from organo – phosphoric compounds with special properties synthesis and their utilization in polymerizations processes.

ACTIVITIES

In the year 2007 the activities were centered on the following investigation topics Organic – inorganic hybrids from organo – phosphoric compounds with special properties synthesis, physical – chemical, chemical and thermal characterization of these products.

12. CNCSIS Grant TD 168/1.10.2007, code TD-22, type TD, theme: *DNA/RNA Markers and Inhibitors*

Value: 30,000 RON
Director: Drd. Ing. Iulia Andreea PÎNZARU

FIELD DESCRIPTION

Naphthazarin, and the intermediar compound in the synthesis of 1,5-dinitronaphthalene with souffre sesquioxide in fumans sulfuric acid media, naphthoxidine, are the two markers for research activities in this projects. The reason of this research theme was the importance of naphthazarin in organic dyes synthesis and in drugs research who are well know and, the intense blue color of naphthoxidine, very rare at one small size molecule. With the two markers will study the possibility to obtain some new compounds with possible (fluorescent) properties of markers and/or inhibitors for nucleic acids. In the research activities we study the chloromethylation of this compounds with different agents (one of this are BCME) in order to functionalized the markers for coupling the products with purines and pyrimidines: adenine, guanine, cytosine, thymine and uracil.

ACTIVITIES

In the year 2007 the activities were centered on the following investigation topics:

➤ The study of the reactions between naphthoxidine and naphthazarin with various

chloromethylation agents in order to find the optimal conditions to obtain the desired functionalized products.

- Synthesis of chloromethyl derivatives from chloromethyluracil with the two markers, naphthoxidine and naphthazarin, in different organic solvents in normal conditions.

PHD RESEARCH ACTIVITIES

1. Prof.dr. Carol Csunderlik, PhD supervisor

PhD students:

- Stanoiev Zlatimir: *Synthesis and Characterization of Heterocyclic Compounds Used in Derivatization Reactions of Natural Polymer Compounds*
- Szöcz-Biro Emese: *Synthesis of Functional Derivatives of Polyhydroxilic Compounds Using Biotransformation Reactions with Free or Immobilized Enzymes*
- Pinte Beniamin-Nicolae: *New Synthetic Methods for Obtaining of N-Substituted Derivatives of the Cyclic Imides of Dicarboxylic Acids*
- Şofei Daniela: *Contributions to the Study of Functionalization Reactions of Nitrogen Containing Heterocycles*
- Susan Simona: *Studies of Separation, Purification and Applications of Some Natural Compounds Isolated from Capsicum*
- Zarcu (Paul) Ana Cristina: *Biocatalytic Transformations Using Immobilized Hydrolytic Enzymes by the Sol-Gel Methods*
- Pop Oana-Raluca: *Synthesis and Reactivity of Some Carbonylic Derivatives of Aromatic Heterocycles*
- Şişu Ioana: *Studies of the Synthetic Methods for Obtaining of Functional Derivatives of Aldoses*
- Turoczi Cristina: *Reactive Organic Functional Derivatives of Carbonic Acid*
- Bosilcov Alin: *Studies of Methods for Organic Synthesis in the Field of Derivatives of Essential Oils*
- Palani Adil: *Thermal Decomposition of N-Carbamoil Derivatives of Cyclic Imides*

2. Prof.dr.eng. Ionel Manovicu, PhD supervisor

PhD students:

- Homone Claudia-Gabriela: *Contributions to study of rubber compound's composition for rolling bands and hard tire's flank*
- Mărieş Gheorghe Radu Emil: *Contributions to injection parameter's study of thermoplasts for performance sports articles*
- Roşca Cristina: *Interaction characterization of rubber-filling*
- Mişcă Ruxanda Manuela: *Researches about improvement of physico-mechanic characteristics of synthetic elastomers's compounds*

- Uscătescu Maria Ramona: *Contribution at study of rubber mixture's adherence at transport band's base*
- Grandtner Gerlinde Iuliana: *Contributions at study of reagent oligomers usage in nanocomposites*

3. Prof.dr.eng. Alfa-Xenia Lupea, PhD supervisor

PhD students:

- Caciş Svetlana: *Vegetable extracts possible used as natural ingredients for drugs, cosmetics, food*
- Cătănoiu Gabriela: *Contributions to the synthesis and characterization of new phase transfer catalysts from quaternary ammonium salts class*
- Ienaşcu Ioana Maria Carmen: *Potentially biological active with o-hydroxybenzamide structure*
- Pop Mariana: *Vegetable extracts, from berry, possible used in bioconstituents oxidation processes inhibition*
- Popa Ioana: *Structure-properties relationships for some natural hydroxyl-quinine*

4. Prof.dr.eng. Lucian RUSNAC, PhD supervisor

PhD students:

- Başa Adela: *Contributions on the obtain of the biodiesel*
- Sălăgean Ioana: *Contributions on carbohydrate based polymers synthesis and characterization*
- Dobren Flavius: *Contribution regarding the modeling and simulation research of the CO₂ dispersion process in urban environment*
- Hegheduş Mîndru Gabriel: *Contributions to the study possibilities of mineral water indicators improvement by utilizing modern techniques of simulation, modeling and automated operation*

5. Prof.dr.eng. Constantin DĂESCU, PhD supervisor

PhD students:

- Pînzaru Iulia Andreea: *Naphthoxidine-nucleotides DNA-markers and inhibitors*
- Burlacu Marcela Mădălina: *Drugs solubilisation with chlormethyl-pyridinium chloride*

6. Prof.dr.eng Liviu MIRCI, PhD supervisor

PhD students:

- Boran Sorina: *The principle of polyfunctionality and asymmetry in the realization of new plasticizers and lubricants*
- Curelea Sergiu: *Polyfunctional derivatives esters for polymer processing and tribological applications*

PHD THESIS SUSTAINED

1. Segneanu Adina Elena: *Organic Carbonates Utilization for Protecting of the Amino Group and Activating of the Carboxyl Group from Aminoacids in Peptides Synthesis*; February 2007; PhD supervisor: Prof. Dr. Csunderlik Carol
2. Neanu Cristian: *Synthesis and Studies of Some Modified Carbohydrates with Potential Biologic Activity*; November 2007; supervisor: Prof. Dr. Csunderlik Carol
3. Cacig Svetlana: *Vegetable extracts possible used as natural ingredients for drugs, cosmetics, food*; February 2007; PhD supervisor: Prof. Dr. Eng. Lupea Alfa
4. Șofei Daniela: *Contributions to the Study of Functionalization Reactions of Nitrogene Containing Heterocycles*; December 2007; supervisor: Prof. Dr. Csunderlik Carol
5. Mărieș Gheorghe Radu Emil: *Contributions to injection parameter's study of thermoplasts for performance sports articles*; May 2007; PhD supervisor: Prof. Dr. Eng. Manovicu Ionel
6. Grandtner Gerlinde Iuliana: *Contributions at study of reagent oligomers usage in nanocomposites*; September 2007; PhD supervisor: Prof. Dr. Eng. Manovicu Ionel
3. Hădăruță, D.I., Hădăruță, N.G., Riviș, A., Gruia, A., Pinzaru, I.A., *Thermal and Oxidative Stability of the Allium sativum L. Bioactive Compounds/ α - and β -Cyclodextrin Nanoparticles*, Rev. Chim. (Bucuresti), 58(11), 2007, ISSN 0034-7752, pp. 1009-1015
4. Badea, V., Șofei, M.D., Venter, M.N., Bercean, V.N., *Regioselective alkylation of 1H-7-ethoxycarbonyl-6-methyl-3-phenyl-pyrazolo[5,1-c][1,2,4]triazole and 1H-6-methyl-3-phenyl-pyrazolo[5,1c][1,2,4]triazole*, Tetrahedron, 63, 2007, ISSN 0040-4020, pp. 1467-1471
5. Segneanu, A., Milea, M., Badea, V., Csunderlik, C., *Reacții de alcoxicarbonilare la amine și aminoacizi cu carbonați micști de N-ftalimidil*, Rev. Chim. (Bucuresti), 58(7), 2007, ISSN 0034-7752, pp. 659-665
6. Bercean, V.N., Badea, V., Șofei, D., Costea, L.V., Csunderlik, C., *Azoic and azomethinic dyes derivatives of 1H-6-methyl-3-phenyl-pyrazolo[5,1-c][1,2,4]triazole*, Rev. Chim. (Bucuresti), 58(8), 2007, ISSN 0034-7752, pp. 791-796
7. Segneanu, A., Milea, M., Simon, M., Csunderlik, C., *Sinteze de carbonați nesimetrice din N,N'-succinimidilcarbonat și alcoolii*, Rev. Chim. (Bucuresti), 58(6), 2007, ISSN 0034-7752, pp. 542-551

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BOOKS

Clemons, P.A.; Olah, M.; Rad, R.; Ostopovici, L.; Bora, A.; Hădăruță, N.G.; Hădăruță, D.I.; Moldovan, R.; Fulias, A.; Mracec, M.; Oprea, T.I., *Expanding the Genetic Code. Chemical Informatics*; In: *Chemical Biology: From Small Molecules to Systems Biology and Drug Design*, Wiley-VCH, New York, 2007, ISBN-10: 352-731-150-5, ISBN-13: 978-352-731-150-7, pp. 723-788 (published in English)

PUBLISHED PAPERS

1. Hădăruță, D.I., Hădăruță, N.G., Resiga, D., Pode, V., Dumbravă, D., Lupea, A.X., *Obtaining and Characterization of Sage (Salvia sclarea L.) Essential Oil/ β -Cyclodextrin Supramolecular Systems*, Rev. Chim. (Bucuresti), 58(6), 2007, ISSN 0034-7752, pp. 566-573
2. Hădăruță, N.G., Hădăruță, D.I., Riviș, A., Păunescu, V., Costescu, C., Lupea, A.X., *Bioactive Nanoparticles. Essential Oil from Lamiaceae Family Plants / β -Cyclodextrin Supramolecular Systems*, Rev. Chim. (Bucuresti), 58(10), 2007, ISSN 0034-7752, pp. 909-914
8. Scott, E., Peter, F., Sanders, J., *Biomass in the manufacture of industrial products- the use of proteins and amino acids*, Appl. Microbiol. Biotechnol., 75, 2007, ISSN 0175-7598, pp. 751-762
9. Kiss, C., Zarcuța, C., Csunderlik, C., Peter, F., *Acilarea enantioselectivă a unor alcoolii secundari prin biocataliză cu lipaza din Pseudomonas fluorescens imobilizată prin metoda sol-gel*, Rev. Chim. (Bucuresti), 58(8), 2007, ISSN 0034-7752, pp. 799-804
10. Szabo, R., Iditoiu, C., Chambre, D., Lupea, A.X., *Improved DPPH Determination for Antioxidant Activity Spectrophotometric Assay*, Chem. Paper, 61(3), 2007, ISSN 0366-6352, pp. 214-216
11. Grad, M., Simu, G., Munteanu, S., Lupea, A.X., *Sinteza, caracterizarea și studiul de culoare în spațiul CIELAB ale unor coloranți disazoici simetrici ai acidului 4,4-diaminostilben-2,2-disulfonic*, Rev. Chim. (Bucuresti), 58(2), 2007, ISSN 0034-7752, pp. 214-217
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13. Grad, M., Raditoiu, V., Wagner, L., Raditoiu, A., Lupea, A.X., *Sinteza si caracterizarea unor cromogeni derivati ai acidului 4,4-diaminostilben-2,2-disulfonic*, Rev. Chim. (Bucuresti), 58(8), 2007, ISSN 0034-7752, pp. 786-790
 14. Samoila, C., Anghel, A., Motoc, M., Lupea, A.X., Tamas, L., *Functional Analysis of Human Gene Promoters*, Rev. Chim. (Bucuresti), 58(12), 2007, ISSN 0034-7752, pp. 1253-1256
 15. Segneanu, A.E., Milea, M., Badea, V., Csunderlik, C., *Reacții de alcoxycarbonilare la amine și aminoacizi cu carbonați micști de ftalimidil*, Rev. Chim. (Bucuresti), 58(7), 2007, ISSN 0034-7752, pp. 659-663
 16. Venter, M.M., Bercean, V.N., Ilici, M., Pînzaru, S.C., *New metal complexes of monoanionic (3H-2-tioxo-1,3,4-thiadiazol-5-il)-thioacetic acid. (5-mercapto-1,3,4-thiadiazol-2-yl)thioacetic acid. x-ray structure of [Na(C2N2HS3CH2COO) (H2O)4]2×2H2O*, Revue Roumaine de Chimie, 52(1-2), 2007, ISSN 0035-3930, pp. 75-79
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 19. Simon, M., Csunderlik, C., Bandur, G., Rusu, G., Palani, A., *Thermal Stability Study of Some N-Alkyl-o-Nitrophenyl Carbamates*, Chem. Bull. "Politehnica" Univ. (Timișoara), 52(66), 2007, ISSN 1224-6018
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 27. G. Rusu, G. Bandur, L. Rusnac, I. Manovicu, V. Pode, N. Joly, P. Martin, *Valorificarea esterilor de inulină prin compuși posibil biodegradabili*, Materiale Plastice, 2007, 44(2), 112,ISSN0025-5289
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- Comparative study on erythrocyte membrane fragility in rats consecutively with the administration of salicylamide, sulphanilamide and a new synthesis compound of salicylic acid*, Lucr. Șt. Med.Vet.XL, Timișoara, 2007, p.622-625, ISSN:1221-5295
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35. C. Zarcu, L. Corici, R. Croitoru, F. Peter, *Kinetic resolution of secondary alcohols in lipase-catalyzed transesterification reactions*, Annals of West University of Timisoara, Series of Chemistry, 16 (4), p. 107-112, 2007, ISSN 1224-9513
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39. A. Popa, R. Trif, Gh. Iliu, C.M. Davidescu, S. Iliescu, *Capture of micro-organisms by phosphonium salts grafted on polymers*, Romanian International Conference on Chemistry and Chemical Engineering, RICCE XV, Sinaia, Romania, 19-22 Sept., 2007, S-6-103
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