

Research Centre

Research Centre for Heterocycles Chemistry Applied in Nanoscience, Medicine and Environment

Acronym: HETNANMED

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7. Lect . dr. Robert Gradinaru
8. CS III Dr. Vasilichia Bejan
9. As. Dr. Dorina Mantu
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11. ACS dr. Catalina Ciobanu
12. CS dr. Brindusa Alina Petre
13. Doctoranzi, masteranzi, studenti licenta

Research Field:

The main field of our current and next proposed scientific research is related to Chemistry of Heterocyclic Compounds, and directed to three areas of interest:

- 1. Chemistry and Health: Nitrogen Heterocycles Chemistry and Medicinal Chemistry.** The development of new useful strategies for the synthesis of heterocyclic compounds, in particular, reactions involving reactive species such as cycloimmoniu ylides is performed. The main outcomes of new developed chemical strategies are the final chemical products such as, new nano-biomaterials with and without nitrogen heterocycle moieties, new nitrogen heterocycles biologically active potentials drugs (anticancer, anti-HIV, antituberculosis, antimicrobials), new grow up chemical compounds for agriculture and modified polypeptides with biological implication in different pathologies (Alzheimer's and Parkinson's diseases, lysosomal rare disease and auto-immun diseases).
- 2. Chemistry and Nanoscience: Nitrogen and/or Oxygen Macrocycles, Supramolecular Chemistry.** Within this area our interest is directed to design different organic compound such as, oxa- and oxaaza- coronands, nano-electronics and nano-devices, nano-biomaterials (e.g. materials for dentistry), new highly fluorescent materials, chemical captors (chemosensors).

3. **Chemistry and Environment: Eco-friendly Reactions using Microwave and Ultrasounds Assisted Approaches** (see repeat reactions si nu suna bine).

Microwave and ultrasounds assisted reactions are technologies that allow us to develop environmental friendly methods, with lower waste products, low amount of chemical compounds used and higher time saving rate. These new reaction strategies performed as scientific "green" chemistry laboratory research will provide a major environmental friendly impact for economy and production at large scale of new eco-friendly organic compounds.

Keywords: heterocycles, diazine, ylides, oxa- oxaaza- coronands, microwave, ultrasounds, cycloadditions, fluorescent materials, nanobiomaterials, antituberculosis, antimicrobials, anticancer, anti-HIV, nano-electronics and nano-devices (logic gates, chemosensors), "green" chemistry.

Currently used infrastructure: the main infrastructure of the proposed Research Centre comprise currently:

- Four research laboratories fully equipped for *Fine Organic Synthesis, Macrocycles Synthesis and Heterocycles Synthesis*. Laboratories are equipped with numerous "small" devices such as, analytical-mixers, ovens, inert gas cylinders, rotary, vacuum pumps, technical and analytical balances, etc.
- Two research laboratories fully equipped for *Toxicology and Biochemistry*. Laboratories are equipped with numerous "small" devices such as, termo-mixers, technical and analytical balances, centrifuge, automatic micro-pipettes, rotary, vacuum pumps, SDS-PAGE system, Western blot transfer system, etc..,
- 1 lab for *Microwave and Ultrasounds Assisted Reactions*;
- 1 lab for *Structural Organic Analysis*.

All laboratory rooms are well equipped with hoods, specific laboratory furniture, water supplier and other technical working conditions).

Main currently used equipments are listed below:

- NMR Spectrometer 500 MHz, Bruker Biospin;
- Single Crystal X-Ray Diffractometer, Super Nova dual(Cu and Mo);
- GC-MS SHIMADZU QP 2010 (EI, CI pozitiv and negative, direct inlet), Shimadzu, Japan, 2006;
- FTIR 8400s / IR-Prestige – 21 (for both solids and liquids), Shimadzu, Japan, 2006;
- UV-VIS V-1800 Shimadzu, Japapan, 2008 ;
- Microwave Monomode Reactor (under pressure), Monowave 300 Anton Parr, Austria, 2012;
- Microwave Monomode Reactor, STAR-2 CEM, SUA, 1999;
- Ultrasound Generator Sonix VCX 130 Sonisc&Materials, USA, 2005;
- Ultrasound Generator Sonoplus HD 3200 Bandelin, Germania, 2006;
- Liofilizator ALPHA 1-2 LD Plus Christ, Germania, 2006;
- Colling device with recyrclation LAUDA VKL 600 Bandelin, Germania, 2006;
- SDS-PAGE – protein/polypeptides separating system, Biorad, Germany, 2012;
- Western-Blot –immuno device, Biorad, Germany, 2005;
- G-Box – Gel photo-documentation device, Syngene, Germany, 2012;

- MilliQ – water purification system, Millipore, Germany, 2013 ;

Computers and accesories: Pentium III and IV computers (with different software(s)), Scanners, Printers, Xerox Copy Machines, DC-stabilizers, etc.

Library: full access to resources of Library Faculty (journal, books, Chemical Abstracts, web resources including Scopus, ISI Thomson, etc.).

Scientific publications list (in the last five years)

Scientific publications in journals with impact factor

2014

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Research projects:

1. Research project - FP7- People-2009-IRSES-No. 246902

Title: **Photocatalytic Clusters Complexes for Artificial Photosynthesis Applications**

Finance from: **European Union- FP7 program IRSES**

Directors: prof.dr. Ionel Mangalagiu, Romania/ prof. Dr. Andrew Benniston, UK (coordinator)/ prof.dr. Constantin Turta, Moldova

Duration: 2010-2012, grant no. 246902/2009

Value: Total: 194.400,00 Euro

2. Bilateral Grant Romania-Moldova

Title: **Biologically active compounds with terpenoid and azaheterocycle skeleton through conventional and nonconventional methods**

Finance from: Romanian (ANCS, PN-II program, Modul III) and Moldavian Government

Directors: prof.dr. Ionel Mangalagiu, Romania/ CP I.dr. Aculina Aracu, Academy of Science of Rep. Moldova

Duration: 2010-2012 grant nr. 418/02.06.2010

Value: 41.376 lei (10.000 Euro aprox)

3. Director: Prof. dr. IONEL MANGALAGIU

Type of grant: PN II-Ideas, grant PN-II-DE-PCE-2011-3-0038, No. 268/2011

Finance from: **CNCSIS**, Romanian Ministry of Education and Research

Duration: 2012-2014

Title: **New polifunctional nitrogen derivatives (heterocycles, podants and macrocycles) as smart versatile building blocks for multiple tasks**

Value : 350.000,00 €

4. Director: Prof. dr. IONEL MANGALAGIU

Type of grant: PN II-Ideas, grant. No. 88/2008

Finance from: **CNCSIS**, Romanian Ministry of Education and Research

Duration: 2009-2011

Title: **Chemosensors with Macrocyclic Skeleton**

1st year: 2009. Value : 25.000,00 €

2nd year: 2010. Value : 35.000,00 €

3rd year: 2011, Value : 45.000,00 €

5. **Scientific project: PN-II-RU-TE-2011-3-0038, Title:** Noi abordări mass-spectrometrice pentru elucidarea modificărilor oxidative în proteine.

Project director: Dr. Brindusa Alina Petre,

Duration: 11/2011- 10/2014; **Value:** 920.000 Ron.