

National Institute of Research and Development for Optoelectronics INOE 2000

Subsidiaries:

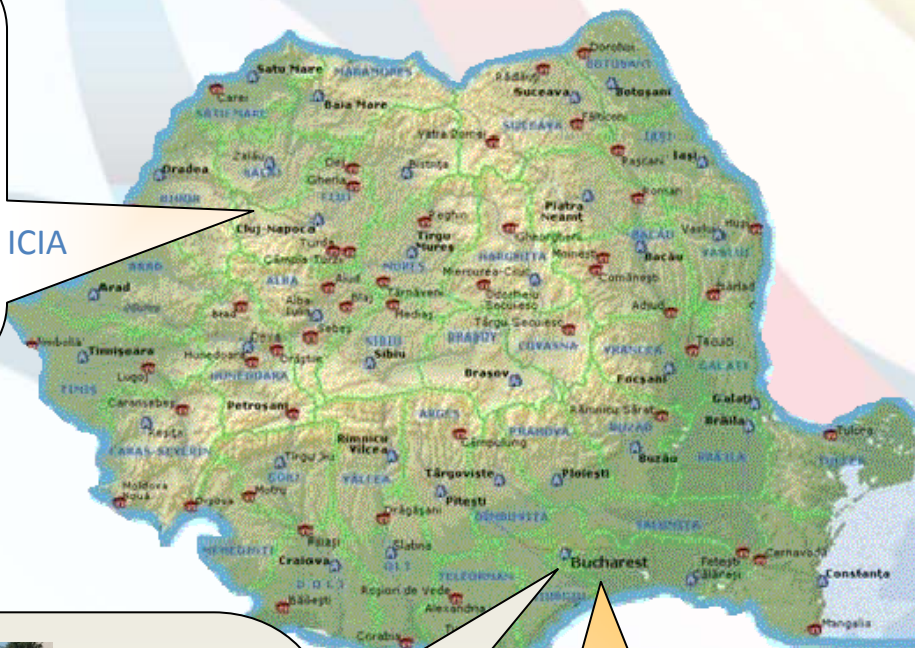
Institute of Analytical Instrumentation Research (ICIA) – Cluj Napoca
Institute of Hydraulic and Pneumatic Research (IHP) - Bucharest

<http://inoe.ro>



67 Donath Str.,
RO 400293
Cluj-Napoca, ROMANIA

ICIA



409 Atomistilor Str., RO 077125
Magurele, Ilfov County, ROMANIA

INOE
headquarter



14 Cutitul de Argint Str.,
RO 040558 Bucharest,
ROMANIA

IHP

Mission

The Institute develops fundamental and applicative research in optoelectronics, analytical chemistry and mechanical engineering, aligning itself to the main scientific directions of the European programs and responding to the requirements of the national research strategy.

The institute's mission is to develop materials for optoelectronics and to engineer optoelectronic devices for nurturing them through to industrial applications, art restoration, environmental monitoring/remediation and beyond.

Research direction/Objectives



► *Optoelectronics and analytical instrumentation engineering*

The goal is to fit-in the lasers, optical equipment, optical amplifiers etc., in integrated systems with applications in industry, health and defense. The analytical instrumentation and methods represent a support for increasing the capacity to perform high quality research.

The scientific activities are focused on new technological solutions for • **Industry** including **Defense**: → **Fiber** optic sensors for smart mechanical systems; → **New** components; → **Laser** equipment for evaluating and monitoring the landslide effects; → **Design** and development of new types of analytical instrumentation; → **Modern**, green analytical methods (extractive, purification, concentration), • **Healthcare**: → **Optical** imaging systems for early diagnosis of diseases; → **Advanced** methods to determine the traceability in food chain; → **Modern** methods to determine the geographic origin and authenticity of food, environment samples, drugs, forensic, etc.

► *New Optoelectronic Materials, Thin Films and Surface Processing by Vacuum Technologies*

The activities are related to thin film Physical Vapor Deposition, to the study of the plasma - surface interactions, and to the development of the related ultra-high, clean vacuum technologies.

Objectives:

- **Development** of novel thin films for optoelectronic applications as: → **growth** of oxides films as graded or superlattice structures, → **growth** of epitaxial semiconductor films,
- **Surface** engineered solutions in clean-tech applications like thermo-solar for energy generation
- **Novel** high energy density electric field pulsed engineering technologies, for water/air remediation technologies; further development of novel biocompatible coatings
- **New** films deposition techniques (HIPIMS, cathodic arc coupled with low energy ion implantation);
- **New** characterization methods (in-depth nano-Auger electron spectroscopy, nano-corrosion, surface microscopy at nano- and mezo-scales).

► *Optoelectronics methods and techniques for cultural heritage restoration*

The research focuses on the creation and delivery of knowledge towards professionals and organizations responsible for the cultural heritage preservation, scientifically enforcing all restoration strategies and decision making.

The values of this axis are: **excellence** pragmatically evaluated; **innovation** understood in the broadest meaning sense - not strictly as "invention", but also developing novel approaches, pushing boundaries, and creating knowledge; **leadership** helping to shape and advance the profession, both technical and social dimension; **in service** to the preservation community.

The foreseen main development directions are: ▪ **New** perspectives of digital models exploitation – data processing for polyvalent use, data mining for prediction, and informational instruments; ▪ **e-Smart** Access to Infrastructure for cultural agents and not only; ▪ **Instrumentation** and investigation research for underwater archaeology; ▪ **New** materials accelerated aging and contemporary art preservation issues.

► *Optoelectronics Environment Assessment and Remediation Applications*

The direction provides coverage of laser remote sensing and complementary methods, technology and applications within environmental domain, where atmosphere, water and soil are considered as 3-dimensional dynamic systems in continuous interaction.

Objectives:

- **D**evelopment and improvement of investigation methods for environmental assessment: active and passive remote sensing, in situ and laboratory;
- **M**odeling and experimental retrieval of atmospheric pollutants' properties during transport, interactions and modifications influencing air quality and climate
- **E**xperimental and theoretical research for the physical, chemical and optical characterization of environmental components and parameters;
- **D**evelopment of new effective methods and technologies for environment rehabilitation: → **e**ffects of natural environment on human health and well-being, vulnerabilities and adaptation capacity; → **c**reating new interfaces between the scientific community and decision makers; → **e**stablishing of strategic partnerships.

► *Alternative fuel technologies and the science of environmental impacts*

Objectifs: **D**evelopment of bio-fuels - 3rd and 4th generation; → **A**ssessment of the used bio-fuels on the biodiversity impact; → **D**evelopment of the green pre-treatment technologies for improving the ligno-cellulosic biomass potential; → **I**ncrease of the biogas production technology efficiency; → **D**evelopment of secondary products from bio-fuel; → **D**evelopment of innovative photovoltaic cells; → **G**reen-house gases inventory and their impact on the bio-fuel chain; → **U**nderstanding the long-term fate of geologically stored CO₂; → **O**ptimising the integration of CO₂ capture into power plants; → **N**ew CO₂ storing methods; → **N**ew methods for obtaining and capture the bio-hydrogen.

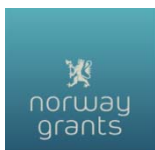
► *High performance complex systems for hydraulic and pneumatics actuation*

Objectifs: **D**evelopment of digital hydraulics for energy consumption optimisation; **T**ribology of mobile seals and mechanical couplings; **I**mprovement of the dynamic performances of hydraulic-mechanical systems using servo-equipments; **M**odernize the pneumatic drive systems; **O**ptimisation of the mobile equipment operation using mechatronics, based on hydraulic drives, sensor science and electronics; **I**ncreasing working pressure in hydraulic systems, using new materials; **E**lectro-hydraulic equipment with central automated control able to learn repetitive movements or perform in some default parameters.

► *Technology transfer*

The National Institute of Optoelectronics is part of the Romanian Network for Innovation and Technology Transfer having as objectives: • promoting scientific expertise; • consolidating the innovation; • effectively informing the policy-makers and leadership organizations/persons.

Project RADO - Romanian Atmospheric research 3D Observatory, Norway Grants STVES 115266



(<http://rado.inoe.ro>):

- **Budget:** 2.8 milioane EUR
- **Duration:** 2009-2011
- **Role:** Coordinator



RADO



Networking & coordination

Obtained results:

- National Observatory for Atmospheric Remote Sensing (unique in the SE Europe)
 - Observation network = 5 measurement sites: Iasi, Cluj, Timisoara, Bucharest-Baneasa, Bucharest-Magurele (lidar, sun photometer, in situ)
 - Data center = 1 common data repository, data handling procedures, EUMETCAST
 - Science center = education (MSc & PhD students, campaigns) & outreach activities (children, high school students, public at large, mass-media)

Equipments & human resources

Project EXIST – EXtentation for research and development **I**nfrastructure using remote **S**ensing **T**echniques for environmental studies

Project DELICE - Developing the emerging research potential of Romanian Lidar Centre, FP7-REGPOT-2008-1, 229907

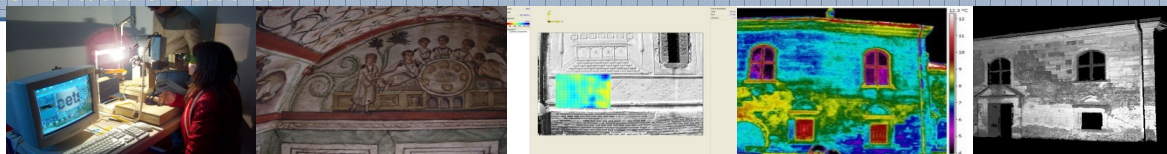
Annual On-site European Campaigns for Cultural Heritage Culture 2000 Program



- Partner in the Project CLT 2003/A1/RO-515 - *Advanced On-Site Laboratory for European Antique Heritage Restoration* / 43200 Euros / 2003-2004;
- Coordinator of the Project CLT2005/A1/RO-488 - *Saving Sacred Relics of European Medieval Cultural Heritage* / 147590 Euros / 2005-2006;
- Partner in the Project CLT 2006/ A1/CH/RO 80 – *The Stone House* / 20000 Euros / 2006-2007



- evidenced less known European treasures – part of the European cultural heritage;
- stimulated the trans-disciplinary applications and demonstrated the research teams' compatibility;
- highlighted the the modern scientific knowledge accumulated in the restoration techniques and methodologies;
- contributed to the European research results obtained in national and framework programs;
- created new applications, as modern methods for validation, standardization, certification and implemented the studies.



Results: mobile laboratory and on-site working capacity; package of non-contact, non-invasive, remote controlled methods of investigation and evaluation for conservation (3D scanning, laser Doppler vibrometry, thermovision, laser spectroscopies, radar ground inspection etc); techniques for long-term on-line control of conservation parameters etc.

Project MNT-ERA.NET Functionalised Implants for Medicine – FIMED

Duration: 2010 - 2012
 Budget: 252,325 EUR
 Role: Romanian Coordinator

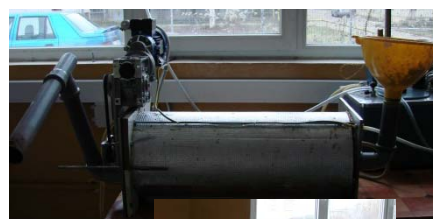


Obtained results:

- Technology for production of the Ti10Zr10Nb5Ta new alloy for spinal implants
- Biocompatible coatings with reduced friction coefficient and wear, with enhanced corrosion resistance, obtained by vacuum arc cathodic technique

Project BIOGEF - Highly efficient technology for biogas production from biomass, in an integrate system, for Romanian agricultural farms - Contract no. 22099/2008

Duration: 2008-2011
 Budget: 2,000,000 ROL
 Role: Cordinator
 Programme: PNCDI-2

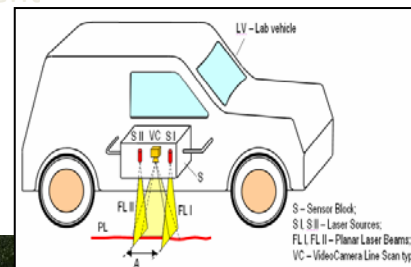


Obtained results:

- Technology for biogas obtaining from biogenic wastes
- Pilot installation for biogas obtaining from biogenic wastes
- Biogas obtained from biogenic wastes
- Elaboration of a biogas standard proposal according to EU norms

Project HERMES - Innovative, Highly Efficient Road Surface Measurement and Control System - FP 7 - Grant agreement no: 315029

Duration : 2012 - 2014
 Budget: 201,858 EUR
 Role: Partner



Results:

- Longitudinal and transversal road profile measurement system
- Feature extraction for road safety warning system