E9: HETEROGENEOUS SYSTEMS

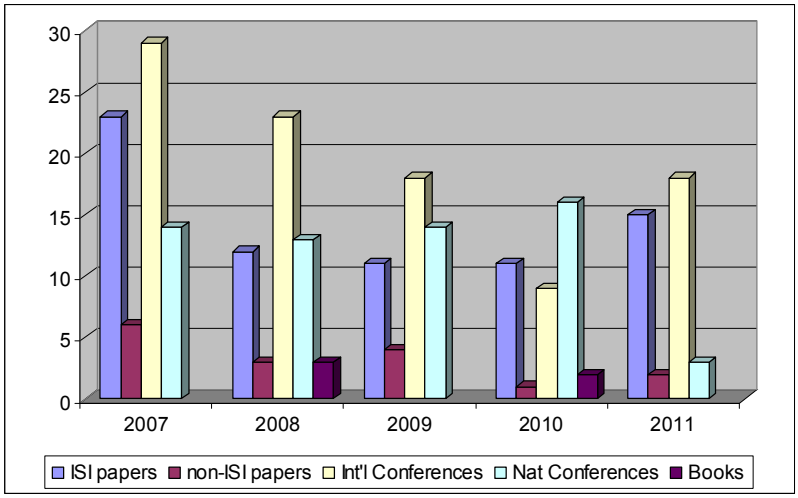
The "Heterogeneous systems" team, lead by Dr. CSI Dan Donescu, is formed by 7 researchers with PhD title, 1 PhD student, 1 assistant researcher and 2 technicians.

R&D directions.

- Polymer-inorganic hybrids obtained by sol-gel process and/or melting intercalation processing;
- Polymer-inorganic functional nanoparticles obtained in disperse media;
- Hybrid nanocomposites obtained by Layer-by-Layer polyelectrolyte deposition;
- Polymeric nanoparticles and thin films for biomedical applications
- Hybrid magnetic-polymer nanoparticles for drug delivery systems and biosensors;
- Emulsion and microemulsion polymerization with functional monomers;
- Multifunctional polymer electrolytes;
- Core-shell micro- and nanoparticles;
- Customer designed synthesis for new biocompatible polymers;
- Micro- and nanoparticles with controlled properties;
- Specific, high technology, analyses and characterizations for polymer nanoparticles.

Major Results

- ISI papers: **72** (summarizing $\mathbf{FI_{total}}$ **= 79,817** and $\mathbf{AIS_{total}}$ **= 52,056**) of which, **11** in collaboration with international teams (a complete list could be provide by request);
- Non-ISI papers: **14**;
- International communications: **89**;
- National communications: **52**;
- Books and international book chapters: **5**;
- National Patents: **1**;
- External collaborations – submitted EU proposals: **8**.
- PhD thesis: **7**;
- Training stages in European labs.: **10**;
- Postdoctoral fellows: **4**;
- Young graduates hired: **8**



New area of research explored. Polymer nanohybrids with application in medicine, with magnetic nanoparticles and biopolymers used for drug encapsulation, with silver (Ag) nanoparticles with anti-bacterial properties, with carbon nanowires for electromagnetic shielding, radiation insulating foams.

Entrepreneurship initiatives. Due to the slow development of the national economy interested only in few areas in applying new researches, it was managed to integrate into international consortium. HARCANA project has developed research for obtaining polymer materials or to use carbon

nanotubes for automotive industry and polymer foams for screens against electromagnetic radiations.

Projects coordinated by "Heterogeneous Systems" team:

International:

No.	Type	Name	Period
1.	FP7-Large	High Aspect Ratio Carbon-based Nanocomposites – HARCANA	2008-2012
2.	FP6-SSA	Enhancement the Quality Participation at FP6 Projects in the Polymer Nanomaterials Field – ENPONA	2005-2008
3.	Bilateral	Natural Fiber Composites with Nanofiller Containing Binders	2007-2008

National:

No.	Type	Name	Period
1.	PN2-HR	Polymeric nanocomposites obtained through polymerization in aqueous medium in the presence of superhidrophobic layered silicates - SILFOB	2010-2012
2.	PN2-Ideas	Polymer composites based on nanosilica networks grew through -soft- methods on nanolamellare entities - SILICORE	2009-2011
3.	PN2-Capacities	High Aspect Ratio Carbon-based Nanocomposites – ROHARCANA	2008-2012
4.	PN2-Collaborative	Medical device for articular diseases treatment based on nanomaterials and magnetic field effects - ARTROMAG	2008-2011
5.	PN2-Collaborative	Eco-efficient solutions for plastic waste management using degradative potential of biological systems - ECODEGRAD	2008-2011
6.	PN2-Collaborative	Design and development of innovative biotechnologies to obtain monascus sp. nanosamples with potential applications in therapy - MONALISA	2008-2011
7.	PN2-Capacities	Creating a centre of expertise for the characterization of polymer nanocomposites - POLINANO	2008-2010
8.	PN2-Collaborative	Nanocomposites with electric and magnetic properties for high selective separative processes - NEMSEPSEL	2007-2010
9.	CEEX	New Nanostructured Materials With Controlled Properties And Biomedical Applications - BIONANOMAT	2006-2008
10.	CEEX	Chromogen-polymeric composite systems for photoinduced surface structures and selective ion sensors - CROMOPOL	2006-2008
11.	CEEX	Therapeutic Nanostructured Iridoids Bio-Products Obtained from Romanian Vegetal Species - NANOIRIDOPLANT	2006-2008
12.	CEEX	Radiolabeled micro and nanospheres for cancer therapy - MAR	2006-2008
13.	CEEX	Surface phenomena and organization in disperse systems with anisotropic fluids - SIDISANIZ	2005-2008
14.	CEEX	Integrated scientific network for multifunctional polymeric materials development based on knowledge - MULTIPOL	2005-2008
15.	CEEX	Nano-composites polymers-inorganic layers used like strengthen hybrids at nano-scale - NANOCHRASN	2005-2008
16.	CEEX	Multi-functional advanced materials with silver nano-powders addition - NACOLAG	2005-2008

17.	CEEX	Textile printing digitization technologies and products complex integrated system - DIGINTEX	2005-2008

Major Infrastructure

- Environmental Scanning Electron Microscope (ESEM);
- Thermal & Thermomechanical Analysis System:
  - Thermal Gravimetric Analysis instrument (TGA);
  - Differential Scanning Calorimeter (DSC);
  - Simultaneous DSC-TGA instrument couplet with Mass Spectrometer;
  - Dynamic Mechanical Analysis instrument (DMA).
- Measurement System of Particles Dimensions by Dynamic Light Scattering, Molecular Weight and Z Potential (DLS);
- Fourier Transformate Infrared Spectrometer (FTIR);
- UV-VIS Spectrophotometer.

Visibility actions. International projects

- ENPONA (FP6-2004-ACC-SSA-2-017494)
- HARCANA (FP7-NMP3-LA-2008-213277)

Within this projects have been organized brokerage activities to initiate collaborations with big research centers from Europe. A high number of researchers were interested regarding these meetings (France, Slovakia, England, Germany, Holland).

International partners:

GKSS - Forschungszentrum Geesthacht GmbH, Germany
Ecole Superieure de Physique et de Chimie Industrielles de la Ville de Paris, France
Materia Nova, Belgium
Universite de Liege, Belgium
GMT Membrantechnik GmbH, Germany
BORSIG Membrane Technology GmbH, Germany
Universite Catholique de Louvain, Belgium
Consejo Superior de Investigaciones Cientificas, Spain
Emerson & Cuming Microwave Products NV, Belgium
FutureCarbon GmbH, Germany
INERGY Automotive Systems Research SA, Belgium
Technische Fachhochschule Wildau, Germany
Ecole Superieure de Chimie Physique Electronique de Lyon, France
Polymer Institute - Slovak Academy of Science, Slovakia
The University of York - Green Chemistry Centre of Excellence, U.K.
Laboratoire d'Electrochimie et de Physicochimie des Materiaux et des Interfaces, France
Universite de Provence - Laboratoire de Chimie Macromoleculaire, France
Institut fur Verbundwerkstoffe GmbH - Materials Science Department, Germany
Eindhoven University of Technology - Dpt. of Chemical Engineering and Chemistry, The Netherlands
Utrecht University - Van't Hoff Laboratory, The Netherlands
Perugia University, Italy
Centro Ricerche FIAT, Italy
Fundacion INASMET, Spain
Sheffield Hallam University, U.K.

Other significant aspects.

- Within ENPONA project have been recruited 7 young people to prepare and finalize PhD theses. It were provided the conditions through which each young researcher performed training stage in European centers (France-3, Holland-3, Slovakia-2, England-1, Germany-1)
- Organization of: short visits of **5** abroad experts in ICECHIM; **6** international brokerage events; short visits of **8** Romanian specialists in EU labs.; **4** equipments training courses;