E 8: ECO – FRIENDLY MATERIALS

Team description

The team consists in specialists in the development of new polymeric materials (including bio - nano-hybrides) considering synthesis methods and melt processing procedures.
The results are certified by the number of patents and ISI coated articles, new technologies and new products, obtained or realized over the years including the analyzed period, all with the main authors / project manager the team leader.

Fields of interest

- Eco-friendly multifunctional materials for eco – friendly applications;
- Micro-encapsulation;
- Hydrogels for tissular regeneration

Achievements

– Publication of about. 4 articles each year (2007 – 2011) (Fig.1)
– Patents and patents application with an average by 2.2 patent - patent application / year (Fig.1)
– Books / chapter in books :1 book to be published at Politehnica Press – UPB
1 chapter in a book

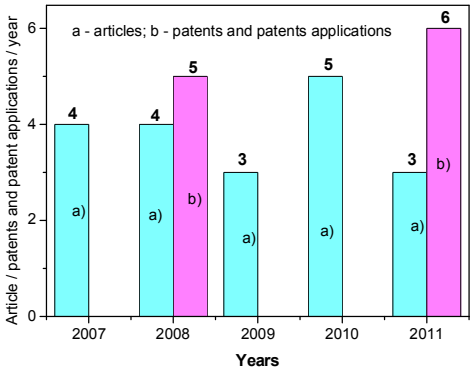

Fig.1

The dynamic of the research subject and directions

- The main research area that the team approached was the study and the realization of eco-friendly materials for various eco-friendly applications, namely:
- Materials with barrier properties for eco-friendly food packaging;
- Hydro-soluble materials for eco -friendly packaging;
- Biodegradable materials, including foam-type, for eco-friendly packaging;
- Materials with antimicrobial properties for eco-friendly food packaging;
- Materials for corrosion, anti-vibrational and anti-abrasive protection of the for metal surfaces;
- Sustainable materials for runways in road constructions.

In 2008 the team approached two new applications directions of new eco -friendly materials of great scientific and practical interest, in which significant results were obtained:

- Biodegradable and biocompatible materials for tissue reconstruction (hydrogels for adipose and cartilaginous tissue regeneration);
- Microencapsulation of some reactants used in soil decontamination polluted with petroleum products.

Based on the obtained results the team has decided to maintain and develop all the three described research directions. The main results obtained in the last period is summarized in table 1

Table 1 Main projects and the scientific results with the specification of the way in which the results are disseminated (2007 – 2011)

Project	Articles ISI quoted / Symposium (in accordance with the CV and the main results list)	Technology / Product / Patent
A. International projects **2006 - 2008** Eureka E! 3523 – "Plastics recycling technology using the re-melting and re-stabilization method" / **Project manager** / project type EUREKA	Chapter in book: **Doina Dimonie** et al., **"**Recycling – book 1 - chapter. "Overview on POSTC-PET recycling by chain extension", ISBN 979-953-307-329**-2,** InTech open access publisher Croatia	Technology for recovery of POSTC-PET
B. National projects -" Foam eco - friendly packages based on biodegradable renewable polymers", 2008 –2011 /Project manager / project type PN II /2008	- **D.Dimonie et al.,** Journal of Nanomaterials, Volume 2008, Article ID 538421, 7 pages, doi:10.1155/2008/538421 "The dependence of the XRD Morphology of some bionanocomposites on the silicate treatment" - **D.Dimonie et al**., Polymers 2011, 09, ISSN 1618-7229, www.e-polymer.org - MATERIALE PLASTICE, 47 (4), pp. 486-491, 2010; - **D.Dimonie et al.,** Revue Roumaine de Chimie, 2011, 56(7), 685 – 690; - **D.Dimonie et al.,** Proceeding of 16th Romanian International Conference on Chemistry and Chemical Engineering, Sinaia, September 9-12, 2009, Ed. Printech,2009, ISBN 978-606-521-349-4 - **D.Dimonie et al.,** Proceeding of International Conference of the South Eastern Countries Chemical Societies September - ICOSECS7 – 7TH, 15 – 17, 2010, Bucharest – Romania, ISBN 978-973-748-512-0;	New technology for obtaining eco –friendly new foamed packages New products: granules based on starch and polymeric foams based on starch for eco – frie.ndly packages Patent application 2011
"New concepts and strategies for developing new knowledge of biocompatible structures in bioengineering" /2010 – 2013 / Project responsible / Project type : Exploratory research complex ideas	**Doina Dimonie et al., "N**ew alginate hydrogels with controlled gelling time, morphology and properties for soft tissue regeneration", under publication at BMC Biotechnology (journal with 2,86 impact factor).	New hydrogel type Patent application 2011 no.A/01263 / 29.11.2011

List of ongoing projects

– "Cellular biodegradable ecological packaging based on renewable polymer" / contract no.32101 / 2008 – 2011 / **Doina Dimonie**

– "Development and modernization of food films based on biopolymers and natural microbial agents to increase food security" / contract no.52134 /2008 – 2011 /**Liliana Anton**

– "New concepts and strategies for developing new knowledge of biocompatible structures in bioengineering" /contract no. 248/2010 – 2013 /**Doina Dimonie**

– "Oxidizing and reducing microencapsulation of substances for cleansing soil" / contract FP 7 226956 / sub-contracting by ICECHIM / 2010 – 2011 / **Doina Dimonie**
– "Plastics recycling technology using the re-melting and re-stabilization method" /Eureka E!3523, 2008 / **Doina Dimonie**

The evolution of the human resources
In our group, young people were always involved. Even though some have left the team (one to work in University and another in Spain) others were immediately hired. Recently was hired a young graduate in 2011. Improving the professional level was always an objective and was performed especially by youth participation in master and doctoral studies. During 2007 - 2011 were presented two doctoral theses, with subjects related to the scientific activity performed by the team. For an internship at a University in Europe for the young doctoral student that presented its dissertation in 2011 (POST-DRU programme) following three possibilities were established:

- Pissa University, Italy, Prof. Camino;
- University of Strasbourg, France, Prof. Luc Averous.
- University of Patras, Greece, Dr. George Papanicolaou.

In our group, students had conducted research internships including for the elaboration of their graduation thesis. There are requests for research internships from foreign students. Solving the legal formalities for accepting these young students in ICECHIM is required.
Young people are trained continuously in dissemination activities of the team. All presentations at conferences are held only by young people.

Other aspects for the scientific development of the research team
For cooperation related to studying and carrying out different eco – friendly materials the team has received the agreement from the following professors:

- Prof. Fillipe Philippe DUBOIS from Universite de Mons-Hainaut UMH, Center of Innovation and Research in Materials & Polymers CIRMAP,
- Prof. Luc Averous, Université de Strasbourg, Ecole Européenne de Chimie, Polymères et Matériaux

These agreements will be used in the future approaches of the team.

Visibility – Between 2007 – 2011, Dr. Doina Dimonie-the team leader:
– Was reviewer at Polymer International, Journal of Polymer Research, Materials Chemistry and Physics
– Has received Gold medal at " INVENTIKA", 2008, Bucharest, for patent Ro no.121692
– Has received Bronze medal at "INVENTIKA" 2011, Bucharest, for patent application no .00560/21.07.2008, decision Ro. no.3/112
– Was expert valuator at RELANSIN, CEEX, PNCD II, PNCD II – "Capacitati" research programs
– Has supervised the PhD thesis "Multifunctional new materials based on starch" (UPB- 2011).