Autoritate contractanta:

Unitatea Executiva pentru Finantarea Invatamantului Superior, a Cercetarii Dezvoltarii si Inovarii

Contractor principal:

Institutul de Chimie Macromoleculara "Petru Poni" Iasi

BIONANOCOMPOZITE ANTIMICROBIENE PENTRU APLICAŢII MEDICALE

BIONANOMED

Program PARTENERIATE - PNII-PT-PCCA-2011-3.2-0979
Contract nr. 164/2012

Domeniul: Materiale, procese si produse inovative
Durata proiect: 2012 - 2016

CONSORTIU

Coordonator proiect:
INSTITUTUL DE CHIMIE MACROMOLECULARA
"PETRU PONI" IASI
Director proiect CO: Dr. Cornelia Vasile

Partener P1:
INSTITUTUL NATIONAL DE CERCETARE-DEZVOLTARE PENTRU STIINTE BIOLOGICE BUCURESTI (INCDSB)
Director proiect P1:
Dr. Mioara Lungu

Partener P2:
S.C. I.C.P.E. BISTRITA S.A. (ICPE)
Director proiect P2:
Dr. Maria Rapa

OBIECTIVE GENERALE

- Obtinerea unei noi categorii de materiale – BIONANOCOMPOZITE continand amestecuri de polimeri sintetici cu polimeri naturali, optimizate cu nanoparticule de argint cu efect antimicrobian.

- Stabilirea unor tehnologii de prelucrare a acestor materiale in vederea obtinerii unor dispozitive medicale cu proprietati speciale, biocompatibile, biodegradabile, antimicrobiene.

OBIECTIVE SPECIFICE

- bioactivarea unor polimeri sintetici biodegradabili nou sintetizati (PLA, PVA, PU) modificati cu polimeri naturali in vederea cresterii biocompatibilitatii;
- obtinerea de nanoparticule de argint cu dimensiuni controlate;
- optimizarea bionanocompozitelor polimerice obtinute prin imprimarea de proprietati antimicrobiene;
- caracterizarea fizico-chimica si biologica a bionanocompozitelor obtinute in vederea stabilirii domeniului lor de utilizare;
- elaborarea unei tehnologii de obtinere a unui dispozitiv medical biodegradabil cu proprietati antimicrobiene

BUGETUL PROIECTULUI

	Valoare de la buget (lei)	Cofinantare proprie (lei)
Etapa 2012	254 000	0
Etapa 2013	815 100	62 103
Etapa 2014	385 000	29 020
Etapa 2015	381 900	31 361
Etapa 2016	476 500	65 016
Total	2 312 500	187 500
Total proiect	2 500 000	

ETAPA I (26.07.2012 – 10.12.2012):

Stabilirea/selectarea conditiilor din punct de vedere stiintific si tehnic pentru obtinerea unor materiale cu proprietati antimicrobiene

Activitati:

- *Realizarea unui studiu privind obtinerea dispozitivelor medicale biodegradabile si antimicrobiene*

Diseminarea rezultatelor: Etapa 2012

Comunicari

2eme Colloque Franco-Roumain de Chimie Medicinale, Iasi, 3 – 5 Octombrie 2012

1. In vivo and in vitro sustained release study of theophylline from biodegradable and biocompatible alginate/PNIPAAm hydrogels, R. P. Dumitriu, A.M. Oprea, C. N. Cheaburu, O. Novac, C. M. Ghiciuc, L. Profire, C. Vasile

2. Anhydride-modified collagen, D.Pamfil, C.Vasile, L.Verestiuc, M.T Nistor

Zilele Universității "Al. I. Cuza", Conferința Facultății de Chimie, Iași, România, 25-27 Octombrie 2012

3. (Bio)active Layers Deposition by Electrospraying, E. Pâslaru, B. S. Munteanu, A. Coroaba, G. E. Hitruc M. C. Baican, C. Vasile.

4. Electrospun coatings for antioxidant food packaging, R.P. Dumitriu, G.R. Mitchell, F. J. Davis, C. Vasile

5. Hydrolytic degradation of some poly(vinyl alcohol) copolymers for biomedical applications, R. Lipsa, N. Tudorachi, C. Vasile, M. T. Nistor, C.Grigoras

Postere

COST Action FA0904 International Workshop , "Processing technology and functional properties of polymer nanomaterials for food packaging", Wroclaw, Poland Sept 11-12, 2012

1. Electrospraying of the Chitosan/Vitamin E Formulations onto Various Substrates, B. S. Munteanu, E. Pâslaru, G. Hitruc, M. C. Baican, C. Vasile

Zilele Universității "Al. I. Cuza", Conferința Facultății de Chimie, Iași, România, 25-27 Octombrie (2012).

2.Testing of antioxidative and antimicrobial activity of some new food packagings, G. Pricope, C. Vasile, R.N. Darie, E. Pâslaru, B.S. Munteanu.

3. Gas permeability of some biocomposites; A. Sdrobis, R.N. Darie, A. Baklavaridis, C. Vasile

NanoTech Italy 2012 International showcase for nanotechnologies, Workshop COST Action: FA0904, Safety, Ethics and Societal Impact Venetia, Italia, 23 noiembrie 2012

4. Toxicity, biocompatibility and degradability of some modified natural polymers used for food packaging, R.P. Dumitriu, A.M. Oprea, C. Vasile

ETAPA II (11.12.2012 – 4.12.2013):

Obtinerea unor nanocompozite polimerice biocompatibile si biodegradabile cu proprietati antimicrobiene

Activitati:

- ***Sinteza si caracterizarea unor polimeri biodegradabili comerciali si sintetizati in laborator: alcool polivinilic (PVA), poliuretan (PU) si acid polilactic (PLA)***
- ***Prepararea unor materiale bionanocompozite pe baza polimerilor obtinuti si a unor biopolimeri naturali: colagen, elastina, condroitin sulfat, acid hialuronic***
- ***Obtinerea de nanoparticole de argint prin metoda electrolizei cu electrozi de argint precum si prin metoda electrospinning***
- ***Studiul interactiunii dintre amestecurile bioactive si nanoparticule in scopul obtinerii unor materiale cu proprietati antimicrobiene***
- ***Evaluarea caracteristicilor fizico-chimice ale bionanocompozitelor bioactive si antimicrobiene obtinute***
- ***Evaluarea in vitro a biocompatibilitatii materialelor prin determinari fizico chimice (conform Farmacopeei Europene in vigoare) si biologice prin determinarea citotoxicitatii***

Rezultate stiintifice obtinute

S-au *preparat* si caracterizat bionanocompozite si componentii lor:

- S-a perfectionat instalatia de "electrospinning" si s-au obtinut nanoparticule de Ag (AgNP), Ag/chitosan
- Poliuretan/biopolimeri/nanoparticule de argint prin incorporare sau prin depunere
- Acid polilactic/nanoparticule de argint/Vitamina E; acid polilactic/chitosan si acid polilactic/chitosan/ (AgNP),
- Poli(vinil alcool)/chitosan

Caracterizarea s-a efectuat prin spectroscopie UV, FT-IR, reologie, SEM, AFM, XDR, studiul proprietatilor mecanice si termice, permeabilitate la gaze, proprietati antioxidante, titrari potentiometrice,

S-au realizat unele *teste microbiologice*, de activitate antimicrobiana si antioxidanta

Diseminarea rezultatelor: Etapa 2013

Publicatii:

1. *Preparation of medical devices with antimicrobial properties*, M. Râpă, P. Stoica, E. E. Tănase, E. Grosu, G. Vlad, Journal of Optoelectronics and Advanced Materials Vol. 15, No. 7- 8, July – August 2013, P. 807 – 816;
2. *Novel Environmentally Friendly Copolymers Carboxymethyl Starch Grafted Poly(Lactic Acid)* Rodica Lipsa. Nita Tudorachi, Cornelia Vasile, Aurica Chiriac, Anca Grigoras, J Polym Environ (2013) 21:461–471;
3. *Evaluation of the Controlled Release Ability of Theophylline from Xanthan/Chondroitin Sulfate Hydrogels.* Ana-Maria Oprea, Manuela-Tatiana Nistor, Marcel Ionel Popa, Catalina Elena Lupusoru, Cornelia Vasile *Journal of Biomaterials and Nanobiotechnology*, 2013, 4, ***-*** Published Online April 2013 (http://www.scirp.org/journal/jbnb)
4. *Lignin Modification with Carboxylic Acids and Butyrolactone under Cold Plasma Conditions,* Oana Chirila, Marian Totolin, Georgeta Cazacu, Marius Dobromir, and Cornelia Vasile, dx.doi.org/10.1021/ie4015183, Ind. Eng. Chem. Res. *52*, 13264–13271 (2013)

Publicatii (continuare):

5. *Chitosan coatings applied to polyethylene surface to obtain food-packaging materials.* Bogdãnel Silvestru Munteanu, Elena Pâslaru, Lidija Fras Zemljic, Anamaria Sdrobis, Gina Mihaela Pricope, Cornelia Vasile, Cell. Chem. Technol. *48 (5-6)*, *565-575 (2014);*

6. *Effectiveness of chitosan as antimicrobial agent in LDPE/CS composite films as poultry minced meat packaging materials*, C. Vasile, R.N. Darie, A. Sdrobis, G. Pricope, A. Baklavaridis, E. Paslaru, S.B. Munteanu, I. Zuburtikudis, Cell. Chem. Technol *48 (3-4)*, *325-336 (2014)*;

Conferinte:

COST ACTION FA0904 "Eco-sustainable Food Packagingbased on Polymer Nanomaterials" INTERNATIONAL WORKSHOP: Characterization, Mechanics and Performance of Innovative Polymer Nanomaterials for Food Packaging Application 24-25 September 2013, Varna, Bulgaria. Frederic Joliot-Curie" Hotel Congress Complex, "Sts. Constantine and Helena", Varna

1. Poly(vinyl alcohol) composites and nanocomposites for food packaging. C. Vasile, E. Părpărită M. Baican;
2. Characterization by AFM and nano-indentation method of some stratified nanocomposites destined to food packaging. E. Pâslaru,Y. Tsekov,S. Munteanu, R. Kotsilkova, C. Vasile
3. New potential applications in food packaging of the electrospinning / electrospraying method used for polymer surface modification and to obtain of nano(micro)structures from antimicrobial agents as chitosan, silver and various bioactive agents. I. Polylactic acid / Silver NP/Vitamin E bio-nanocomposite fibers with antibacterial and antioxidant activity. B. Munteanu, Z. Aytaç, T. Uyar, C. Vasile.

Comunicari:

10th International Conference on Nanosciences & Nanotechnologies (NN13) 9-12 July 2013, Thessaloniki, Greece

1. *Poly(vinylalcohol)/chitosan/montmorillonite hydrogel nanocomposites*, Elena Părpăriţă, Cătălina Cheaburu Yilmaz, Manuela-Tatiana Nistor, Cornelia Vasile

2. *Polyethylene/ chitosan-Na^+-MMT nanocomposites*, R.N. Darie, A. Sdrobis, G. Pricope, A. Baklavaridis, *C. Panayiotou,* I. Zuburtikudis, L. Fras, D. Pamfil, C. Vasile

Al XI-lea Simpozion Internaţional de Produse Cosmetice şi Aromatizante, Iaşi – Romania, 4 – 7 Iunie 2013

3."*Textile de uz cosmetic cu caracter antioxidant*", Anamaria Sdrobiş, Emilia Csiszar, Cornelia Vasile Sdrobiş Anamaria, Ioanid E. Ghiocel, Vasile Cornelia

4. *Biomateriale pe baza de nanocompozite alcool polivinilic/chitosan / montmorillonit preparate prin metoda inghet dezghet* E. Parparita, C. Cheaburu Yilmaz, M.-T. Pintilie, C. Vasile

Comunicari (continuare):

Zilele Academice Iesene, A XXIV-a Sesiune de Comunicari Stiintifice a Institutului De Chimie Macromoleculara „Petru Poni" Iasi:Progrese în Stiinta Compusilor Organici și Macromoleculari Iasi, 3 - 5 Octombrie 2013

5. Caracterizarea Termica a Retelelor Semiinterpenetrate Pe Baza De Colagen Si 2-Hidroxietil Metacrilat D. Pamfil, C. Vasile, C. Schick.
6. Depunerea de Formulari Biocompatibile pe Substrat Poliuretanic prin E*lectrospraying / Electrospinning.* B. S. Munteanu, D. Macocinschi, E. Pâslaru, G. Hitruc, F. Doroftei, C. Vasile
7. Activarea cu Enzime pentru Obtinerea de Materiale Textile Inteligente. A. Sdrobis, E.Csiszar, M. Dobromir, C. Vasile.
8. Imobilizarea Imunoglobulinei G si a Fibrinogenului pe Suprafata Poli(Fluorurii de Viniliden) E. Pâslaru, G. E. Hitruc, M. C. Baican, A. Coroaba, M. Nistor, C. Vasile.

Postere:

The 8th International Conference on Materials Science & Engineering – BraMat 2013, BRASOV, 28 Febr.-2 March 2013

1.Preparation of medical devices with antimicrobial properties. M. Râpă, P. Stoica,E. Tănase, E. Grosu, G. Vlad

International Workshop Waedenswil, Switzerland, March 21-22, 2013 COST FA0904:Eco-sustainable food packaging based on polymer nanomaterials: "Development of new safe PNFP and Development of strategies to identify any critical interaction of PNFP with food"

2. Polyethylene - chitosan composites and nanocomposites for food packaging C. Vasile, R. Darie, A. Sdrobis, C. Cheaburu-Yilmaz, I. Zuburtikudis, Baklavaridis A.,G-M.Pricope***.***

10th International Conference on Nanosciences & Nanotechnologies (NN13) 9-12 July 2013, Thessaloniki, Greece

3. Hybrid collagen-based hydrogels with embedded montmorillonite nanoparticles M.T. Nistor, C. Vasile, A.P. Chiriac

4. *Biocompatibility, biodegradability and drug carrier ability of the hybrid collagen-based hydrogel nanocomposites.* M. T. Nistor, C. Vasile, A. P.Chiriac, L. Tartau;

5. *Effect of nanoclay hydrophibicity on the PLA/clay nanocomposites properties.* Sdrobis, R. Darie, E. Paslaru, A. Baklavaridis, R.P. Dumitriu, C. Panayiotou, I. Zuburtikudis A., C. Vasile

Postere (continuare):

Salonul Naţional de Inventică CHIM - INVENT 2013, Iaşi – Romania, 3 – 5 iulie 2013

6. *Obţinerea fibrelor textile receptive la modificări de temperatură şi pH,* A. Sdrobis, E.G. Ioanid, C. Vasile, a primit diploma si medalia "Petru Poni" iar A. Sdrobis a primit diploma si cupa "Tanarul cercetator".
7. *Procedeu de obtinere a unui hidrogel bicomponent* , R.P. Dumitriu, C. Vasile, a primit diploma si medalia "Petru Poni".

Zilele Academice Iesene, A XXIV-a Sesiune de Comunicari Stiintifice s Institutului De Chimie Macromoleculara „Petru Poni" Iasi:Progrese în Stiinta Compusilor Organici și Macromoleculari Iasi, 3 - 5 Octombrie 2013

8. Evaluarea Eficientei Analgezice A Ketoprofenului Încorporat in Hidrogeluri de Poli(N-Izopropilacrilamida) / Alginat de Sodiu. U. Filipov, R- P. Dumitriu, C.Vasile;
9. Membrane Biocompatibile de Baza de Poliuretan Continând Diferiti Compusi Naturali si Nanoparticule de Argint. E. Pâslaru, D. Macocinschi, D. Filip, A. Sdrobis, S. B. Munteanu, M. Lungu, D.Constantin, C. Zgardan, C. Vasile.

Etapa III. (5.12.2013 – 4.12.2014):

Evaluarea si optimizarea caracteristicilor compozitelor obtinute prin amestecarea polimerilor naturali si sintetici si a nanomaterialelor in diverse combinatii

Activitati:

- ***Studiul interactiunii dintre amestecurile bioactive si nanoparticule in scopul obtinerii unor materiale cu proprietati antimicrobiene;***
- ***Evaluarea caracteristicilor fizico-chimice ale bionanocompozitelor bioactive si antimicrobiene obtinute;***
- ***Evaluarea prelucrabilitatii materialelor - Caracteristici, determinari, capacitati (laboratoare acreditate, etc.);***
- ***Evaluarea stabilitatii termice a materialelor;***
- ***Evaluarea in vitro a biocompatibilitatii materialelor prin determinari fizico chimice (conform Farmacopeei Europene in vigoare) si biologice prin determinarea citotoxicitatii ;***
- ***Evaluarea activitatii antimicrobiene a materialelor cu ajutorul antibiogramei, prin metoda difuzimetrica Kirby – Bauer adaptata ;***
- ***Evaluarea degradabilitatii in diferite medii biologice;***
- ***Selectarea nanocompozitelor la care raportul prelucrabilitate/ biocompatibilitate/ biodegradabilitate/ proprietati antimicrobiene este optim.***

Rezultate stiintifice obtinute

- S-au dezvoltat noi nanocompozite la care raportul prelucrabilitate/ biocompatibilitate/ biodegradabilitate/ proprietati antimicrobiene este optim:
  - Bionanocompozite cu matrice poliuretanică prin metoda evaporării solventului si electrospinning;
  - Bionanocompozite pe bază de acid polilactic(PLA)/ulei epoxidat /nanoparticule de Ag (Ag NP) sau chitosan și agenți antioxidanți prin prelucrare in topitura si electrospinning;
  - Bionanocompozite pe bază de PLA/PCL/AgNPs și PLA/policaprolactonă (PCL)/Alg/Zn prin prelucrare in topitura;
  - Bionanocompozite pe bază de poli(alcool vinilic) și nanoargile.
  - S-au efectuat teste preliminare de degradare in mediu pentru copolimeri conținând poli(alcool vinilic) si acid polilactic sau aspartic

Diseminarea rezultatelor: Etapa 2014

Publicaţii:

1. **Effect of Nanoclay Hydrophilicity on the PLA/Clay Nanocomposites Properties,** R.N. Darie, E. Pâslaru, A. Sdrobis, G. M. Pricope, G. E.Hitruc, A. Poiata, A. Baklavaridis, I. Zuburtikudis, C.Vasile, Industrial & Engineering Chemistry Research, *53* (19), 7877–7890 (2014).

2. **Poly(lactic acid) co-Aspartic acid copolymers, Possible utilization in drug delivery systems**, Tudorachi N., Lipsa R., Vasile C., F. Mustata, *J. Polym. Env.,* 21:1064–1071 (2013).

3. **Biocompatible and biodegradable alginate/poly(N-isopropylacrylamide) hydrogels for sustained theophylline release,** R. P.Dumitriu, A.-M. Oprea, C.N. Cheaburu, M.-T. Nistor, O. Novac, C. M. Ghiciucc, L. Profire, C.Vasile, *J. Appl. Polym. Sci.,* 131(17), 40733-40748 (2014).

4. **Polylactic acid (PLA)/Silver-NP/VitaminE bionanocomposite electrospun nanofibers with antibacterial and antioxidant activity,** B. S. Munteanu, Z. Aytac, G.M. Pricope, T.Uyar, C. Vasile, *J. Nanoparticle Research,* in press

5. **Polyurethane-extracellular matrix silver bionanocomposites for urinary catheters**, D.Macocinschi, D.Filip, E. Paslaru, B. S. Munteanu, R. P. Dumitriu, G. M. Pricope, M. Aflori, M. Dobromir, V. Nica and C.Vasile, *J. Bioact. Compat. Polym.* Accepted

6. **Polyurethane biocompatible silver bionanocomposites for biomedical applications.** D. Filip, D. Macocinschi, E. Paslaru, B. S. Munteanu, R. P. Dumitriu, M. Lungu and C.Vasile *J. Nanoparticle Research*, 10.1007/s11051-014-2710-x

7. **Degradation of polyvinyl alcohol)-graft-lactic acid copolymers by fungus Trichotecium Roseum**. R. Lipșa, Niță Tudorachi, V.C. Grigoraș, C. Vasile, J. Appl. Polym. Sci, accepted

8. **Polyvinyl alcohol and starch blends: properties and biodegradation behaviour**., M. Râpă, E. Grosu, P. Stoica, M. Andreica, M. Hetvary, Ecoterra, Journal of Environmental Research and Protection, 2014, 11(1):34-42.http://www.ecoterra-online.ro/files/1402003301.pdf.

Cărţi:

1. Daniela Pamfil, Cornelia Vasile: **Aplicaţiile medicale şi farmaceutice ale unor biomateriale şi biocompozite sensibile la stimuli externi**, Technopress, 2014, ISBN: 978-606-687-149-5

Capitole de carte:

1. **Drug delivery and Release from polymeric nanomaterials,** C. Vasile, A.M. Oprea, M.T. Nistor, A.M. Cojocariu, Chap. 2 in Nanotechnology and Drug Delivery, Ed. J.L. Arias, Vol.1, 2014, CRC Press, Taylor and Francis Group, p. 28-81.
2. **Design and Mechanical Performance: Polyolefin / Biomass Composites,** C. Vasile, R. N. Darie, E. Părpăriţă, Woodhead Publishing (Elsevier) Chapter 16 in **Biocomposites: Design and Mechanical Performance** Eds. Manjusri Misra , Amar Kumar Mohanty, Jitendra Kumar Pandey, Gwen Jones, Woodhead (Elsevier) Publishing **:** in press

Cereri brevete depuse:

1. **Procedeu și compoziție pentru obținerea de noi bionanocompozite polimerice biocompatibile, cu proprietăți antimicrobiene și antioxidante pentru uz medical**, R.N. Darie, R. Lipșa, N. Tudorachi, E. Stoleru, C. Vasile, B.S. Munteanu, A/00598/Aug. 2014;

2. **Procedeu și compoziție de obținere prin electrofilare / electropulverizare a unor suprafețe poliuretanice bioactive (biocompatibile și antimicrobiene) pentru uz medical și farmaceutic**", B.S. Munteanu, E. Paslaru (Stoleru), D. Bejenaru, D. Filip, C. Vasile, A/00651/Aug. 2014.

Comunicări:

1. ***Antibacterial membranes based on polyurethane and biological polymers***, B.S. Munteanu, D. Macocinschi, E. Paslaru, R. P. Dumitriu, G.E. Hitruc, Cornelia Vasile, International Conference "Eco-sustainable Food Packaging Based on Polymer Nanomaterials" COST ACTION FA0904, 26-28 February 2014, Roma, Italia.

2. ***Evaluarea in vitro a hidrogelurilor pe bază de poli (alcool vinilic)/chitosan ca sisteme cu eliberare controlată a bisoprololului fumarat. The in vitro testing of polyvinyl alcohol/chitosan hydrogels as systems for controlled delivery of bisoprolol fumarate*** Autori: D. Pamfil, E. Parparita, C.N. Yilmaz, O. Yilmaz C. Vasile, Zilele Universităţii,"Alexandru Ioan Cuza" din Iaşi, Conferinţa Facultăţii De Chimie & 3ème Colloque Franco-Roumain de Chimie Médicinale, Ediţia 2014, Iasi, 31 oct – 01. nov., 2014, http://www.chem.uaic.ro/ro/manifestari/

3. ***Poly(vinyl alcohol) copolymers biodegradation with Trichotecium roseum fungi*****,** R. Lipsa, N. Tudorachi, A. Grigoras, C. Vasile, P. Gradinariu, A. P. Chiriac, F. Mustata, Zilele Universităţii,"Alexandru Ioan Cuza" din Iaşi, Conferinţa Facultăţii De Chimie & 3ème Colloque Franco-Roumain de Chimie Médicinale, Ediţia 2014, Iasi, 31 oct – 01. nov., 2014, http://www.chem.uaic.ro/ro/manifestari/

Postere:

1. Electrospraying of chitosan/vitamin E mixtures for bioactive coatings, R.P. Dumitriu, B.S. Munteanu, E. Pâslaru, C. Vasile, International Conference on Green Chemistry and Sustainable Engineering Barcelona, 29-31 July 2014
2. Polyurethane/biopolymers films and electrospun fibrous coatings for antimicrobial materials, R.P. Dumitriu, E. Pâslaru, B.S. Munteanu, D. Macocinschi, D. Filip, G.E. Hitruc, M. Lungu, C. Vasile, International Conference on Green Chemistry and Sustainable Engineering Barcelona, 29-31 July 2014
3. Smart textiles obtained by enzymatic activation followed by surface grafting of N-isopropylacrylamide, A. Sdrobiș, E. Csiszar, M. Dobromir, F. Doroftei, C. Vasile, *International Conference on Green Chemistry and Sustainable Engineering*, 29 - 31 July 2014, Barcelona, Spain;
4. Effect of Poly(ε-caprolactone)/Chitosan ratio on the properties of the Electrospun Nanofibres, A. Sdrobiș, R.P. Dumitriu, A. Baklavaridis, C. Vasile, *International Conference on Green Chemistry and Sustainable Engineering*, 29 - 31 July 2014, Barcelona, Spain.
5. Protein nanolayer with antimicrobial and antioxidant properties immobilized onto cold plasma or gamma activated poly(lactic acid) substrate, E. Stoleru Paslaru, G.E. Hitruc, E.G. Ioanid, T. Zaharescu, A. Coroaba, G. M. Pricope, C. Vasile, *6th Szeged International Workshop on Advances in Nanosciences*, 15-18 Octombrie, Szeged, Ungaria;
6. Method and composition for obtaining stratified composites, E. Pâslaru, B.S. Munteanu, R.P. Dumitriu, C. Vasile, *The XVIII^{-th} International Exhibition of Inventics, Research and Technological Transfer "INVENTICA 2014"* , July 2nd – 4th, 2014, Iasi, Romania;
7. Poly(vinylidene fluoride) surface modified with fibrinogen – Scaffold for cell culture, E. Pâslaru, M. Lungu, V. Coroiu, C. Vasile, *Joint IUBMB/ICGEB Symposium on Modern Biotechnological Advances for Human Health – BAHH*, May 20-22, 2014, Bucharest, Romania;

Postere (continuare):

8. Effect of silver nanoparticles on the dispersion, rheological properties and morphological aspect of solvent cast polyurethane/biopolymers bionanocomposite membranes – R.P. Dumitriu, D. Macocinschi, D. Filip, C. Vasile (P31), 6th International Conference *"Biomaterials, Tissue Engineering & Medical Devices" BiomMedD'2014,* 17-20 Septembrie 2014, Constanta, Romania;

9. Preparation And Characterisation Of Poly(Lactic Acid)/Poly(E-Caprolactone)/Sylver Nanoparticles Bionanocomposites, P. Stoica, M. Râpă, E. Grosu, M.-C. Chifiriuc, M. Lungu, R. Tatia, V. Coroiu, V. Lazăr, *Simpozionul International PRIOCHEM, Prioritatile Chimiei Pentru o Dezvoltare Durabila*, Ed. A X-A, ICECHIM, Bucuresti, 30-31 Octombrie 2014 (Poster).

10. Novel Bioactive And Biodegradable Materials For Medical Applications, P. Stoica, M. Râpă, M.-C. Chifiriuc, M. Lungu, R. Tatia, V. Coroiu, Gr. Vlad, V. Lazăr, *The 10th Environmental Legislation,Safety Engineering And Disaster Management (Elsedima) International Conference,* 18-19 Septembrie 2014, Cluj-Napoca, Isbn: 978-973-606-526-183-9 (Poster).

11. Biocompatibility Of New Biomaterials Based On Polyvinyl Alcohol And Natural Compounds With Silver Nanoparticles, *International Symposium On Modern Biotechnological Advances For Human Health – Bahh* M. Lungu, V. Coroiu, R. Tatia, S. Manoiu, M. Rapa, L. Moldovan, May 20-22, 2014, Bucharest, Romania (Poster).

12. Novel Biopolymeric Composites With Anti-Microbial And Anti-Biofilm Properties Based On Polycaprolactone, Chitosan and Essential Oils, P. Stoica, M. C. Chifiriuc, M.Râpă, C. Bleotu, V. Lazăr, *The 24th European Congress Of Clinical Microbiology And Infectious Diseases (Eccmid),* Barcelona, Spania, 10-13 Mai 2014. (Poster P0321, Conferinţă Internaţională Cotată ISI).

Teze de doctorat susţinute:

1. Elena Pâslaru: ***Elaborarea de suprafeţe polimerice receptive la factori externi*** – 24 Ianuarie 2014
2. Elena Părpăriță: ***Contribuții la obținerea și caracterizarea unor noi materiale polimerice degradabile in mediu*** – 27 iunie 2014

Etapa IV. (5.12.2014 – 4.12.2015)

Evaluarea fizico-chimica si biologica a compozitelor selectate in etapa III

Activitati:

- *Evaluarea in vitro a biodegradabilitatii compozitelor selectionate in mediu biologic simulat;*
- *Selectarea celor mai bune formulari ale bionanocompozitelor pe baza de PLA, PVA si PU si agenti antimicrobieni (teste de eliberarea a agentului bioactiv) si investigarea proprietatilor de suprafata;*
- *Testarea in vitro a citotoxicitatii bionanocompozitelor prin metode directe si indirecte;*
- *Evaluarea activitatii antimicrobiene;*
- *Evaluarea in vitro a biocompatibilitatii produselor;*
- *Determinarea efectului materialelor studiate asupra gradului de viabilitate si a proliferarii celulare*

Rezultate stiintifice obtinute

❖ ***Corelarea comportarii mecanice, termice si reologice cu aspectele morfologice ale bionanocompozitelor avand diferite continuturi de nanoparticule de argint pentru a stabili concentratia minima a acestora care asigura caracterul antimicrobian fara a afecta biocompatibilitatea.***

❖ ***Evaluarea in vitro a biodegradabilitatii compozitelor selectionate in mediu biologic simulat. S-a efectuat evaluarea pentru compozite cu cele trei matrici PLA, PU, PVA:***

- Degradarea hidrolitica in solutii de diferite pH-uri
- Degradarea enzimatica in prezenta enzimelor secretate de Trichoderma viride
- Actiunea degradativa a fungului Phanerochaete chrysosporium

❖ ***Evaluarea activitatii antimicrobiene:***

- bacterii Gram-pozitive: Staphylococcus aureus ATCC 29213, Staphylococcus aureus, Staphylococcus xylosus, Enterococcus fecalis
- bacterii Gram-negative: Escherichia coli; Escherichia coli, Klebsiella pneumoniae
- microfungi: Candida albicans ATCC, Listeria monocytogenes si Salmonella typhymurium.

❖ ***Evaluarea in vitro a biocompatibilitatii produselor***

– gradului de viabilitate si de proliferare celulara

– Imbunatatirea metodei citometrie de flux

- determinarea ADN total,
- a continutului de colagen,
- evaluarea proprietatilor de suprafata.

❑ **S-a stabilit ca toate bionanocompozitele sunt biocomatibile iar eliberarea agentilor bioactivi are loc controlat/prelungit prin mecanisme ne-Fickiene si dupa un timp indelungat prin degradarea matricei.**

Diseminarea rezultatelor: Etapa 2015

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1. **Degradation of poly(vinyl alcohol)-graft-lactic acid copolymers by Trichotecium roseum fungus.** R. Lipsa, N. Tudorachi, V.C. Grigoras, C. Vasile, *J. Appl. Polym. Sci.* 2015, DOI: 10.1002/APP.41777.

2. **Study of poly(vinyl alcohol) copolymers biodegradation.** R. Lipsa, N. Tudorachi, A. Grigoras, C. Vasile Memoirs of the Scientific Sections of the Romanian Academy CHEMISTRY, Tome XXXVIII, 2015, 1-22.

3. **Thermal and hydrolytic stability of silver nanoparticle polyurethane biocomposites for medical applications.** D. Macocinschi,,D. Filip, M.F. Zaltariov, C.D. Varganici, *Polymer Degradation and Stability*, 121, 238–246, 2015.

4. **Electrospun/electrosprayed polyurethane biomembranes with ciprofloxacin and clove oil extract for urinary devices.** D. Macocinschi, D. Filip, S. Vlad, C. Cernatescu, C.G. Tuchilus, C.A. Gafitanu, R.P. Dumitriu, *J. Bioacti. Compat Polym.* 1–15, 2015, DOI: 10.1177/0883911515581508.

5. **Polyurethane-extracellular matrix silver bionanocomposites for urinary catheters.** D. Macocinschi, D. Filip, E. Paslaru, B.S. Munteanu, R.P. Dumitriu, G.M. Pricope, M. Aflori, M. Dobromir, V. Nica, C. Vasile, *J. Bioact. Compat. Polym.* 30 (1), 99-113, 2015.

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8. **Fabrication, characterization and bioevaluation of novel antimicrobial composites based on polycaprolactone, chitosan and essential oils.** P. Stoica, M. C. Chifiriuc, M. Rapa, C. Bleotu, L. Lungu, G. Vlad, R. Grigore, S. Bertesteanu, E. Stavropoulou, V. Lazar, *Romanian Biotechnological Letters* 20 (3), 10521-10535, 2015. *http://www.rombio.eu/rbl3vol20/18.pdf*

9. **Environmentally protection by preparing of biomaterials based on synthetic and biopolymers.** M. Rapa, P. Stoica, E.E. Tanase, E. Grosu, M. Lungu, R.N. Darie, D. Stanciu, M. Somesan, M. Hetvary, *Studia Universitatis Babes-Bolyai Ambientum,* 58 (1-2), 121 - 130, 2013. *http://www.studia.ubbcluj.ro/download/pdf/904.pdf.*

10. **Novel bioactive and biodegradable materials for medical applications.** P. Stoica, M. Rapa, M.-C. Chifiriuc, M. Lungu, R. Tatia, V. Coroiu, G. Vlad, V. Lazar. *Environmental Engineering and Management Journal* (in proces de evaluare).

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12. **New NO-donors for lung diseases, Therapy.** L. Profire, C. Vasile, COST Action MP1404 SimInhale, Simulation and pharmaceutical technologies for advanced patient-tailored inhaled medicines, 12-13 Octombrie, Università di Parma, the 2nd Management Committee and the 1st Working Groups meetings, publicat pe site-ul proiectului. http://www.siminhale-cost.eu/members-area/

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1. **Collagen-based materials for pharmaceutical applications,** D. Pamfil, M.T. Nistor, C. Vasile, Chap. 13 in Handbook of Polymers for Pharmaceutical Technologies, Vol. 3 Eds V. Thakur and M. Kumari Thakur, 2015, Scrivener Publ. LLC 2015 439-482.

2. **Performance of biomass filled polyolefin composites,** C. Vasile, R.N. Darie-Niţa, Chap. 10 in BiocompositesŞ Design and Mechanical Performance, Eds M. Misra, J.K. Pandez, A. K. Mohanty, Woodhead Publ. 2015, 257 – 303.

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1. **Tehnologie de laborator de prelucrare a bionanocompozitelor prin incorporare**, C. Vasile, R. Darie-Nita, E. Stoleru, R. Lipsa, A. Irimia, M. Lungu, M. Rapa, G. Pricope – proces verbal de omologare 1/25.11. 2015.
2. **Tehnologie de laborator de obtinere a bionanocompozitelor prin prelucrare in topitura**, C. Vasile, M. Lungu, M. Rapa - proces verbal de omologare 618/16.11. 2015.
3. **Tehnologie de laborator de obtinere a bionanocompozitelor prin tratarea suprafetei**, C. Vasile, E. Stoleru, B.S. Munteanu, R.N. Darie-Nita, G. Pricope - proces verbal de omologare 2/25.11. 2015.

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2. Biomateriale antimicrobiene pentru aplicatii in tratamentul ranilor, R.P. Dumitriu, B.S. Munteanu, L. Sacarescu, G.E. Hitruc, L. Profire, C. Vasile Co 12/25.09.2015, Zilele Academice Iesene MACRO Iasi 2015 „Progrese in stiinta compusilor organici si macromoleculari", 24-26 septembrie 2015, Iasi, Romania.
3. Alginate or chitosan matrices as carriers for drug delivery in lung diseases therapy C.N. Cheaburu-Yilmaz, L. Profire, C. Vasile, COST Action MP1404 SimInhale, Simulation and pharmaceutical technologies for advanced patient-tailored inhaled medicines, 12-13 Octombrie, Università di Parma.
the 2nd Management Committee and the 1st Working Groups meetings, publicat pe site-ul proiectului. http://www.siminhale-cost.eu/members-area/
4. New NO-donors for lung diseases, Therapy, L. Profire, C. Vasile COST Action MP1404 SimInhale, Simulation and pharmaceutical technologies for advanced patient-tailored inhaled medicines, 12-13 Octombrie, Università di Parma. the 2nd Management Committee and the 1st Working Groups meetings, publicat pe site-ul proiectului. http://www.siminhale-cost.eu/members-area/

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1. Physically Crosslinked Hydrogels Based on Hyaluronic Acid and Polyvinyl Alcohol for Theranostic Applications. I. Synthesis and Characterization, C.N. Cheaburu-Yilmaz, N. Bibire, O. Yilmaz, C. Vasile, COST TD1004 Theragnostics Imaging and Therapy: An Action to Develop Novel Nanosized Systems for Imaging-Guided Drug Delivery WG4-P3 Final Annual Meeting Belgrade, 10-11 September 2015, Serbian Academy of Sciences and Arts.
2. Biocompatibility and Toxicity Studies on Unloaded and Loaded Hyaluronic Acid and Polyvinyl Alcohol Hydrogels with Methotrexate, N. Bibire, C.N. Cheaburu-Yilmaz, C.E. Lupusoru, C. Vasile, COST TD1004 Theragnostics Imaging and Therapy: An Action to Develop Novel Nanosized Systems for Imaging-Guided Drug Delivery WG4-P4 Final Annual Meeting Belgrade, 10-11 September 2015, Serbian Academy of Sciences and Arts.
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4. Process for preparing novel superabsorbing hydrogels based on xanthan and lignin from annual plants, with applicability in medicine and food industry, I.E. Raschip, C. Vasile, OSIM Patent No: RO129066A2/2012, Poster RO128, EUROINVENT 2015-European Exhibition of Creativity and Innovation, 14-16 May 2015, Iasi, Romania - medalie de argint si diploma.
5. Process for preparing a bicomponent hydrogel. R.P. Dumitriu, C. Vasile, OSIM Patent Number: RO123511-B1/28.02.2013, Poster RO129, EUROINVENT 2015-European Exhibition of Creativity and Innovation, 14-16 May 2015, Iasi, Romania.
6. New biomaterials responsive to external stimuli containing proteins, D. Pamfil, C. Vasile, Poster RO131, EUROINVENT 2015-European Exhibition of Creativity and Innovation, 14-16 May 2015, Iasi, Romania - medalie de argint si diploma.
7. Biocompatibility, biodegradability and drug carrier ability of some substituted-anhydride modified collagen based hydrogels, D. Pamfil, L. Tartau, L. Verestiuc, L. Nita, A. Chiriac, C. Vasile, Seventh Cristofor I. Simionescu Symposium, Frontiers in Macromolecular and Supramolecular Science, 4-6 June, Iasi, Romania.

Lucrare de licenta:

Student: Alexandru Nicoara: Biodegradarea substantelor complexe si biotehnologii de reducere a poluarii mediului cu substante xenobiotice. Iunie 2015, Licentiat cu nota 10.

Teze de doctorat sustinute:

1. Rodica Lipsa: Sinteza si caracterizarea unor compusi macromoleculari degradabili in mediul ambient. 30.01.2015 / Conducator stiintific: Prof. As. Dr. C. Vasile, Calificativ: excelent.

2. Petruta Stoica: "Optimizarea caracteristicilor fizico-chimice si biologice ale polimerilor in vederea utilizarii lor in medicina" / 3.09.2015: Conducator stiintific: Prof. dr. V. Lazar, Calificativ: excelent, experimentari in cadrul bionanomed: cap. 4: compozite biopolimerice pe baza de acid polilactic, policaprolactona şi alginat de zinc; cap. 5: compozite biopolimerice pe baza de policaprolactona, chitosan şi uleiuri volatile; cap. 7: compozite biopolimerice pe baza de acid polilactic şi nanoparticule de argint

Proiecte inrudite si noi:

1. **ACTIBIOSAFE**: Improving food safety through the development and implementation of active and biodegradable food packaging systems, Contract 1SEE/30.06.2014.
2. **ERASMUS +**: "Joint innovative training and teaching/learning program in enhancing development and transfer knowledge of application of ionizing radiation in materials processing" (AGREEMENT NUMBER 2014-1-PL01-KA203-003611).
3. **COST TD1004**: Theragnostics Imaging and Therapy: An Action to Develop Novel Nanosized Systems for Imaging-Guided Drug.
4. **COST MP1404**: Simulation and pharmaceutical technologies for advanced patient-tailored inhaled medicines (SimInhale).

ETAPA IV. (5.12.2015 – 4.12.2016)

Evaluarea biologica a compozitelor selectate si obtinerea unui produs experimental (tub de drenaj urinar cu actiune antimicrobiana) pe baza compozitelor obtinute

REZULTATE OBTINUTE:

Elaborarea tehnologiei de extrudare la faza miropilot pentru obtinerea unui dispozitiv medical (tub de drenaj urinar)

Rezultate stiintifice obtinute

Bionanocompozitele selectate in fazele anterioare ale proiectului au fost obtinute prin tehnologia micropilot elaborata si au fost detaliat caracterizate stabilindu-se:

- biocompatibilitatea
- gradul de viabilitate
- proliferarea celulara prin citometrie de flux
- continutul de DNA total
- stabilirea influentei materialelor asupra ciclului celular si evaluarea imuno-histo-chimica asupra sintezei componentilor matricei extracelulare respectiv a colagenului,
- evaluarea activitatii antimicrobiana prin studierea biofilmului depus pe suprafata acestuia,
- toxicitatea *in vivo* si
- testarea preclinica a tubului de drenaj urinar.

- **REZULTATELE AU ATESTAT FAPTUL CA BIOCOMPOZITELE OBTINUTE INDEPLINESC CERINTELE STANDARDIZATE IMPUSE PENTRU TUBURILE DE DRENAJ URINAR**

Diseminarea rezultatelor: Etapa 2016

Publicatii

1. **New antimicrobial chitosan derivatives for wound dressing applications,** Oana Maria Dragostin, Sangram Keshari Samal, Mamoni Dash, Florentina Lupascu, Andreea Pânzariu, Cristina Tuchilus, Nicolae Ghetu, Mihai Danciu, Peter Dubruel, Dragos Pieptu, Cornelia Vasile, Rodica Tatia, Lenuta Profire, *Carbohydrate Polymers* 141 28–40 (2016);

2. **Complex poly(lactic acid)-based biomaterial for urinary catheters: I. Influence of AgNP on properties**, Raluca N. Darie-Niţă, Bogdan S. Munteanu, Niţă Tudorachi, Rodica Lipşa, Elena Stoleru, Iuliana Spiridon, Cornelia Vasile, *Bioinspired, Biomimetic and Nanobiomaterials* DOI: http://dx.doi.org/10.1680/jbibn.15.00011, Published Online: May 18, 2016;

3. **Complex poly(lactic acid)-based biomaterial for urinary catheters: II. Biocompatibility,** Elena Stoleru, Bogdanel S. Munteanu, Raluca N. Darie-Niţă, Gina M. Pricope, Maria Lungu, Anamaria Irimia, Maria Râpă, Rodica D. Lipşa, Cornelia Vasile, *Bioinspired, Biomimetic and Nanobiomaterials*, http://dx.doi.org/10.1680/jbibn.15.00012, Published Online:April 07, 2016;

4. **Biodegradation of poly(lactic acid) and some of its based systems with Trichoderma viride**, Rodica Lipsa, Nita Tudorachi, Raluca Nicoleta Darie-Nita, Lacramioara Oprica,Cornelia Vasile, Aurica Chiriac, *International Journal of Biological Macromolecules* 88 515–526 (2016);

5. **Polyethylene Materials with Multifunctional Surface Properties by Electrospraying Chitosan / Vitamin E Formulation Destined to Biomedical and Food Packaging Applications,** Elena Stoleru, Silvestru B. Munteanu, Raluca P. Dumitriu, Adina Coroaba, Mioara Drobotă, Lidija Fras Zemljic, Gina M. Pricope, Cornelia Vasile, *Iran Polym J.,* DOI 10.1007/s13726-016-0421-0 (2016);

6. **Poly (vinyl alcohol)/chitosan cryogels as PH responsive ciprofloxacin carriers**, D.Pamfil, E. Butnaru, C. Vasile, *Journal of Polymer Research*, 23:146 (2016);

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7. **Novel Bioactive and Biodegradable Materials for Medical Applications**, P. Stoica, M. Râpă, M. C. Chifiriuc, M. Lungu, R. Tatia, V. Coroiu, G. Vlad, V. Lazăr, Environmental Engineering and Management *Journal*, November 2015, Vol.14, No. 11, 2703-2711. (FI = 1,065, Print ISSN: 1582-9596, eISSN: 1843-3707, Accession Number: WOS:000369090999000022, Tip document: Articol);

8. **Hybrid Nanostructures Containing Sulfadiazine Modified Chitosan as Antimicrobial Drug Carriers**, B.S. Munteanu, R.P. Dumitriu, L. Profire, L. Sacarescu, G. E. Hitruc, E. Stoleru, M. Dobromir, A. L. Matricala, C. Vasile, *Nanomaterials*, 6, 2016, http://www.mdpi.com/journal/nanomaterials;

9. **Lactoferrin-immobilized surfaces onto functionalized PLA assisted by the gamma-rays and nitrogen plasma to create materials with multifunctional properties**, E. Stoleru, T. Zaharescu, E. G. Hitruc, A. Vesel, E. G. Ioanid, A. Coroaba, A. Safrany, G. Pricope, M.Lungu, C.Schick, C. Vasile, *ACS Materials and Interfaces*, doi 10.1021/acsami.6b09069 (2016);

10. **Environmentally Friendly Polylactic Acid/Modified Lignosulfonate Biocomposites**; G. Cazacu, R.N. Darie-Niţă**,** O. Chirila, M. Totolin, M. Asandulesa, D.E. Ciolacu, J. Ludwiczak, C. Vasile, Journal of Polymers and the Environment*,* DOI 10.1007/s10924-016-0868-2 (2016);

11. **pH-responsive HEMA / citraconic anhydride modified collagen hydrogels as ciprofloxacin carriers for wound dressings, Short title: pH-responsive hydrogels for wound dressings**, D. Pamfil, C. Vasile, L. Tarțău, L. Verești uc, A. Poiată, *J. Bioactive and Compatible Polymers*, accepted;

12. **Alginate/Lignosulfonate Blends With Photoprotective And Antioxidant Properties For Active Packaging Applications,** R.P. Dumitriu, I. Stoica, D. S. Vasilescu, G. Cazacu, C. Vasile, *J. Polym. Environ.* Submitted.

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1. Nanogels of natural polymers, D. Pamfil, C. Vasile, Chapter 4 in Handbook on "Polymer gels". Section Polymer gels: Science and fundamentals. Ed. Vijay Kumar Thakur, accepted

2. Polysaccharide containing gels for pharmaceutical applications, C. N. Cheaburu- Yilmaz, S. Tuncay Tanriverdi, O. Ozer, C. Vasile. Chapter 6 in Handbook on "Polymer gels". Section Polymer gels: Science and fundamentals**.** Ed. Vijay Kumar Thakur, accepted

Teze de doctorat sustinute:

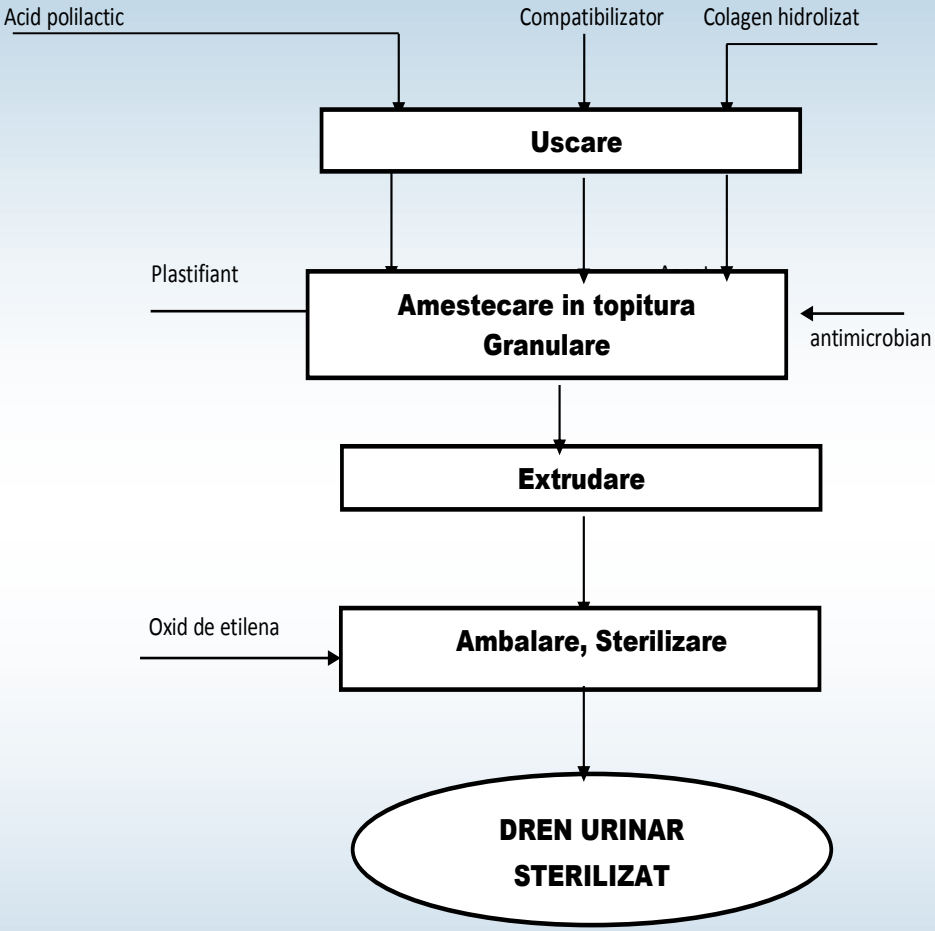
Pamfil Daniela: Noi biomateriale receptive la stimuli externi continand proteine, Coordonatori, C. Vasile si M. Cazacu, 9 mai 2016

Cereri de Brevete

• Composition and developing method of new modified release aminodarone hydrochloride matrix tablets with prolonged action, A. Creţeanu, L. Ochiuz, C. Ghiciuc, C. Vasile, C.M. Popescu, G. Ţintaru, Patent application A/00138-2016, **Medalie de bronz.**

• Composition and developing method of new modified release aminodarone hydrochloride complexed with hydroxypropyl-beta-cyclodextrin matrix tablets with prolonged action, A. Creţeanu, L. Ochiuz, C. Ghiciuc, C. Vasile, O.M. Păduraru, G. Ţintaru, Patent application A/00139/2016. **Medalie de argint.**

Activitatea V.9 P2. *Redactare brevet, tehnologie de obtinere tub de drenaj urinar cu actiune antimicrobiana*



Schema fluxului tehnologic de obtinere a drenurilor urinare

Compozite polimerice pentru obținerea unui tub de drenare urinar cu proprietăți antimicrobiene și procedeu de obținere a acestuia; Rapa M., Preda P., Lungu M., Coroiu V., Vasile C., Darie-Nita R. N., Dumitriu R. P., Chifiriuc M. C., Bleotu C., numar de inregistrare OSIM A2016/00876 din 22.11.2016 (beneficiar: S.C. I.C.P.E. Bistrita S.A.)

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- Evaluation of polylactic acid antioxidant packaging materials containing rosemary powder, R.N. Darie-Niță, T. Zaharescu, E. Stoleru, K. Leluk, C. Vasile, International Symposium on Modern biotechnologies in sustainable development of the Danube delta, May 31-June 2, 2016, Murighiol, Tulcea, Romania, p.21-23.

- Biodegradable PLA/Chitosan blends for medical and food packaging applications, M. Râpă, E.E. Tănase, R.N. Darie-Niță, A.C. Miteluț, C. Vasile, International Symposium on Modern biotechnologies in sustainable development of the Danube delta, May 31-June 2, 2016, Murighiol, Tulcea, Romania, p.31-33.

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1. Composition and developing method of new modified release aminodarone hydrochloride matrix tablets with prolonged action, A. Creţeanu, L. Ochiuz, C. Ghiciuc, C. Vasile, C.M. Popescu, G. Ţintaru, Patent application A/00138-2016, Proceedings of the 8+th Edition of the European exhibition of creativity and innovation, EUROINVENT'2016, Eds. A.V. Sandu,I.G. Sandu, 19-21 may, 2016, Iasi Ed. StuDIS, 2016, ISBN 978-606-775-212-0, p.326.
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3. Influence of silver nanoparticles concentration on the mechanical and thermal properties of poly(lactic acid) based biomaterial for urinary catheters, C. Vasile, Raluca N. Darie-Niţă , Bogdănel S. Munteanu, N. Tudorachi, E. Stoleru, R. Lipșa, International Symposium on Modern biotechnologies in sustainable development of the Danube delta, May 31-June 2, 2016, Murighiol, Tulcea, Romania, p.50 - 51.
4. Biocompatibility, functional properties and degradability of a poly(lactic acid) based biomaterial, E. Stoleru, B.S. Munteanu, Raluca N. Darie-Niţă , G.M. Pricope, M. Lungu, A. Irimia, M. Râpă, C. Vasile, International Symposium on Modern biotechnologies in sustainable development of the Danube delta, May 31-June 2, 2016, Murighiol, Tulces, Romania, p.71 - 72.
5. pH sensitivity and biocompatibility of poly(vinyl alcohol)/chitosan cryogels, D. Pamfil, E. Butnaru, M. Lungu, C. Vasile, International Symposium on Modern biotechnologies in sustainable development of the Danube delta, May 31-June 2, 2016, Murighiol, Tulces, Romania, p.73 - 74.
6. Effect of silver nanoparticles on the properties of pla based bionanocomposites for the medical devices field, M. Râpă, E. Grosu, P. Stoica, M. Hetvary, M. Lungu, R. Tatia, B.-S. Munteanu, M.-C. Chifiriuc, T. Zaharescu, C. Vasile The XXXIV-th Roumanian Chemistry Conference, OLTCHIM, Ramnicu Valcea, October 04-07, 2016, Calimanesti-Caciulata, Valcea, Romania
7. Process and composition for producing novel biocompatible polymeric bionanocomposites having antimicrobial and oxidation preventing properties for medical use. Raluca N. Darie-Niţă , Rodica Lipșa, Niță Tudorachi, Elena Stoleru, Cornelia Vasile, Bogdănel S. Munteanu, *INVENTICA 2016, June, 29 – July, 1, Iasi, Romania, diploma și medalie de aur.*
8. Effect of silver nanoparticles on the properties of pla based bionanocomposites for the medical devices field, M. Râpă, E. Grosu, P. Stoica, M. Hetvary, M. Lungu, R. Tatia, B.-S. Munteanu, M.-C. Chifiriuc, T. Zaharescu, C. Vasile, A XXXIV-a Conferinta Nationala de Chimie organizata de Centrul de Cercetare Oltchim, Academia Romana – Sectia de stiinte Chimice si Societatea de Chimie din Romania, in perioada 04-07 octombrie 2016, (http://conferinta.oltchim.ro/). Abstractul lucrarii a aparut in volumul de rezumate al conferintei.