RAPORT ŞTIINŢIFIC 1

Titlul proiectului: : Noi funcţionalizări hibride (anorganic – organic) a suprafeţelor biomaterialelor (metale, aliaje) cu molecule bioactive prin tehnici electrochimice.

Acronim: **HyBioElect**

Obiectivele etapei I (2013) au fost realizate în proporţie de 100 %, astfel:

1. Managerierea cu succes a proiectului

Managmentul proiectului a fost asigurat pe toată perioada etapei I, fiind realizate următoarele activităţi:

S-au planificat activităţile membrilor echipei.
S-au planificat reuniunile echipei.
S-au planificat activităţile experimentale şi s-au elaborat protocoale experimentale pe etape şi activităţi de obţinere a suprafeţelor funcţionale şi de caracterizare a lor (confidenţiale pentru membrii echipei).
S-au identificat 137 de articole bibliografice în domeniul temei proiectului care s-au clasificat într-un tabel, numărul din tabel corespunde numărului din dosarul cu fişierele pdf descărcate.

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110	H.O. Ammar, M. Ghorab, S.A. El-Nahhas, I.M. Higazy	Proniosomes as a carrier system for transdermal delivery of tenoxicam	International Journal of Pharmaceutics 405 (2011) 142–152
111	Xin Che, Ruo Yuan, Yaqin Chai, Jingjing Li, Zhongju Song, Wenjuan Li, Xia Zhong	A glucose biosensor based on chitosan–Prussian blue–multiwall carbonnanotubes–hollow PtCo nanochains formed by one-step electrodeposition	Colloids and Surfaces B: Biointerfaces 84 (2011) 454–461
112	Shyam S. Agrawal, Ashish Aggarwal	Randomised, cross-over, comparative bioavailability trial of matrix type transdermal drug delivery system (TDDS) of carvedilol and hydrochlorothiazide combination in healthy human volunteers: A pilot study	Contemporary Clinical Trials 31 (2010) 272–278
113	Sunil A. Agnihotri, Nadagouda N. Mallikarjuna, Tejraj M. Aminabhavi	Recent advances on chitosan-based micro- and nanoparticles in drug delivery	Journal of Controlled Release 100 (2004) 5 –28
114	Koji Kawahara and Kakuji Tojo	Skin Irritation in Transdermal Drug Delivery Systems_ A Strategy for its Reduction	Pharmaceutical Research, Vol. 24, No. 2, February 2007 (2006) DOI: 10.1007/s11095-006-9165-4
115	Iris Ale · Jean-Marie Lachapelle · Howard I. Maibach	Skin tolerability associated with transdermal drug delivery systems: an overview	Adv Ther (2009) 26(10):920-935 DOI 10.1007/s12325-009-0075-9
116	J. Berger, M. Reist, J.M. Mayer, O. Felt, N.A. Peppas, R. Gurny	Structure and interactions in covalently and ionically crosslinked chitosan hydrogels for biomedical applications	European Journal of Pharmaceutics and Biopharmaceutics 57 (2004) 19–34
117	José M. Campi, Hiléia K.S. Souza, João Borges, Ana Martins, Maria Pilar Goncalves, Fernando Silva	Studies on the interactions between bovine β-lactoglobulin and chitosan at the solid–liquid interface	Electrochimica Acta 55 (2010) 8779–8790
118	Pengkai Qi, Manfred F. Maitz, Nan Huang	Surface modification of cardiovascular materials and implants	Surface & Coatings Technology http://dx.doi.org/10.1016/j.surfcoat.2013.02.008
119	Isadora Reis Rodrigues, Maria Madalena de Camargo Forte Denise Scherman Azambuja, Katia R.L. Castagno	Synthesis and characterization of hybrid polymeric networks (HPN) based on polyvinyl alcohol/chitosan	Reactive & Functional Polymers 67 (2007) 708–715
120	Tingting Yin, Ruizhi Wu, Zhe Leng, Guanjun Du, Xuying Guo, Milin Zhang, Jinghuai Zhang	The process of electroplating with Cu on the surface of Mg–Li alloy	Surface & Coatings Technology http://dx.doi.org/10.1016/j.surfcoat.2013.03.024
121	A. E. Vasil'ev, I. I. Krasnyuk, S. Ravikumar, and V. N. Tokhmakhchi	Transdermal Therapeutic Systems For Controlled Drug Release (A REVIEW)	Pharmaceutical Chemistry Journal Vol. 35, No. 11, 2001
122	M. Surender, B. Basu, R. Balasubramaniam	Wear characterization of electrodeposited Ni–WC composite coatings	Tribology International 37 (2004) 743–749
123	Shigan Chai, Jinzhi Zhang, Tingting Yang, Jianjun Yuan,	Thermoresponsive microgel decorated with silica	Colloids and Surfaces A:

	Shiyuan Cheng	nanoparticles in shell: Biomimetic synthesis and drug release application	Physicochem. Eng. Aspects 356 (2010) 32–39
124	Gaëlle M. Roger, Serge Durand-Vidal, Olivier Bernard, Guillaume Mériguet Scott Altmann, Pierre Turq	Characterization of humic substances and polyacrylic acid: A high precision conductimetry study	Colloids and Surfaces A: Physicochem. Eng. Aspects 356 (2010) 51–57
125	PengHuang, Mingli, Cao, Qi Liu	Adsorption of chitosan on chalcopyrite and galena from aqueous suspensions	ColloidsandSurfacesA:Physicochem.Eng.Aspects409 (2012) 167–175
126	Linhui Qiang, Zhanfeng Li, Tianqi Zhao, Shuangling Zhong, Hongyan Wang, Xuejun Cui	Atomic-scale interactions of the interface between chitosan and Fe3O4	ColloidsandSurfacesA:Physicochem.Eng.Aspects419 (2013) 125–132
127	I. Pepi, J. Filipovi-Grcic, I. Jalsenjak	Bulk properties of nonionic surfactant and chitosan mixtures	Colloids and Surfaces A: Physicochem. Eng. Aspects 336 (2009) 135–141
128	Kun Yu, Jackie Ho, Elizabeth McCandlish, Brian Buckley, Rajesh Patel, Zhoubo Li, Nina C. Shapley	Copper ion adsorption by chitosan nanoparticles and alginate microparticles for water purification applications	To appear in: Colloids and Surfaces A: Physicochem. Eng. Aspects DOI: doi:10.1016/j.colsurfa.2012.12.043
129	Y. Li, K. Wu, I. Zhitomirsky	Electrodeposition of composite zinc oxide–chitosan films	Colloids and Surfaces A: Physicochem. Eng. Aspects 356 (2010) 63–70
130	Carolina Siqueira Franco Picone, Rosiane Lopes Cunha	Formation of nano and microstructures by polysorbate–chitosan association	Colloids and Surfaces A: Physicochem. Eng. Aspects 418 (2013) 29–38
131	Jinbin Lin, Hongling Chen, Ting Fei, Jinlong Zhang	Highly transparent superhydrophobic organic–inorganic nanocoating from the aggregation of silica nanoparticles	Colloids and Surfaces A: Physicochem. Eng. Aspects 421 (2013) 51–62
132	Cristel Onésippe, Serge Lagerge	Studies of the association of chitosan and alkylated chitosan with oppositely charged sodium dodecyl sulfate	Colloids and Surfaces A: Physicochem. Eng. Aspects 330 (2008) 201–206
133	Cristel Onesippe, Serge Lagerge	Study of the complex formation between sodium dodecyl sulfate and chitosan	Colloids and Surfaces A: Physicochem. Eng. Aspects 317 (2008) 100–108
134	Chee-Chan Wang, Li-Huei Lin, Hsun-Tsing Lee, Yu-Wun Ye	Surface activity and micellization properties of chitosan-succinyl derivatives	ColloidsandSurfacesA:Physicochem.Eng.Aspects389 (2011) 246–253
135	Erin C. Dreyer, Professor Gary W. Rubloff	Characterization Of Electrodeposited Chitosan Films By Atomic Force Microscopy And Raman Spectroscopy	Master of Science, 2006
136	Rong Ma	Nanocomposite Coatings for Biomedical Applications	Open Access Dissertations and Theses. Paper 4261. http://digitalcommons.mcmaster.ca/opendissertations/4261
137	Yi Cheng, Xiaolong Luo, William E. Bentley, Jordan Betz, and Gary W. Rubloff, Susan Buckhout-White, Omar Bekdash, Gregory F. Payne,	In situ quantitative visualization and characterization of chitosan electrodeposition with paired sidewall electrodes	First published as an Advance Article on the web 27th May 2010 DOI: 10.1039/c0sm00124d www.rsc.org/softmatter

2. Cercetarea exploratorie

S-a elaborat un raport experimental, care stabileşte metodele optime de obţinere şi caracterizare a suprafeţelor funcţionale, stabilileşte programele utilizabile pentru corelarea parametrilor de obţinere cu proprietăţile suprafeţelor funcţionalizate. S-au stabilit protocoale experimentale cu parametrii definiţi - ***Protocol experimental – Cinetica şi mecanismul electrocristalizării şi electro-co-depunerii*** (confidenţial pentru membrii echipei).

3. Mobilităţi

3.1. Mobilităţi interne:

Pentru activitatea de mobilitate internă a beneficiat tânărul cercetător dr. ing. Eliza DĂNĂILĂ, angajat pe proiect pe poziţia de cercetare post doctorală. A participat astfel cu interes la lucrările prezentate în diferitele secţiuni din cadrul conferinţei ***IEEE International Conference on e-Health and Bioengineering, EHB 2013 - "Improving Quality of Life through Research and Innovation***. Participarea tânărului cercetător la diferitele lucrări prezentate a condus la consolidarea cunoştinţelor sale în domeniul temei de cercetare, iar temele de interes au vizat printre multe altele ***Medical devices, Measurements, Instrumentation, Biomaterials and Biotechnologies, Teaching, e-Learning, Management in Health Care,*** teme complementare prezentului proiect de cercetare.

3.2. Mobilităţi externe:

Pentru activitatea de mobilitate externă a beneficiat tânărul cercetător dr. ing. Eliza DĂNĂILĂ, angajat pe proiect pe poziţie de cercetare post doctorală. A participat astfel la NanotechItaly 2013, la workshopurile şi prezentările din partea reprezentanţilor comisiei europene referitoare la programul cadru Horizon 2020. La Workshopul ***From the Lab to the Market*** , a primit informaţii şi instruire despre modul cum se pot organiza şi exploata lucrările experimentale ale unui proiect de cercetare pentru un transfer mai eficient către posibili parteneri din producţie (din sectorul economic), activitate complementară proiectului de cercetare în această etapă. La workshopul ***Nanotechnology and Patents*** a beneficiat de instruirea în domeniul exploatării rezultatelor de cercetare prin propuneri de invenţii. Atât directorul de proiect cât şi tânărul cercetător post doctoral au participat la discuţii cu reprezentanţi ai altor instituţii de cercetare, universitare sau economice în sistemul ***Networking*** pentru stabilirea de colaborări viitoare în domeniul ***Nanotechnologies for medicine***, în care grupul proiectului să producă prin metode electrochimice suprafeţe nanostructurate prin metode electrochimice, cu aplicabilitate în domeniul biomedical şi parteneri externi să participe cu caracterizarea lor prin metode avansate şi specifice (activităţi complementare).

4. Activităţi suport pentru diseminarea rezultatelor

4.1. Participări la conferinţe

S-au plătit 4 taxe de participare la conferinţe internaţionale organizate în ţară.
În cadrul conferinţei: *The Second International Conference of Young Researchers "New trends in environmental and materials engineering" (TEME)* studenţii master Sorin Bogdan BAŞA şi Andrei Mihai CHIRIAC angajaţi pe proiect ca tineri cercetători au prezentat lucrări din activitatea lor anterioară din lucrările de licenţă, complementare activităţilor din domeniul proiectului de cercetare, coordinate de directorul proiectului, prof. dr. Lidia Benea. De asemenea doctorandul Iulian BOUNEGRU, membru al echipei proiectului a prezentat o lucrare cu o sinteză bibliografică aferentă domeniului proiectului şi doctoranda Marilena MARDARE (PRALEA) a prezentat câteva rezultate anterioare obţinute în cadrul tezei de doctorat, în domeniul straturilor hybride anorganic – organic cu posibile utilizări biomedicale. Ambii doctoranzi sunt coordonaţi de directorul proiectului. În cadrul conferinţei: *IEEE International Conference on e-Health and Bioengineering, EHB 2013 - "Improving Quality of Life through Research and Innovation"*, au fost prezentate alte două lucrări care au prezentat câteva rezultate anterioare obţinute în cadrul tezelor de doctorat coordonate de directorul de proiect. Lucrările prezentate la sesiunile respective sunt sintetizate în tabelul 1. Deasemenea s-a beneficiat şi de 2 deplasări în cadrul *EHB 2013.*

Tabel 1. Lucrări prezentate la Conferinţe internaţionale organizate în ţară.

Nr crt	Autori / Titlu lucrare / Conferinţă
1.	**Sorin Bogdan BAŞA**, Lidia BENEA, Nadège CARON, Olivier RAQUET, Pierre PONTHIAUX, Jean-Pierre CELIS, **Electrochemical synthesis and characterization of Ni/WC nanocomposite layers**, *The Second International Conference of Young Researchers "New trends in environmental and materials engineering" (TEME), 28 - 30 Octombrie 2013, Galaţi, Romania*.
2.	**Andrei Mihai CHIRIAC**, Lidia BENEA, Nadège CARON, Olivier RAQUET, Pierre PONTHIAUX, Jean-Pierre CELIS, **Codeposition of TiC particles into nickel matrix for self-lubricant nanocomposite coatings**, *The Second International Conference of Young Researchers "New trends in environmental and materials engineering" (TEME), 28 - 30 Octombrie 2013, Galaţi, Romania*.
3.	**Iulian BOUNEGRU**, Lidia BENEA, Eliza DĂNĂILĂ, Alexandru CHIRIAC. **Properties and biomedical applications of chitosan**, *The Second International Conference of Young Researchers "New trends in environmental and materials engineering" (TEME), 28 - 30 Octombrie 2013, Galaţi, Romania.*
4.	Lidia BENEA, **Marilena MARDARE (PRALEA)**. **Effects of UHMWPE inclusion on the surface morphology and corrosion resistance of Co/UHMWPE hybrid biocoatings**, *The Second International Conference of Young Researchers "New trends in environmental and materials engineering" (TEME), 28 - 30 Octombrie 2013, Galaţi, Romania*.
5.	Lidia BENEA, **Eliza DĂNĂILĂ**, Jean-Pierre CELIS, **Influence of Contact Frequencies on Corrosion Behavior of Ti-6Al-4V Alloy during Fretting in Physiological Solution**, *IEEE International Conference on e-Health and Bioengineering, EHB 2013 - "Improving Quality of Life through Research and Innovation", 21 – 23 noiembrie 2013, Universitatea de Medicină şi Farmacie „Gr. T. Popa" Iaşi, Romania.*
6.	Marilena PRALEA – MARDARE, **Lidia BENEA**, Eliza DĂNĂILĂ, Iulian BOUNEGRU, **Effect of Electroplating Parameters on UHMWPE Co-deposition into Cobalt Matrix**, *IEEE International Conference on e-Health and Bioengineering, EHB 2013* - "Improving Quality of Life through Research and Innovation",*, 21 - 23 noiembrie 2013, Universitatea de Medicină şi Farmacie "Gr. T. Popa" Iaşi, Romania*.

S-a plătit 1 taxă de participare şi 2 deplasări la o conferinţă internaţională organizaţă în străinătate pentru prezentarea a două postere din activitatea de cercetare din domeniul proiectului, dar anterioară, referitoare la teza de doctorat a actualului cercetător post doctoral, teză realizată tot sub coordonarea directorului de proiect, respectiv prof univ dr Lidia BENEA, conform tabelului 2.

Tabel 2. Lucrări prezentate la Conferinţe internaţionale organizate în străinătate.

Nr crt	Autori / Titlu lucrare / Conferinţă
1.	**Eliza MARDARE – DĂNĂILĂ**, Lidia BENEA, Iulian BOUNEGRU, Jean-Pierre CELIS, **Controlled Growth of Nanoporous TiO_2 Oxide Layer as Support for Hydroxyapatite Electrodeposition on Ti-6Al-4V Alloy**, *International conference NanotechITALY 2013 – Key enabling technologies for responsible innovation, New Materials and Processes; Manufacturing and Nanofabrication - session, 27 – 29 Noiembrie 2013, Veneţia, Italia.*
2.	**Lidia BENEA**, Nadège CARON, Olivier RAQUET, Pierre PONTHIAUX, Jean-Pierre CELIS, **Influence of electro-co-deposition parameters on TiO_2 nanoparticles inclusion into nickel matrix, structure and morphology**, *International conference NanotechITALY 2013 – Key enabling technologies for responsible innovation, New Materials and Processes; Manufacturing and Nanofabrication - session, 27 – 29 Noiembrie 2013, Veneţia, Italia.*

4.2. Rapoarte intermediare teze de doctorat

Doctorandul Iulian BOUNEGRU a prezentat raportul ştiinţific din cadrul tezei de doctorat intitulat: ***Metode de producere a materialelor, conţinând chitosan***. Conducător doctorat prof univ dr Lidia BENEA (confidenţial pentru membrii echipei).

4.3. Rapoarte intermediare PostDoc

Activitatea cercetătorului postdoctoral, Dr. Eliza DĂNĂILĂ, aferentă proiectului de cercetare s-a concretizat într-un raport ştiinţific de cercetare (confidenţial pentru echipa proiectului).

4.4. Pagină web publică.

S- realizat pagina web a proiectului care se poate accesa la următoarele adrese web:
Pe site-ul centrului de ***cercetare Interfeţe – Tribocoroziune şi Sisteme*** *Electrochimice* (CC-ITES)
http://www.cc-ites.ugal.ro
http://www.cc-ites.ugal.ro/
http://www.cc-ites.ugal.ro/proiecte.htm
http://www.cc-ites.ugal.ro/in_derulare.htm

Pe site-ul facultăţii ***Ingineria materialelor şi a mediului***:
http://www.fimm.ugal.ro/new/
http://www.fimm.ugal.ro/new/index.php/hybioelect

Pe site-ul Universităţii Dunărea de Jos din Galaţi.
http://www.hybioelect.ugal.ro

4.5. Articole publicate

In plus faţă de activităţile etapei I (2013) a proiectului s-au publicat două articole, datorită faptului că aceste articole conţin informaţii ştiinţifice din domeniul proiectului, dar din activitatea ştiinţifică anterioară a celor doi doctoranzi angajaţi pe proiect ca şi cercetători pe poziţie post doctorală. Informaţiile ştiinţifice provin din tezele de doctorat realizate sub coordonarea ştiinţifică a prof dr Lidia Benea, aportul ştiinţific acestor articole in actualul proiect de cercetare fiind de 50 %. Articolele au fost publicate în Proceeding Volume: ***4th IEEE International Conference on e-Health and Bioengineering EHB 2013, ISBN 978-1-4799-2372-4.***

1) Marilena PRALEA – MARDARE, Lidia BENEA, Eliza DĂNĂILĂ, Iulian BOUNEGRU, **Effect of Electroplating Parameters on UHMWPE Co-deposition into Cobalt Matrix**, 4 pagini, Secţiunea Biomaterials and Biotechnology.

2) Lidia BENEA, Eliza DĂNĂILĂ, Jean-Pierre CELIS, **Influence of Contact Frequencies on Corrosion Behavior of Ti-6Al-4V Alloy during Fretting in Physiological Solution, 4 pagini, Secţiunea** iomaterials and Biotechnology.

Director proiect

Prof. univ. dr. Lidia BENEA